the time they have ſerved, in the two laſt years of the war, the ſick were in proportion as numerous as they had been in the two firſt: and what happened in the cantonments in *Dutch-Brabant*, during the laſt campaign, ſhews that no ſeaſoning can avail againſt the influence of the moiſt and corrupted air of marſhes.

The whole amounts to this. Conſidering all the hardſhips, and expoſitions to colds attending the eaſieſt ſervice, thoſe troops will be beſt ſeaſoned to undergo the fatigues of a ſecond campaign, whoſe conſtitution has been leaſt weakened in the firſt.

OBSER-

OBSERVATIONS ON THE DISEASES OF THE ARMY.

PART III.

CHAP. I.

Obſervations on colds, and inflammatory fevers in general.

HAVING laid down the diviſion of the diſeaſes moſt incident to an army, with the remoter cauſes and means of prevention, I ſhall proceed in this part to offer ſome practical obſervations upon each diſtemper, in the order in which they were propoſed*; and therefore ſhall begin with ſuch as depend upon inflammation only.

But as inflammatory diſorders are every where common, and are treated by ſo many authors, I ſhall not enter in-

* Part ii. chap. i.

to a particular account of any, but make a few remarks on ſuch as moſt frequently occur in military hoſpitals.

Upon firſt taking the field, as well as during the winter, pleuriſies and peripneumonies are the moſt common forms of the inflammatory fever; and next to them, fevers attended with rheumatic pains. The inflammation turns alſo upon the brain, liver, ſtomach, and other *viſcera*. Univerſally, the fever taking its riſe from a ſtoppage of perſpiration (or from whatever is the primary effect of cold) by firſt inflaming any of theſe parts ſeems afterwards to be kept up by that inflammation.

Sometimes we can perceive no part more affected than another, and only ſome general inflammatory ſymptoms. The diſtemper is then called ſimply an inflammatory fever, although probably ſome of the more indolent parts may at this time be affected with inflammation. This fever is moſt common after the weather begins to be warm. But inflammatory fevers are ſeldom ſeen ſingle in the end of ſummer, or in autumn; for at ſuch times expoſitions to cold, or moiſture, produce fevers and fluxes of a putrid kind, where the inflammation ſeems to be often the leaſt part of the diſeaſe.

For, after the ſummer ſolſtice, the fevers tend moſtly to remit, and are attended with leſs ſizy and more putreſcent blood. But towards the end of the campaign, when the weather

weather grows cold, more inflammatory ſymptoms are joined; ſo that the fevers may be ſaid, at that time, to depend on two different cauſes.

Among the mixed inflammatory fevers may be likewiſe reckoned the vernal intermittents, which upon the firſt encampment not only ſeize thoſe who have had agues in the preceding autumn, but others who never had any. Theſe are the more carefully to be diſtinguiſhed from true intermittents, as they are to be treated chiefly by bleeding and other antiphlogiſtic remedies. If the Bark be given whilſt the blood is inflamed, or before there is a proper intermiſſion, the diſtemper will either be changed into a continued fever, or ſtop for a while to recur with worſe ſymptoms.

The inflammatory fevers of an army differ from others, only in being more violent, and perhaps more frequently attended with a *diarrhœa*. The ſeverities of the weather, to which a ſoldier is ſo much expoſed, his backwardneſs to complain of the firſt ſymptoms, his rough lying when firſt taken ill, or his being carried to an hoſpital at a diſtance in a waggon, when already in a fever, account ſufficiently for the firſt; and it is the ſtoppage of perſpiration by lying cold, or by drinking improper liquors when firſt ſeized, that is the cauſe of the looſeneſs.

As

As bleeding is the principal remedy in the cure of all inflammatory diſeaſes, the delaying it too long, or not repeating it often enough in the beginning of bad colds, is the chief cauſe of their ending in dangerous inflammatory fevers, or in rheumatiſms or conſumptions: and as a ſoldier applies firſt to the ſurgeon of his regiment, on him it chiefly depends to prevent many fatal diſorders by the timely uſe of the lancet. In general, young practitioners are too ſparing in letting blood, and delay it too long. But the ſurgeon may be aſſured that ſoldiers will ſeldom complain of a cough, or pains with inflammatory ſymptoms, wherein immediate bleeding is not proper; and from the continuance of the complaints, he is to judge of the neceſſity of repeating the evacuation; which, in the caſe of a ſtitch or difficult breathing, is never to be omitted, even in the advanced ſtate of the fever. I have generally ordered from twelve to ſixteen ounces, or more, to be let at the firſt bleeding, and ſomewhat leſs at all the reſt. Here it may be proper to follow *Celſus*'s rule, in obſerving the colour and conſiſtence of the blood whilſt it flows; that is, when it is thickiſh and of a dark caſt (which it always is in difficult breathing and great inflammations) to take it away more freely *. When large quantities are neceſſary, it is beſt to bleed the patient lying, in order to prevent his fainting before enough be drawn:

* De Med. lib. ii. cap. x.

drawn; otherwiſe, in all inflammatory pains, the *animi deliquium*, upon the loſs of blood, is reckoned a favourable circumſtance.

Another prevention (if the patient can have a bed) conſiſts in an early ſweat; for which, one of the beſt medicines is a large draught of warm vinegar-whey with ſome ſpirit of hartſhorn, at bed-time *. It has been uſual to give the *theriaca*, or ſome other hot medicine for this purpoſe; but all ſuch drugs increaſe the fever if they fail of bringing out the ſweat, whereas this ſaline mixture operates without heating. The *theriaca* is rendered more ſudorific and leſs narcotic, by adding to half a drachm ſome grains of the ſalt of hartſhorn, and by encouraging the ſweat with vinegar-whey, or plenty of thin water-gruel acidulated with vinegar. But as to preventing fevers, that will fall more in the way of the regimental ſurgeons than of the phyſicians attending the hoſpital, who rarely ſee the patient till either the fever be quite formed, or ſo far advanced as not to be removed by ſweating.

If therefore the feveriſh diſorder or cold has been of two or three days ſtanding, it is to be treated by bleeding, and ſuch medicines as are not heating, and yet tend to remove

* Or give at bed-time two ſcruples of the ſalt of hartſhorn, ſaturated with about three ſpoonfuls of common vinegar, in one draught, and promote the *diaphoreſis* with ſome warm diluting liquor.

the

the inflammatory obſtruction and promote perſpiration. Some have thought nothing ſo efficacious for this intention as the *ſpiritus Mindereri* * ; the internal uſe of which was firſt mentioned by the celebrated *Boerhaave* †, and afterwards introduced into practice, at *Edinburgh*, by the late Dr. *John Clerk*, a phyſician of eminence in that city ‡. But during the former war I followed the common method of joining the *teſtacea* to nitre, without any particular attention at firſt to the effects of the former; but as

* *Pharmacop. Edinburg.* But it is to be obſerved, that as to the names and compoſitions of medicines, unleſs where it is expreſſed otherwiſe, as here, I follow the laſt edition of the *London* Diſpenſatory, *viz.* that of the year 1746.

† Chem. vol. ii. proc. cviii.

‡ As it may give ſatisfaction to the reader, to have Doctor CLERK's obſervations upon the effects of this medicine in various caſes, I ſhall ſubjoin his own account, in the following extract of a letter which he favoured me with on this ſubject.

" In relation to the *ſpiritus Mindereri*, I never gave above half an ounce for a " doſe. When I intend to promote a *diureſis*, I give that quantity twice a day, " mixed with an equal portion of *ſyrupus de althæa*, and find it ſeldom fail. But in " a dropſy, I more commonly make uſe of the *julapium diureticum Pharmacopœiæ* " *Pauperum Edinburgenſis*. I have ſometimes added the *ſal ſuccini*, when I was " ſure of its being genuine; but that is rarely to be found. For that reaſon it is " left out of the *Pharmacopœiæ Pauperum*, and the ſpirit put in its place; which " has the ſame *ratio* to the ſalt, that the ſpirit of hartſhorn has to its ſalt; though " formerly not being in uſe, it was thrown away as of no value. When I give " the *ſpiritus Mindereri* to promote a *diaphoreſis*, I always add a ſmall quantity of " *ſal cornu cervi* to give it the alcaline caſt, as in the *hauſtus diaphoreticus Phar-* " *macopœiæ Pauperum*. When I deſign to bring on a plentiful ſweating, as in rheu- " matic diſeaſes, I uſe the *julapium diaphoreticum (Pharmacop. Pauper.)* two ſpoon- " fuls

as I have ſince diſcovered a ſeptic quality in thoſe ſubſtances by experiments out of the body, it ſeems natural to conclude that they exert a like power when taken by way of medicine *. And this perhaps would be more frequently ſeen, were it not for the quantity of acids uſually given in acute diſeaſes; in which caſe not only the ſeptic nature of the *teſtacea* may be deſtroyed, but the acid neutralized, and thereby rendered more diaphoretic. The putrefying quality of theſe powders is alſo corrected by the *contrayervæ* root, and by the camphire which was added to them. The common doſe was ten grains of the *pulvis contrayervæ compoſitus*, with as much nitre, and three grains of camphire reduced to a powder, and given four times a day.

Theſe powders were given partly to promote a *diaphoreſis*, when nature ſeemed to be pointing that way, and partly to abate ſpaſms, as the head was ſo apt to be affected: upon the whole it was a medicine which had little

" fuls every hour, or hour and a half, till the ſweat breaks out; repeating it *pro re* " *nata*, when warm diluting liquors are not ſufficient to keep it up. I have given " of the ſpirit in this manner about two ounces, and ten grains of the *ſal cornu* " *cervi* in the ſpace of four and twenty hours. In topical inflammations, I give it " the acid caſt by mixing with it an equal quantity of *acetum ſcilliticum*. I " have often given it ſo in pleuriſies and peripneumonies. I underſtand that ſome " of my brethren uſe this form only. Of all neutrals, I take the *ſal Ammoniacum* " *crudum* to come neareſt the *ſpiritus Mindereri*. I uſe ſometimes the *bolus diaphore-* " *ticus Pharmacopœiæ Pauperum*, but I do not find it nearly ſo efficacious as the " julep."

* Append. paper iii. exp. xxiii.

ſenſible effect, and therefore I laid the leſs ſtreſs upon it. We may obſerve, that in fevers in different countries and different ages, beſides thoſe remedies which have a manifeſt action, phyſicians have uſed others, which though operating imperceptibly have yet been imagined to be of ſome efficacy towards conquering the diſeaſe. But as their practice was founded on the theory then prevailing, when that changed, ſo did the medicine; and this will probably be the caſe till the nature of a fever is better underſtood.

My firſt practice in every inflammatory fever was to bliſter, and eſpecially in the advanced ſtate when I believed that the patient could not bear any farther loſs of blood. But afterwards, when I found that a ſolution of the fever was not to be procured by ſuch means, I confined the uſe of bliſters to thoſe ſtates of the diſeaſe in which I could be the moſt aſſured of their efficacy. Such was that of a headach, when not removed by the firſt bleeding and by opening the body; in this caſe a bliſter between the ſhoulders ſeldom failed of giving eaſe.

To the ſame place, though not with equal certainty of relief, a bliſter was applied, when the patient had a cough (which he generally had) or any other ſign of inflammation in the lungs: but when he complained of a ſtitch in his ſide, the plaſter was laid on the part affected. In theſe circumſtances I likewiſe ordered ſome pectoral drink, and an oily mixture which ſhall be mentioned when I come

come to the pleuriſy. In a *delirium*, I followed that courſe which ſhall be laid down in the next chapter.

If the body was bound, I opened it (after the firſt bleeding) with ſome lenient phyſic; but throughout the courſe of the fever I found it ſufficient to prevent coſtiveneſs by daily clyſters *, if the patient had not otherwiſe regular ſtools. After recovery, ſome mild purge was often requiſite, in order to prevent the too haſty repletion of the convaleſcents, upon indulging their appetite: cathartics at that time ſeemed otherwiſe unneceſſary. But if the fever in the beginning was attended with gripes and a looſeneſs, after bleeding I gave ſome rhubarb; and if the purging ſtill continued, I endeavoured to check it by the chalk-julep only; and afterwards proceeded in the method as above.

Towards the *criſis*, or in the decline of the fever, a little wine was added to the panada, or given in ſome other ſhape, as the beſt cordial; and in great ſinkings, I preferred ſome drops of ſpirit of hartſhorn, in a tea-cup-full of white wine whey, to every other medicine of that intention.

After ſhewing that ſo much depends on early and repeated bleedings in the beginning of theſe fevers, and

* A motion or two daily, procured in this way, I have obſerved to be one of the beſt and moſt general remedies in fevers.

on bliſters, I can offer no remark more uſeful than what relates to *opiates*; which otherwiſe one might be too apt to have recourſe to, amidſt ſo many complaints of pain, looſeneſs, and want of reſt. With regard to the two firſt, I have already propoſed what I found ſufficient for the cure; but as to the watchfulneſs, I ſhall obſerve, that opiates ought only to be uſed in the advanced ſtate of the diſeaſe, when the inflammatory ſymptoms are much abated, when the head is not affected, and when the patient after long watching believes he ſhould be well enough if he could but ſleep. At ſuch times, and eſpecially at the *criſis*, and after it, I have uſually given two ſcruples of the *confectio Damocratis* at bed-time, and with good effects. If the paregoric be continued, coſtiveneſs muſt be prevented by clyſters or ſome mild laxative.

In theſe, as in other fevers, thirſt was moderated by acidulating the barley water with vinegar, or by balm-tea with lemon-juice. And as to diet, the patient was always kept upon the loweſt, ſuch as panada, water-gruel, and the like, without allowing any broth till after a breaking and a ſediment in the urine: when that happened, a decoction of the Bark, or the elixir of vitriol, completed the cure.

CHAP.

CHAP. II.

Obſervations on particular inflammations.

§ 1.

Of the inflammation of the brain.

THE *phrenitis* or inflammation of the brain, conſidered as an original inflammation, is properly a ſummer diſeaſe, when men are expoſed to the ardour of the ſun; and eſpecially whilſt aſleep and in liquor. But a ſymptomatic *phrenitis* or *delirium* is one of the moſt general inflammatory ſymptoms, is confined to no ſeaſon, and happens indifferently in the bilious, malignant, or inflammatory fever. It is more common in military hoſpitals than elſewere, on account of the violence done to all fevers when the ſick are carried in waggons from the camp to an hoſpital, where the very noiſe, or light alone, would be ſufficient with more delicate natures to raiſe a phrenzy.

An original inflammation of the brain requires immediate, large and repeated bleedings; and the relief is thought to be the more certain if the blood be taken from the jugular. I have never adviſed cutting the temporal artery, finding ſo much relief from applying three

or four leeches to each temple after bleeding in the arm *. The benefit thence arifing may be compared to the effects of an hæmorrhage by the nofe. The reft of the cure confifts in the medicines common to all inflammatory fevers.

The fymptomatic *phrenitis* is alfo treated by opening a vein, if the pulfe can bear it; but if this cannot be done by reafon of lownefs, the cure is to be attempted by leeches and blifters. It is ufual in bliftering to begin with the head, but in military hofpitals I found it convenient to leave that to the laft; becaufe barbers are carelefs, and in cutting the fkin expofe the patient more to a ftrangury †. The common internal medicine was the diaphoretic powder mentioned in the laft chapter.

A *phrenitis* is often brought on, or increafed, in the hofpitals of an army, by the want of due perfpiration, and of warmth in the extremities. Therefore, as foon as a foldier

* I have fometimes fince applied fix to each temple.

† Upon reading this paffage in the firft edition, Dr. WHYTT, profeffor of medicine in the univerfity of *Edinburgh*, wrote to me, he had obferved, that by fhaving the head, twelve or fifteen hours before the application of the blifter, a ftrangury was generally prevented. Sometimes I have found the brain fenfibly relieved by cutting off the hair and fhaving the head, though no plafter was applied: and fince the firft edition, I have in fuch cafes, out of the hofpital, given the *fal fedativum* of HOMBERG, to the quantity of 25 grains every four hours, and, as I have imagined, with good effect; but as I never trufted to that medicine fingly, I cannot fpeak of it with certainty.

foldier is brought into the houfe with feverifh fymptoms, his hands and feet fhould be wafhed with warm vinegar and water. And I would likewife recommend for the hofpitals, what I have fometimes fince in a *phrenitis* fuccefsfully ufed in my private practice, a fomentation to the feet and lower part of the legs with double flannels wrung out of water (with a feventh of vinegar) made agreeably warm, and repeated often for an hour or two at a time.

§ 2.

Of the inflammation of the eyes.

SOLDIERS are fubject to an *ophthalmia* or inflammation of the eyes, not only from winter colds, but from their frequent expofition to the fun and duft during the campaign. The flighter cafes may be cured without bleeding; but if any degree of fever be joined, or the inflammation be confiderable, this evacuation ought not to be omitted. The greater inflammations are not to be cured without large bleeding, unlefs we can make a derivation from the part affected without draining the whole body. For this purpofe, blifters are ufefully applied behind the ears, efpecially if they are continued for two or three days, and if the fores are afterwards kept running. This part of the cure is fufficiently known. But what I have obferved

obſerved to be ſometimes more efficacious, though leſs generally practiſed, is bleeding by leeches; when two or more are applied to the lower part of the orbit, or near the external angle of the eye, and the wounds allowed to ooze till they ſtop of themſelves. Therefore in all greater inflammations, after bleeding in the arm or jugular I have uſed this method, and repeated it more than once if required. The practice is no leſs proper in an inflammation of the eyes from a hurt or a blow: only in great fluxions, ſome blood is to be firſt taken from the arm, and immediately after, a revulſion is to be made by a briſk purge. But though theſe means are proper in the common *ophthalmia*, they are not to be relied on when the diſeaſe ariſes from a ſcrofulous, or a venereal cauſe *.

In all caſes, we are to look often and narrowly into the inflamed eyes; ſince the inflammation may either be occaſioned, or kept up by moats, or by hairs of the *cilia* falling in, or growing inwards, ſo as to cauſe a conſtant irritation.

* There are alſo inflammations and ulcers of the eye-lids, which are often miſtaken for diſorders of the eye itſelf, but are not to be cured by the common ophthalmic medicines. The following liniment, communicated to me by a friend who had given particular attention to this branch of medicine, I once found efficacious:

℞. *Unguenti albi* ʒ v. *ſacchari Saturni* ℈ i. *quibus ſuper porphyrite ſimul tritis inſtillentur balſami traumatici* ℈ ij.

Hujus paululum, linteo exceptum, oculo dolenti omni nocte imponatur.

The

The ſlighter inflammations from the duſt, or the ſun, were removed by fomenting with warm milk and water, adding a ſmall proportion of brandy; and by anointing the eyes with the *unguentum tutiæ*, or the like, at night. But in bad caſes, after the inflammation had yielded a little to evacuations, I found the *coagulum aluminoſum* of the *London* Diſpenſatory, ſpread on lint and applied at bed-time, the beſt external remedy. Till then the patient is to uſe a ſolution of white vitriol; or, in violent pains, to foment frequently with a decoction of white poppy heads.

§ 3.

Of the inflammation of the throat.

THE inflammatory *angina* is moſt frequent and dangerous upon the firſt encampment. Its tendency to bring on a ſuffocation requires ſpeedy and large bleedings, purging, and bliſtering; but the method of uſing all theſe being ſo well laid down by *Sydenham*, I ſhall only mention another remedy which I have ſometimes found uſeful. Let a piece of thick flannel, moiſtened with two parts of common ſweet oil and one of ſpirit of hartſhorn (or in ſuch a proportion as the ſkin will bear) be applied to the throat, and renewed once in four or five hours *. By this

* This medicine I had from the late Dr. YOUNG, phyſician at *Edinburgh*.

T means

means the neck, and ſometimes the whole body, is put into a ſweat; which, after bleeding, either carries off or leſſens the inflammation. The *formula* is new but not the whole intention; for the ancients applied warm oil with a ſpunge, and warm bags with ſalt *; and ſome later writers have recommended poultices made of the dung of animals †, which ſeems to be only a coarſe and an offenſive way of uſing the volatiles.

I obſerved little benefit from common gargles; for at that time I did not think of injecting them with a ſyringe, which now I conſtantly do. By this method, the patient brings away a great deal of tough phlegm, and generally finds ſome immediate relief, from clearing the glands of the *fauces*. My compoſition is thirteen ounces of barley-water (or ſage-tea) with two ounces of *mel roſarum* and one ounce of vinegar; ſometimes I have added a ſpoonful of muſtard for a greater *ſtimulus*. The bleedings, the laxatives, the bliſters, and this gargle are all the medicines I now find neceſſary. And even in the *angina maligna* or ulcerous ſore throat, I lay the chief ſtreſs of the cure upon gargling in this manner. In all caſes, I direct five or ſix ſyringefuls to be injected, one after another, as far into the throat as the patient can bear, and the medicine to be repeated three times a day ‡.

§ 4.

* CELS. lib. iv. cap. iv. † ETMULLER. cap. de angina.

‡ In later practice, beſides a bliſter to the back, in bad caſes I have laid one acroſs the throat; at other times I have applied 7 or 8 leeches under the *fauces*; and when the

§ 4.

Of the pleuriſy and inflammation of the lungs.

THE pleuriſy and peripneumony are the moſt frequent forms of our inflammatory fever. It is to be remembered, that in theſe diſorders the pain may be felt in any part of the cheſt, behind or before, as well as in the ſides; and ſometimes ſo low down, as to be miſtaken for an inflammation of ſome of the abdominal *viſcera*, ſuch as the liver, ſpleen, or kidneys.

Before I enter into an inquiry how far the pleuriſy and peripneumony are properly diſtinguiſhed, I ſhall mention thoſe remedies which I have uſed with moſt ſucceſs in ſuch pains of the breaſt, ſharp or obtuſe, as are attended with a difficulty in breathing, almoſt always with a cough, and never are without ſome fever. For we are not to confound theſe inflammatory pains, and difficulties in breathing, with ſome ſpaſmodic ſtitches (which ſeizing the muſcles of reſpiration are not accompanied with a fever, and may be removed by externals only) nor with certain flatulent pains of the ſide, if I may ſo call them, to which hypochondriacal and hyſterical perſons are moſt ſubject.

the patient has been brought low by the loſs of much blood from the arm, I have opened one of the veins under the tongue, and taken away two or three ſpoonfuls: all theſe methods at times have had a good effect. But when an abſceſs is formed, which the lancet cannot reach, its breaking will be haſtened by a common vomit.

Such caſes indeed come rarely into theſe hoſpitals. But to the ſame kind of flatulent ſtitches every perſon is liable when brought low by ſickneſs, and eſpecially by any diſorder of the bowels. Theſe pains may be owing to wind confined, or to excrements pent up in that part of the *colon* next the diaphragm. They generally ſtrike from the breaſt to the back, or from ſide to ſide, affect the breathing, and are ſometimes attended with a ſhort and frequent cough. But the fever and ſizineſs of the blood, with other marks of a true pleuriſy are wanting. Bleeding may do harm, but carminative laxatives, with warm applications to the part give eaſe. A bliſter perhaps is the only remedy common to both.

Although we reject the critical days, we muſt ſtill with the ancients obſerve certain periods of the true pleuriſy, diſtinguiſhable both by the ſymptoms and the indications of cure. The ſick are often brought into the hoſpital when the inflammation has ſpread upon the lungs, and gone too far to yield to bleeding. Now, however improper it would be at this time to commit the whole to nature, yet certain it is, that if the *ſputum* appears, as deſcribed by *Hippocrates*, we are to conſider it as the means of cure, and therefore are not to divert it by bleeding or other evacuations.

With theſe cautions we are to proceed, letting blood freely for the firſt three or four days of the diſtemper; but

but if in that time the ſpitting begins, the bleeding muſt either be wholly omitted, or ſo moderated as to relieve the breaſt, without impairing the ſtrength or checking the expectoration.

With regard to the quantity, and repetitions of bleeding, no preciſe rules can be given. *Sydenham* has ſpecified forty ounces for the whole quantity which men may, at a *medium*, loſe in a pleuriſy; but this, in our circumſtances, would have been too little had it not been for bliſters, which not only ſhortened the cure but prevented the loſs of a great deal of blood.

A pleuriſy, taken in the beginning, will often be cured by one large bleeding, and a bliſter laid on the ſide affected. The objection to this practice is founded on the ſtimulating quality of the *cantharides*; but the relief is ſo certain, that theory ought only to be employed here in accounting for the reſolution of an internal ſpaſm, or obſtruction, by ſuch a *ſtimulus* upon the ſkin.

This method of bliſtering the ſide is ancient, and was performed by *ſinapiſms* *; but now only *cantharides* are uſed, and the practice is become common in *Britain*. Some difficulty remains about the time of application, whether it is beſt to apply the bliſter in the beginning, or to wait till the pulſe be ſoftened by frequent bleeding. The ex-

* CELS. lib. iv. cap. 6.

perience

perience which I have had induces me to prefer the former; for in treating great numbers in the hoſpitals, I found no inconvenience from uſing the bliſter immediately after the firſt bleeding, but, on the contrary, a more ſudden and certain relief. Nay frequently, when the ſurgeon was not at hand, I have had the plaſter put directly to the ſide, and the patient bled afterwards; being ſatisfied if the vein was opened before the *flies* had time to ſtimulate. Theſe lateral bliſters, as well as thoſe for the back, were made as large as the palm of the hand with the fingers; a ſize unuſual any where but in this country.

Although the ſymptoms may vaniſh upon bliſtering, it will be more ſecure to bleed again, unleſs a ſweat comes on with a relief from pain, and makes this and other remedies unneceſſary. But, if the lungs are much inflamed the cure cannot be ſo ſpeedy; for though the firſt bleeding and bliſter ſhould give eaſe, yet repetitions of both will be needful. Sometimes the ſtitch returns and fixes in the other ſide; but this being treated as the firſt, will alſo give way.

A diſtinction has commonly been made between the pleuriſy and peripneumony, which I likewiſe followed in the former editions. But having ſince read the diſſections and remarks of thoſe celebrated authors *de Haller* * and *Morgagni* † relating to this ſubject, I am convinced that

* Opuſcul. Pathol. obſ. xiii. xiv. † De Sed. & Cauſ. Morb. ep. xx. xxi.

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we ought to conſider theſe two diſtempers as one, in which the lungs are always inflamed, and often without the pleura; but the pleura never, without the lungs. Wherever the pain is, I apply a large bliſter to the part; and if there is no particular ſtitch, but only a general oppreſſion, I lay the plaſter between the ſhoulders; and afterwards, if the diſeaſe is obſtinate, firſt to one ſide and then to the other. Bliſters, not only when applied to the cheſt but alſo to the extremities, tend to relieve the breaſt, and to promote expectoration; whereas bleeding muſt be uſed cautiouſly, if at all, after the *ſputum* appears.

Not only during the height of the inflammation, but throughout the ſtate of expectoration, I give the patient from hour to hour a ſmall tea cupful of a pectoral infuſion warm *, and once in five or ſix hours, four ſpoonfuls of an oily mixture †. But when the expectoration flags, inſtead of this laſt medicine, I order as much of the *oxymel ſcilliticum* as the patient can take without ſickneſs, or purging. Or, what I have often found more effectual, four ſpoonfuls once in ſix or eight hours of a ſolution of

* *Viz.* An infuſion made of the ingredients of the *decoctum pectorale*; to a quart of which, add an ounce of the ſimple *Oxymel*.

† ℞ *Mellis (vel ſyrupi ex althæâ)* ʒvi. *gummi Arabici in pulverem contriti* ʒi. *aquæ roſarum* ʒii. *accuratè ſubactis admiſce invicem olei amygdalarum dulcium* ʒiß. *et aquæ puræ* ʒvi.

gum

gum *Ammoniacum* *. I have likewiſe obſerved good effects from making the patient breathe over the ſteam of hot water: a practice recommended by *Boerhaave* and the *Baron van Swieten*, and confirmed to me by the repeated trials of *Dr. Huck*, who found it more beneficial when the phlegm was viſcid, as well as more grateful to the patient, by adding a ſmall portion of vinegar. This is my preſent practice. In the hoſpital, when the patient was reduced by repeated bleedings, I found the *ſal cornu cervi* joined to *ſperma ceti* not only proper for raiſing the pulſe but for promoting expectoration †.

If notwithſtanding this diſcharge, the patient complains much of a ſtitch, or labour in breathing, it is ſtill neceſſary to bleed. But in this caſe there is danger of falling into one of theſe extremes; either of ſuffering the lungs to be overpowered, by omitting to bleed; or of hazarding the ſuppreſſion of the *ſputum*, by bleeding too freely. *Trillerus*, *Huxham*, and the *Baron van Swieten* have delivered the rules how to proceed here. But, with regard to bliſters, there need be no caution at ſuch a juncture, as they are always ſeaſonable, whether for raiſing the pulſe or relieving the breaſt.

* ℞ *Spermatis ceti (ex vitello ovi quantum ſatis eſt ſoluti)* ʒij. *lactis Ammoniaci* ʒvii. *ſyrupi croci* ʒ vi. *miſce.*

† This is the formula which I have generally uſed:
℞ *Spermatis ceti (ex vitello ovi ſoluti)* ʒiii. *aquæ puræ* ʒvii. *ſalis cornu cervi* ʒi. *ſyrupi balſamici* ʒi. *miſce.*

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In the courſe of expectoration, a vomit has ſometimes contributed to diſcharge the viſcid phlegm. Sometimes opiates may be given, but with caution; for, as long as the pulſe is hard, or the breathing difficult, or when watchfulneſs is owing to the fever, they do harm. But when the fever has ceaſed, and ſleep is only prevented by a thin rheum falling on the *fauces*, or lungs, opiates, and eſpecially if joined to ſquills, will both give reſt and promote expectoration.

§ 5.

Of the inflammation of the liver.

THE liver is a part not only liable to original inflammations, but alſo to ſuffer by tranſlations of matter. I have found by ſeveral diſſections that this *viſcus*, next to the lungs, is moſt ſubject to ſuppuration; but I have known one caſe only cured after an abſceſs. In this, the matter pointing was let out, and the patient ſoon after recovered.

Another caſe occurred, remarkable for the ſituation of the abſceſs, which was intirely on the left ſide of the *linea alba*. The inciſion was nevertheleſs made, and a large quantity of *pus* was evacuated. The patient was relieved, but the operation having been delayed perhaps too long, he died ſoon after. Upon opening the body, the inciſion

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was found to have paſſed into the liver, but to have been too ſmall for diſcharging all the matter.

A third caſe was ſingular for the flatneſs of the tumour, and an unuſual difficulty in breathing; for the man could not lie extended, but for the moſt part reſted in a prone poſture upon his knees and hands. He had frequent retchings to vomit, with a conſtant and uncommon pain at his ſtomach and ſickneſs; and two days before his death he grew yellow, and was ſeized with a hiccup. The body being opened, the liver was found wholly ſcirrhous, or purulent. The thick and poſterior lobe was ſuppurated; and another large abſceſs roſe from the concave part, which thruſt the ſtomach outwards in ſuch a manner, that had an inciſion been made before death, as in the former caſe, it muſt have paſſed through the ſtomach before it came to the bag.

As to the cure of an inflammation of the liver, I have made no remark that deſerves notice; unleſs that with plentiful bleeding, one of the beſt remedies is a large bliſter laid over the part affected.

§ 6.

Of the inflammation of the ſtomach and inteſtines.

THE ſame method has been practiſed in the inflammation of the ſtomach and inteſtines: nor have I known theſe local bliſters attended with any bad conſequences, though applied early in the diſeaſe. In particular, they were uſeful in the *ileus* or inflammatory colic; and often anſwered in fixed pains of the bowels from ſpaſms, without evident marks of inflammation.

To this obſervation relating to the effects of bliſters in pains of the *abdomen*, I ſhall ſubjoin a few remarks upon the inflammation of the bowels, which have occurred upon further reflection and more experience.

The ἐιλεὸς, *ileus* (improperly rendered *volvulus*) according to *Galen*, "is an inflammation of the inteſtines attended "with violent gripes, and ſuch a conſtriction as to allow "no paſſage for either the *fæces* or flatulence *." This definition, where vomiting is not named, is nevertheleſs agreeable to the deſcription of the *ileus* by *Hippocrates* †, who mentions both a bilious and a ſtercoraceous vomiting; but which he conſiders as additional ſymptoms when the diſtemper riſes to a height. For, in the Aphoriſms ‡ *Hippocrates* obſerves, that "in the *ileus*, vomiting is a bad "ſign;" which ſeems to imply, that there may be an *ileus* without any vomiting at all. And *Aretæus* §, who of all the ancients has given us the fulleſt and moſt ſatisfactory account of the diſeaſe, takes notice of three degrees of it; one, in which the ſtomach is oppreſſed, without vomiting; another, in which the patient brings up phlegm

* Lib. De Definit.
‡ Sect. vii. 10.
† De Morb. lib. iii.
§ Acut. Morb. lib. ii. cap. vi.

and gall; and the third and fatal one, when he voids his excrements by the mouth. From this it appears, that whenever there are acute pains of the bowels, attended with an oppreſſion at the ſtomach, great coſtiveneſs, and (if I may add from *Hippocrates)* a tenſion of the belly, of all perhaps the moſt conſtant ſymptom, without regarding whether there is vomiting or not, we may freely determine the caſe to be the *ileus* of the ancients; and from them draw what lights they can furniſh with regard to the cure. But if, in conformity with ſome of the beſt of the moderns, we ſhould only call that an *iliac paſſion*, in which the periſtaltic motion is wholly inverted, our practice can receive no aſſiſtance from the *Greeks*, who ſuppoſed that ſtate of the *ileus* to be incurable.

Thus *Sydenham*, when to the above ſymptoms even a vomiting of the food is joined, allows no other name to the diſorder than that of the *paſſio iliaca notha* * as ſuppoſing in that caſe only a partial inverſion of the periſtaltic motion; and he conſiders the rendering of clyſters by the mouth as the mark of a total inverſion, and therefore a pathognomonic ſymptom of the true iliac paſſion: *quando liquet ex clyſteribus per os ejectis et aliis ſignis* verum *eſſe* ileum †, *&c.* This *ileus verus* of *Sydenham* I never ſaw but once (the patient died) and I ſhould imagine, that it has been but rarely ſeen in our times by thoſe in the greateſt

* Sect. i. cap. vi. † Ibid.

practice,

practice, and ſeldom or never cured: ſo that it may ſeem extraordinary, that in his days it ſhould occur ſo often as to ſatisfy him about the certainty of his method of cure; and the more, as the remedies which he uſed would now appear inadequate to much milder degrees of the diſeaſe. But, that excellent author appears to have been afterwards ſenſible of the inſufficiency of his former practice; for, in the *Proceſſus Integri* (his poſthumous work) he omits part of it, and adds ſome more powerful remedies, which ſtill perhaps, in other hands, would prove ineffectual.

As to all the leſſer degrees of the *ileus*, we muſt look in *Sydenham* for their deſcription and cure under the title of *colica bilioſa*, which we may be the more certain is the ſame diſtemper with the *ileus*, as the author himſelf ſays, that if this colic was not timely remedied, it terminated in the *iliac paſſion* *. But it is to be wiſhed that *Sydenham* had not given the name of *bilious colic* to the *ileus*, nor conſidered it in the light he has done; becauſe upon his authority many have been led to correct, and to evacuate the bile (perhaps faultleſs) without ſufficiently attending to the inflammation, as he does not mention it. *Sydenham* bleeds but once; from which circumſtance alone we may judge, that he had never inquired how the bowels of thoſe who died of the diſtemper appeared after death, nor apprehended any danger from a mortification, which

* Sect. iv. cap. vii.

from

from numerous diſſections we are now aſſured is always threatened.

Having had theſe reaſons to deviate from *Sydenham*'s practice, I followed the more ancient one, of bleeding largely and often, as long as the violence of the ſymptoms remained, or whilſt the ſtrength permitted. If after the firſt bleeding, the patient was not ſenſibly better, in a few hours the vein was opened a ſecond time, and immediately after, a bliſter (as large as the palm of the hand with the fingers) was applied over that part of the belly which was moſt affected. As I have more than once known the patient relieved in his bowels as ſoon as he felt the burning of his ſkin, and at the ſame time have ſtools by a purge or clyſter, which had been given before without effect, we have reaſon to believe that the bliſter acts more as an antiſpaſmodic than an evacuant. This was my common method in the hoſpital; and if ſince that time I have made leſs uſe of theſe bliſters, it is not from having ſeen bad conſequences from them, but from finding, in private practice, a greater reluctance in the patient to have them upon a part where they are not commonly applied; and alſo, from their ſomewhat interfering with the warm bath, which though a material article in the cure, was generally wanting in the hoſpitals of the army.

Next to bleeding, the principal part of the cure depends upon opening the body, which formerly I attempted by clyſters,

clyſters, and by giving every hour a pill of aloes, ſoap and calomel; but afterwards I changed that practice for the more lenient medicines. In this intention, I have given, every hour, the ſize of a nutmeg of an electuary compounded of half an ounce of the *electarium lenitivum*, two drachms of the flowers of ſulphur, and one drachm of the creme of tartar, with ſome ſyrup. But of late, I have kept more to the uſe of the *ſal catharticus amarus*, recommended to me by Dr. *Heberden*, who had had ſeveral proofs of its good effects in ſmall but repeated doſes. Two ounces of this ſalt being therefore diſſolved in a pint of water, I give two ſpoonfuls every half hour; or one ſpoonful at ſhorter intervals, as long as the patient's ſtomach will bear it, or till he has had two motions. Although this medicine has a diſagreeable taſte, yet as Dr. *Heberden* remarked, the ſtomach will often retain it when more grateful liquors are rejected: a circumſtance which might incline one to believe, what has been ſaid of other neutral ſalts, that they poſſeſs ſome degree of a ſedative, as well as a laxative quality. Whether I direct the electuary or this ſolution to be given, I order a clyſter, purely looſening, for aſſiſting the operation: for I never could underſtand, how parts lying in the center of animal heat, and naturally in a moiſt ſtate, ſhould be fomented by any fluid, in a clyſter, no warmer than themſelves. When I ſuſpect that the obſtruction is owing to hardened *fæces*, at firſt I only uſe clyſters of oil, but at all other times, the following:

℞ *Decocti communis pro clyſtere* ℥x. *electarii lenitivi, olei olivarum, ſingulorum* ℥ii. *miſce.*

But when the ſtomach is ſo much diſordered as to throw up either of the above laxatives, I then join ſome opium to a ſtimulating purge; a practice which has been long in uſe here and followed by Dr. *Mead* *.

℞ *Extracti cathartici gr.* xxv. *extracti Thebaïci gr.* iß. *mercurii dulcis ſexies ſublimati gr.* v. *miſce, fiant pilulæ* x.

Theſe are for one doſe, to be given at ſome interval when the patient, after vomiting, complains of the leaſt ſickneſs. The ſmaller the pills are, they will have the better chance of being retained. About twelve hours after this, or when the force of the opium begins to go off, I endeavour to promote the operation of the purge by the ſolution of the ſalt as before; and in a few hours more, ſtill continuing the ſolution, I repeat the clyſter.

After procuring ſtools, moſt of the danger being over, I follow pretty nearly *Sydenham*'s method, in regard to the reſt of the diſeaſe; giving laudanum at bed-time; and in the morning, as much of the ſolution, or of ſome other laxative, as is ſufficient to open the body freely till the hazard of a relapſe is paſt.

Sydenham, in the *ileus* (as he defines it) recommends for the vomiting a ſcruple of ſalt of wormwood in a ſpoonful

* Monit. et Præcept. Medic. p. 114.

of

of lemon-juice, to be given in the act of effervеſcence; which practice I remember to have tried more than once ſucceſsfully in iliacal caſes, where the patient only vomited bile; but with this difference, that inſtead of giving the draught twice a day, I gave it every hour.

With regard to the cauſes of the *ileus*, it is well known that thoſe who have ruptures are moſt liable to it; but ſuch caſes are not common in the army. As to other cauſes, there were too few inſtances to ſatisfy me about the moſt frequent. Not but that among ſoldiers the bowels are often inflamed; but every inflammation there does not tend to an *ileus*; for by falling upon the larger inteſtines it generally occaſions a flux, as will appear by the diſſections of thoſe who died of the dyſentery. A few examples may be found of the *ileus* from an inflammation of the *colon*; but I imagine that in moſt of them, ſome hardened *fæces*, or ſome tumour, have concurred to ſtraiten the paſſage and prevent ſtools. Upon the whole, I have met with this diſeaſe more in my practice at home, than abroad in the army. Children and thoſe who are delicate are perhaps more liable to it than men in the vigour of life; beſides ſuch as have ruptures are not enliſted. A gouty humour may be often the cauſe among people of higher rank, but ſeldom or never among ſoldiers. I remember to have had two patients in the *ileus* attended with vomitings; one a young gentleman of two and twenty (who had lived intemperately) whoſe diſorder went off with a

fit of the gout; and the other, a man of fifty, who in a few days after a ſecond attack was likewiſe ſeized with the gout, and afterwards had no complaint in his bowels. Neither of theſe perſons had been troubled with the gout before. But whoever deſires to purſue this inquiry farther, may conſult the *Sepulchretum Anatomicum*, *Ruyſch*'s anatomical and chirurgical obſervations *, and the late excellent work of *Morgagni*, *De Sedibus et Cauſis Morborum* †.

I ſhall conclude with one remark, which though it has been made before, yet has not been ſo generally received as to render any further teſtimony unneceſſary. The *ileus* is for the moſt part attended with a ſenſible degree of fever, and with all the other ſymptoms related above; but beſides that there are caſes, in which there is no vomiting (as ſhewn from the ancients) there are others in which the fever is ſcarce perceptible, when the patient feels little pain, and is not altogether coſtive. I ſay there are ſuch caſes of inflammation; becauſe, when with ſymptoms ſo little alarming the patient has died, the bowels have been found not leſs mortified than after the moſt diſtinguiſhing marks of the diſeaſe. This, ſo far as I know, was firſt taken notice of by Dr. *Simſon*, whoſe obſervation is quoted and confirmed by the *Baron van Swieten* ‡, and lately by *Morgagni* §, who obſerves, that in ſuch circumſtances, the only

* Obſ. 91. † Ep. xxxiv. & xxxv. ‡ Comm. in BOERH. Aphor. § 371.
§ De Sed. et Cauſ. Morb. ep. xxxv. 22.

only preſages of danger are to be taken from the tenſion of the belly, and a dull pain upon preſſing it, from the lowneſs and inequality of the pulſe, and from a change in the countenance. What he ſays upon this ſubject well deſerves attention.

§ 7.

Of the rheumatiſm.

THE ancients ſeem to have imperfectly diſtinguiſhed the gout from the diſtemper now called the rheumatiſm, by giving the name of *arthritis* to the affection of all the joints, whether the pain aroſe from a rheumatic inflammation, or a gouty humour. If not all, but ſome particuluar joint ſuffered, the diſtemper was denominated from the part; hence the terms *chiragra*, *podagra*, *iſchias*, *&c.* all which they conſidered as *ſpecies* of the *arthritis*. But as ſome arthritic pains were obſerved to be of a different nature from others, they diſtinguiſhed them according to the different humours which they ſuppoſed to be the cauſe of the diſeaſe. Thus, one kind they believed depended on the blood, therefore bleeding was recommended as the chief remedy, and in plethoric habits they bled more than once.

Although by making this diſtinction, the ancients might ſometimes treat in a proper manner that diſtemper now

called a rheumatiſm, yet as names are ſo apt to impoſe upon the underſtanding, it is to be imagined that the different kinds of the *arthritis* were often confounded, and conſequently often unſkilfully managed. Accordingly we find, that in later times the phyſicians came to conſider all pains of the joints as the effects of a *rheum* or *catarrh*. But this change of theory had a worſe conſequence; for, all catarrhous humours being ſuppoſed to be of a cold nature, bleeding was forbidden, and the cure of an acute rheumatiſm, as well as of the gout, was then attempted without opening a vein. *Botallus* ſeems to have been the firſt who oppoſed that practice, and diſtinguiſhing the inflammatory *ſpecies* of the catarrh (or what we now call a rheumatiſm) from the reſt, declared that repeated bleeding was neceſſary for the cure *.

But *Ballonius* is the firſt whom I find uſing the term *rheumatiſm*, to denominate this inflammatory *ſpecies* of the *arthritis*, which he alſo conceived to be different from either a gout, or a catarrh †. The ſame author is alſo the firſt who has deſcribed the diſeaſe in a proper manner, and who has recommended repeated bleeding for the cure. This method has been ſince followed by the beſt practical writers, and in particular by *Riverius* and *Sydenham*.

* De Curat. per Sang. Miſſ. cap. xii.

† We meet with the word ξυματισμὸς in GALEN, but in the lax ſenſe of *rheum* or *fluxion*, and not, ſo far as I know, to denominate any particular diſtemper. BALLONIUS begins his treatiſe upon the rheumatiſm by calling it *affectus pæne-ἀνώνυμος apud antiquos*.

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How frequently rheumatiſms occurred, eſpecially in the beginning of a campaign, was ſeen in the general account *; but we muſt add, that though this diſtemper ſometimes appeared with all the ſeverity mentioned by *Ballonius* and *Sydenham*, it was generally of a milder kind. In a high degree of an acute rheumatiſm the joints are conſiderably ſwelled and inflamed, but in our fevers with rheumatic pains that was ſeldom the caſe, and therefore the cure was commonly completed in a few days, by twice or thrice bleeding, and by promoting a *diaphoreſis* with the cooler medicines, particularly with vinegar-whey. But if the rheumatiſm was attended with acute pains, or ſwelling of the joints, the cure was chiefly to be obtained by repeated and almoſt daily bleedings, till the feveriſh heat and the pains were either intirely removed or made much eaſier. And in this courſe we may proceed the more ſafely, as thoſe who are ſubject to this kind of rheumatiſm are generally in the vigour of life, and are either plethoric, or able to bear ſuch evacuations. Add, that frequent bleedings weaken the body leſs perhaps in this diſeaſe than in any other.

If the pain and ſwelling of the joints remain after the fever is abated by frequent bleedings, apply three or four leeches to the part where the inflammation and tumour are the greateſt, and let the blood ooze till it ſtops of itſelf. As the relief hereby obtained is ſometimes imme-

* Part i. chap. iii. and chap. iv.

diate,

diate, and the evacuation but ſmall, the repetitions need not be limited *. *Ballonius* alſo mentions this practice; and I have had ſufficient experience to recommend it to others. But we are to expect little benefit from leeches in ſuch pains of the joints as are not attended with both inflammation and ſwelling.

In the acute rheumatiſm internal medicines avail little. In ſuch caſes I have commonly given camphire, but not ſo as to force a ſweat †. As to diet, it muſt be of the loweſt kind, as *Sydenham* well adviſes.

Ballonius mentions paregorics, but without defining the kind, or the times moſt proper for giving them. *Sydenham*

* I have ſometimes, ſince, ſucceſsfully uſed twelve leeches every day for three days together, and I make the application as ſoon as the parts begin to ſwell.

† Although we are not to force a ſweat, it will be proper to keep up a gentle moiſture on the ſkin; for which end I have uſed the camphire in this manner:

℞ *Camphoræ grana* xii. *amygdalas dulces, demptis pelliculis,* ij. *contritis paulatim adjice aquæ puræ* ℥viiß. *ut fiat emulſio, cujus colaturæ admiſce ſpiritûs volatilis aromatici guttas* xl. *ſyrupi croci* ℥ß.

Dentur quartâ vel quintâ quâque horâ cochlearia iv.

During the feveriſh heat I order a laxative clyſter daily; but when the fever is off, or much on the decline, I give every night at bed-time about a ſcruple of gum *guaiacum* diſſolved with the yolk of an egg, in a draught of plain water ſweetened with ſugar; by which means the patient has generally one or two looſe motions next day. This method I continue, after leaving off the camphire, till he gets well. To the *guaiacum*-draught I ſometimes add a few grains of ſalt of hartſhorn to keep up a perſpiration, without weakening its laxative quality.

condemns

condemns opiates, as fixing the diſeaſe; and, ſo far as I have obſerved, juſtly. Outward applications, excepting leeches, are alſo to be omitted as long as any fever or inflammation remains. The ſpirituous and volatile liniments inflame; and the emollient fomentations, though they give eaſe for a time, do harm by relaxing.

But the chronic rheumatiſm is one of the moſt obſtinate diſorders of the hoſpital; being either the remains of a rheumatic fever, or the continuation of pains that proceed at firſt from neglected colds. In complaints of this kind, if the blood be not ſizy, we may ſuſpect that the ſoldier either pretends indiſpoſition, or that his pains are of another nature *. *Sydenham* has alſo deſcribed this *ſpecies*, wherein, though there be no fever, he recommends bleeding; which practice I followed, and often found efficacious. The patient therefore once in eight or ten days loſt about eight ounces of blood, as long as it was ſizy, or his complaints remained. Between whiles, I purged him with a ſolution of gum *guaiacum* in a larger doſe than in the *formula* above; and on the intermediate days I gave him twice or thrice in the day 50 or 60 drops of the ſpirit of hartſhorn in a draught of water. The tincture of *guaiacum* of the Diſpenſatory contains ſo

* In our hoſpitals, the rheumatic pains were always attended with ſizy blood. This mark however of a rheumatiſm is not conſtant; as I have ſince ſeen perſons with the ſame complaints, under no temptation to deceive, without any viſible alteration in their blood.

little

little of the gum, that we muſt aſcribe moſt of its virtue to the volatile ſalt.

This was my practice in the hoſpital; but ſince that time having ſeen good effects from the gum *guaiacum* uſed only as a laxative, in theſe caſes therefore I give it in ſolution, with five grains of ſalt of hartſhorn, every night at bed-time; and bleed or not as I ſee occaſion.

When the joints are ſwelled and inflamed, leeches are to be uſed as before; but when there is no inflammation, the aching parts are to be covered with flannel. In general I have found little benefit from any other external application, except leeches, or bliſters. After the patient has continued ſome time in this courſe, his recovery will be quickened by the uſe of the cold bath, or the Bark *; and to thoſe who can afford it, riding is a ſpecific remedy.

By this method I have found many cured: but I muſt acknowledge, that ſeveral ſlight caſes in appearance, have withſtood theſe and all other methods which I could think of. Sometimes venereal pains may be miſtaken for rheumatic; at other times the two may be

* Some phyſicians have given the Bark in acute rheumatiſms (after plentiful bleeding) as ſoon as a ſediment appeared in the water; though ſome degree of fever remained, and the pains were ſtill conſiderable. I have had ſome ſucceſs myſelf in giving it ſo early, but have not ſeen caſes enough to recommend the practice to others.

joined.

joined. A ſalivation does not cure a chronic rheumatiſm; but there are caſes which will yield ſooner, if once or twice a week we give a large doſe of *Calomel* over night, and purge it off the next morning *.

Some of the more obſtinate pains may be of that kind which *Sydenham* calls the ſcorbutic rheumatiſm; or others, more properly, the *arthritis vaga* or flying gout. For though the common men, and eſpecially at their time of life, very rarely have the true gout; yet, by irregularities, or diſeaſes, the humours may tend that way without producing any regular fit. Of what kind thoſe pains may be that are ſometimes felt after ill-formed and obſtinate intermittents, I cannot determine. *Sydenham* believes them to be owing to the Bark; but they were certainly taken notice of by *Ballonius* before the uſe of that medicine.

The ſciatica of our hoſpitals is almoſt always of the rheumatic kind; and therefore, if recent, yields to bleeding, bliſtering upon the part, and *guaiacum*. But if the diſtemper is of a long ſtanding, or the cauſe gouty, the matter will lie too deep for a bliſter, or any of the com-

* In obſtinate caſes, without fever, RIVERIUS recommends large and repeated doſes of calomel joined to a purgative. *Prax. lib.* xvi. *cap.* 3. & *Obſervat. cent.* iii. *obſ.* 41. And others have found the ſame preparation anſwer, in alterative doſes, continued for ſome weeks. But, as the venereal pains are ſo often confounded with the rheumatic, it is perhaps chiefly in the former that the mercurials have been found ſo efficacious.

mon medicines. I remember two caſes in the hoſpital, in which the pain was exquiſite and conſtant, and nothing gave relief; ſo that the men, after growing hectic, and long pining, died in agony *. The late Dr. *J. Clerk* of *Edinburgh* acquainted me, that he had known obſtinate ſciaticas, both of the rheumatic and arthritic kind, cured by a long continuance of ſoap taken to the quantity of four or ſix drachms daily †.

* From other caſes which I have ſeen ſince, I am induced to think that theſe men had a ſuppuration about the hip-joint.

† Since the two firſt editions of theſe Obſervations, I have uſed in the rheumatiſm (when there was no fever) Dr. DOVER's powder, giving for ſome nights about 20 or 25 grains of it at bed-time, with plenty of ſome warm diluting liquor, and laying the patient in blankets: for the compoſition, ſee the treatiſe called *The Ancient Phyſician's Legacy to his Country*.

CHAP.

CHAP. III.

Obſervations on coughs, and the phthiſis pulmonalis.

WITHOUT entering into the general conſideration of theſe diſorders, I ſhall only take notice of ſuch caſes as I have found moſt frequent in the army.

Coughs and conſumptions are properly annexed to inflammatory diſeaſes. For, a recent cough from cold may be conſidered as the loweſt degree of a peripneumony; and an old and neglected cough, as the beginning of a conſumption.

Obſtructions of the lungs are ſucceeded by tubercles and ulcerations. In the bodies which I diſſected of thoſe who died of the *phthiſis pulmonalis*, I found the lungs adhering to the *pleura*, and full both of tubercles and ulcers.

We ought therefore to be careful in removing colds in the beginning. But this part belongs to the regimental ſurgeon, who is firſt applied to, and who may be aſſured that a cough is bad indeed when a ſoldier complains of it. The diſeaſe being of an inflammatory nature, bleeding is the chief remedy, which alone will frequently cure bad colds, whilſt all other medicines may be ineffectual without it. Recent coughs, after bleeding, are ſoftened

by a mucilage of linſeed, by *ſperma ceti*, or by any common ſweet oil *.

When the obſtruction is of a long ſtanding, oily medicines are not only uſeleſs, but by relaxing the ſtomach may increaſe the diſorder.

In older and more ſtubborn coughs, or in the firſt ſtage of a conſumption, when the patient complains of pains in his ſide, conſtriction at the breaſt, or of hot and reſtleſs nights, I have truſted moſt to ſmall but repeated bleedings, to ſetons, and to a low and cooling diet.

I have found theſe ſmall bleedings not only beneficial in old coughs threatening conſumptions, but alſo after hectic ſymptoms have appeared. The quantity of blood drawn was from four to ſeven ounces, once in eight or ten days, and ſometimes a vein was opened after ſhorter

* I obſerved that the oils had a better effect when joined to a pretty large quantity of a volatile alkali:

℞ *Salis cornu cervi* ʒß *ſolve ex aquæ puræ* ℥vij. *dein admiſce olei olivarum (vel amygdalarum dulcium)* ʒiß. *ſacchari albi* ʒß.
Sumantur ter quaterve die cochlearia iv. *agitatâ priùs phialâ.*

Beſides this, the patient, if diſturbed by his cough at night, took 6 or 7 grains of the *pilulæ Matthæi* at bed-time; but ſince that time I have generally, in a draught at bed-time, joined 15 or 20 drops of *laudanum* about 2 drachms of the *oxymel ſcilliticum*, or half a drachm of *gummi Ammoniacum* (according to the degree of heat, or to the ſtomach of the patient) in order to correct the binding quality of the opium. The former of theſe compoſitions was communicated to me by the late Dr. J. CLERK of *Edinburgh*; the latter, by Dr. SIMSON of St. *Andrews*.

intervals. It was obſervable that the patients never found themſelves ſo much relieved on the firſt, as on the ſecond or third night after bleeding. The blood was conſtantly ſizy; but if it had been found in a reſolved ſtate, to have inſiſted upon taking away more would have been improper. Nor would I recommend this method for common practice without making great allowance for the ſtrength of ſoldiers, nor without ſuiting the quantity of blood to be let to the condition of weaker patients. In habits naturally weak, or ſcrofulous, or when the patient has been long in a decay, bleeding, like all other means, will be ineffectual.

But I can more freely recommend from repeated trials the uſe of a ſeton, made in the ſide upon the part moſt affected.

In thirſt, heat, and other ſymptoms, the ſigns of a putrid ſtate of the humours, the ptiſan is to be acidulated and the aliments ought then to be all of the aceſcent kind. Butter-milk is particularly good. And, if poſſible, the patient ought to be confined to a milk and vegetable diet.

I have found nothing diminiſh the hectic fits ſo much as ſmall bleedings and a cooling diet. Colliquative ſweats are ſometimes checked by lime-water, and ſometimes by the *elixir* of vitriol.

In

In the advanced ſtate of a conſumption, we may diſtinguiſh two ſorts of coughs, one cauſed by the ulcers, and the other by a thin rheum falling upon the *fauces* and *trachea*; which parts being then deprived of their *mucus* become ſenſible of any irritation: and this laſt kind is perhaps the moſt painful and teazing to the patient. The ſame medicines are not proper for both. For the firſt ſort I have uſed the balſam of *Peru*, but did not find it more efficacious than the *copaiba*. Of this laſt I commonly gave about ten drops, twice a day, in a bolus of conſerve of roſes *.

The other kind of cough can only be palliated by incraſſants, and for that purpoſe I have commonly uſed the conſerve of roſes, and opium. The former is always ſafe, and otherwiſe well adapted to the nature of the diſeaſe, but of weak virtues; the latter is the moſt efficacious, but is to be given with caution, conſidering how apt it is to affect the head, to bind the body, and to obſtruct expectoration. However, as theſe bad qualities are in ſome meaſure to be corrected by ſquills, as ſoon as the patient begins to complain of reſtleſs nights

* Having, ſince the former editions of this work, been ſo often diſappointed in the effects of ſuch balſams in this diſtemper, I have laid them all aſide, and truſt chiefly to ſmall but repeated bleedings (when the patients can bear the loſs of blood) to a total milk or vegetable diet, to a ſeton in the affected ſide, to country air and riding, and to the free uſe of acids when they complain of thirſt and hectic heats.

from

from coughing, I have uſually preſcribed a draught with a drachm and a half of the *oxymel ſcilliticum* and fifteen drops of the *tinctura Thebaïca*, to be given at bed-time; and have increaſed the doſe of each ingredient when there ſeemed to be occaſion for it.

I never gave the Bark in any ſtage of the conſumption, unleſs in the convaleſcent ſtate when the lungs ſeemed to be free from obſtruction *.

Riding and aſſes milk, the two common reſources, are wanting in military hoſpitals: what is ſtill worſe, the air of ſuch places, or of full barracks, is contrary to the cure. Hence it happens, that though theſe means may often ſucceed with men better accommodated, they will generally be fruſtrated by the foul ſteams the ſick breathe there: and though a ſoldier may chance to eſcape their bad effects and recover, it is odds but he relapſes, by being expoſed to colds as ſoon as he returns to his duty.

In this manner I have treated the *phthiſis pulmonalis*. I have likewiſe obſerved much benefit to ariſe from ſmall and frequently repeated bleedings in the cure of wounds, when matter has been abſorbed, and a hectic fever brought on.

* I have frequently, ſince, given three or four ſpoonfuls once or twice a day of a decoction or an infuſion of the Bark, without obſerving it to heat, or obſtruct the breathing; but on the contrary, to have a good effect when the patient has complained of low ſpirits and weakneſs, and has not been in the laſt ſtage of the diſtemper.

CHAP.

CHAP. IV.

Obſervations on the fevers called bilious, or the autumnal remitting and intermitting fevers of the army.

I COME now to conſider thoſe putrid diſeaſes, commonly though perhaps improperly called bilious *, which being the moſt common and fatal to an army, and leaſt known, ſhall therefore be treated of in a more full and regular manner than the preceding.

The bilious diſorders begin about the decline of ſummer, and become epidemic in autumn, appearing earlier, more general, and with worſe ſymptoms, in proportion to the heat of the ſeaſon, and to the moiſture of the ground and climate. Although of different forms they are of a like nature, and may be reduced to two heads, *viz.* fevers and fluxes.

Beginning with the fevers, I ſhall firſt deſcribe that which is frequent in every camp; next, that which ſeems more peculiar to the marſhes; in the third place, I ſhall inquire into the cauſe of both; and then compare them with thoſe of other places in the like circumſtances: laſtly, I ſhall propoſe the method of cure which I followed both in the fevers of the camp, and in thoſe which occurred in the marſhy parts of the *Netherlands*. In the next

* Why ſo called, ſee part ii. ch. i. part iii. ch. iv. § 3.

next chapter I ſhall mention ſuch remedies as I found moſt ſucceſsful in removing the obſtructions occaſioned by theſe diſtempers.

§ 1.

Of the ſymptoms of the remitting, and intermitting fevers of the camp.

IN the month of June, the fevers in the camp are fewer and leſs inflammatory than upon firſt taking the field; and as the ſeaſon advances they are attended with ſtill leſs inflammation, but with more diſorder of the ſtomach and bowels, and with pains in the head; and they have all a ſenſible remiſſion. This change, juſt perceptible after the ſolſtice, becomes manifeſt by the end of ſummer, or the beginning of autumn.

This epidemic differs according to the nature of the ground, and therefore I ſhall diſtinguiſh it into two *ſpecies*; one, incident to an army on dry ground; and the other, infeſting it in damp and marſhy countries. I ſhall firſt deſcribe the former.

The bilious or remitting fever of the camp begins with chilline ſs, laſſitude, pains of the head and bones, and a diſorder at the ſtomach. At night the fever runs high, the heat and thirſt are great, the tongue is parched, the

head aches violently, the patient gets no reſt, and often becomes delirious; but generally in the morning, an imperfect ſweat brings on a remiſſion of all the ſymptoms. In the evening, the paroxyſm returns, but without any cold fit, and is commonly worſe than the former: next morning it remits as before. Theſe periods go on daily till the fever, if neglected, changes inſenſibly into a continued form. Sometimes looſe ſtools carry off the fit and ſupply the place of ſweats.

Although this fever in many particulars reſembles an intermittent, yet it is ſomewhat of a different nature, as ſhall be more fully ſhewn when we come to the cure. In the camp we ſeldom meet with a regular intermittent either in a tertian or quartan form, unleſs in the caſe of a man who was ill of one before he took the field.

The remiſſions uſually appear from the beginning, and eſpecially if the patient is bled on the firſt attack: ſometimes they are little perceptible for the firſt two or three days. Hæmorrhages of the noſe, at the height of the paroxyſm, generally bring on the remiſſion ſooner and make it more complete. Vomiting or purging have the like effects. But I remember no natural evacuation making a cure at once, unleſs when a *cholera* ſupervened, that is, a violent diſcharge both ways of the corrupted humours which ſeemed to be the cauſe of the diſeaſe.

The fits are ſeldom preceded by ſhiverings, or any ſenſe of cold, after the firſt attack. The pulſe is full and quick during the paroxyſms, and in the remiſſions it ſtill indicates ſome degree of fever. The blood is florid, the *craſſamentum* is firm, in a large quantity, and ſinks in the *ſerum*. The blood ſhews no great ſign of inflammation in the beginning of the epidemic, but towards the end of the campaign it acquires a ſizy cruſt; for by that time, to the other ſymptoms are joined either ſtitches, rheumatic pains, or a cough.

Whilſt the weather continues warm, the marks of a foulneſs in the *primæ viæ* are moſt frequent; but as winter approaches, the inflammatory ſymptoms prevail.

The urine is high coloured and crude till ſome evacuations have been made, and then it begins to break. What is voided by vomiting, or by ſtool, is generally of a bilious and corrupted nature. Coſtiveneſs not only often precedes but accompanies the diſeaſe, and when that happens the belly feels hard, and the patient complains of wind. Although all do not vomit, yet every one feels a diſorder at the ſtomach, eſpecially during the hot weather.

Worms come away frequently by ſtool, ſometimes by vomiting. They are of the round kind, and thoſe who are troubled with them have more obſtinate gripings, or ſickneſs at the ſtomach. In ſuch caſes, ſtitches are fre-

quent; but theſe being often of the flatulent kind are not always relieved by bleeding.

Some grow yellow as in the jaundice. This colour was obſerved to be more frequent during the firſt campaign than afterwards: it was an unfavourable, but not a mortal ſign. One of the regimental ſurgeons told me, that he had opened the body of one of his men who died with this ſymptom, but had diſcovered no *calculus*, nor any kind of obſtruction in the gall-bladder or in the biliary ducts.

The infantry was more ſubject to the fever than the cavalry; and theſe laſt, more than the officers: this ſeemed to be owing to the difference of clothing and accommodations *.

There were no critical days, nor any certain duration of the diſtemper, which was longer or ſhorter according to the manner of treating it. It could not be called dangerous, when timely and proper means were uſed; but this fever is often fatal to an army, when ſo many are ſeized at once as cannot be properly attended; or when it changes into a continued or malignant form, either by neglect at firſt, or by crouding too many who are ill of it into the ſame hoſpital.

This remitting fever attended every campaign, and was moſt frequent and fatal after the hot ſummers of

* Part i. chap. iii.

the

the years 1743, and 1747; but in the campaigns 1744, and 1745, the ſeaſons being temperate fewer were ſeized, and the caſes were milder.

§. 2.

Of the ſymptoms of the remitting, and intermitting fevers in low and marſhy countries.

THIS *ſpecies* of the putrid fever was mentioned in the general account of the diſeaſes moſt incident to the *Netherlands* *, and alſo in the account of thoſe which occurred during the two laſt campaigns †; but the full deſcription was reſerved for this place.

We are firſt to obſerve, that though all moiſt countries are ſubject to intermittents, yet if the moiſture is pure, and the ſummers are not cloſe and hot, the fevers will moſtly appear in a regular tertian form and be eaſily cured. But if the moiſture ariſes from ſtagnating water, in which plants, fiſh, and inſects die and rot, then the damps being of a putrid nature not only occaſion more frequent but more dangerous fevers, which oftener appear in the form of quotidians, or double tertians, than in that of ſingle ones. Theſe marſh-fevers are not only apt to begin with little remiſſion, but after intermitting

* Part i. ch. i. † Part i. ch. vii. and viii.

for

for ſome days, to change again into continual fevers of a putrid and malignant nature. It is remarkable how much they vary with the ſeaſon; for however frequent, violent, or dangerous they have been in the decline of ſummer, or beginning of autumn, when the putrefaction is at the height, yet before winter they are reduced to a ſmall number, become mild, and generally aſſume a regular tertian form.

The worſt kind were obſerved to prevail near the inundations in *Dutch Brabant* *; the next, were thoſe of *Zealand* †; of the third degree, were thoſe in the lines of *Bergen-op-Zoom* ‡; and the mildeſt ſort, were ſuch as were moſt frequent in the cantonments around *Eyndhoven* §, in villages rendered moiſt by plantations, and ſubterraneous water, but that not putrid. I ſhall deſcribe the firſt and worſt kind, from which it will be eaſy to judge of the nature of the reſt.

In the end of July 1748, when the troops had been a fortnight or three weeks in the cantonments, whilſt the days were ſultry, but the nights cool and foggy ¶, ſeveral of the men (of thoſe regiments which lay neareſt the inundations) were ſeized at once with a burning heat and a violent head-ach; ſome feeling a ſhort and ſlight chillineſs before the attack, others mentioning no preceding

* Part i. ch. viii. † Ibid. ch. vii. ‡ Ibid. ch. vii. § Ibid. ch. viii.
¶ Ibid. ch. viii.

ceding diſorder. They alſo complained of intenſe thirſt, aching of the bones, a pain of the back, great laſſitude and inquietude, frequently of a *nauſea*, ſickneſs, or a pain about the pit of the ſtomach, and ſometimes they vomited green or yellow bile of an offenſive ſmell. The pulſe upon the firſt attack was generally depreſſed, but roſe upon bleeding. There were ſome inſtances of the head being ſo ſuddenly and violently affected, that without any previous complaint the men ran about in a wild manner, and were believed to be mad, till the ſolution of the fit by a ſweat, and its periodic returns, diſcovered the true nature of their *delirium*.

Some time after, Dr. *Stedman*, then ſurgeon to the *Greys*, acquainted me: "That two of the men who were firſt "taken ill were ſeized at once with ſymptoms of an ar-"dent fever, and though they were ſpeedily and plenti-"fully bled, yet, in an hour after, both were in a high "*delirium*, which continued for ſome hours and then "went off with a profuſe ſweat, under which all the "other ſymptoms either abated or vaniſhed. That next "day about the ſame hour the paroxyſm returned, and "in ſix or ſeven hours ran the ſame courſe. That in this "manner the fever affected many of that corps, whilſt "ſome of them had leſs diſtinct paroxyſms, the hot fits "longer, and thoſe followed by imperfect ſweats and little "relief. That ſometimes the remiſſions were ſo imper-"ceptible,

" ceptible, that the diſeaſe appeared almoſt in a conti-
" nued form. That the nearer it approached to this laſt
" ſtate it was the more intractable; but that when the pa-
" roxyſms were diſtinct, with an intermiſſion of ſome
" hours between them, the patients for the moſt part did
" well, however great the *delirium* was during the fever.
" That a few returns of the paroxyſms reduced their
" ſtrongeſt men to ſo low a condition as to diſable them
" from ſtanding. That ſome became at once delirious
" without any previous complaint, and would have
" thrown themſelves out of the windows, or into the
" water, if not prevented; that their phrenzy continued
" for ſome hours, after which falling into a profound
" ſleep, they awaked quite ſenſible but with a violent
" head-ach. That others, whoſe fever appeared in a
" continued or remitting form, had critical ſweats about
" the ninth day, and afterwards regular paroxyſms and
" intermiſſions. That a few had a *criſis* by ſtool, or urine.
" That there were ſome who were ill about three weeks
" without any ſenſible remiſſion, after which the fever end-
" ed with ſome quotidian paroxyſms, and that theſe men
" during their illneſs had gentle ſweats, or rather a con-
" tinual moiſture upon the ſkin. That many upon being
" firſt taken ill had bilious vomitings; and that ſeveral void-
" ed round worms both ways. That the profuſe ſweats
" had always a putrid ſmell; and that the diſcharge
" from the bliſters was ſo offenſive, that the nurſes de-
" clined dreſſing them. What was moſt remarkable, a
" few of thoſe who died were obſerved to have a regu-
" lar pulſe, though very near their end. That all thoſe
" who died had a cadaverous ſmell for ſome days before
" death, and immediately after, livid ſpots and other ſigns
" of a mortification." Dr. *Stedman* concluded with obſerv-
ing, that " the ſame diſtemper was alſo common among
" the peaſants of the cantonments in the neighbourhood,
" and that a great number of them died."

This account of the beginning of the epidemic being ſo full and diſtinct, I need only add, that it agreed with the obſervations of all the other regimental ſurgeons in the like ſituation, allowing for ſome variation according to the different circumſtances of thoſe corps. Thus Mr. *Lauder*, ſurgeon to the *Inſkilling* regiment, then Lord *Rothes's*, informed me, " that moſt of the men were firſt taken ill
" upon their return from forage: For, the regiment be-
" ing cantoned upon the right and left of St. *Michel's Geſtel*
" (their principal quarters) cloſe upon the inundations *,
" and many of the quarters being above two leagues from
" *Bois-le-duc* where the magazines were kept, the men
" were obliged to ſet out about four in the morning, in
" order to get back before the greateſt heat of the day.
" That at this early hour the meadows and marſhes on
" each ſide of the road were covered with a thick fog of

* Part i. ch. viii.

" an offenſive ſmell, which he conſidered as the chief " cauſe of the ſickneſs. For though the party generally " returned before noon, that ſeveral among them were al- " ready in a fever, and ſome actually delirious; nay, that " a few on their way home were ſo ſuddenly taken with a " phrenzy, as to throw themſelves from their truſſes into " the water, imagining they were to ſwim to their quar- " ters. That from the firſt attack, as many of them as " were ſenſible complained of a violent head-ach, thirſt, " and burning heat; and that all of them, attempting to " ſit up, were ready to faint away with a giddineſs, ſick- " neſs at ſtomach, and retching to vomit. That theſe fe- " vers were for ſome days of a continued form, or at moſt " had ſlight remiſſions; after which they either remitted " more plainly, or thoroughly intermitted. That at firſt " the pulſe was ſmall and depreſſed (though the patient " was then delirious) but that it always roſe upon bleed- " ing." Mr. *Lauder* told me, about three years after this ſickneſs, that two of thoſe men, who were ſo ſuddenly taken with a phrenzy on their return from foraging, though they recovered of their fever, had ever ſince been epileptic; and that all the reſt, who had been ill, were ſtill liable to returns of an intermitting fever.

The condition of the foot was ſomewhat different, for few of them being cantoned near the inundations, their fevers though frequent were generally of a milder nature; yet ſome of thoſe corps had the ſickneſs alſo in a high

high degree, occaſioned by the moiſt and corrupted air of their quarters. The village of *Dinther* * lay low, and was ſurrounded with ditches and thick plantations. Mr. *Tough*, ſurgeon to the battalion there, obſerved: " That " the meadows were every evening overſpread with a fog, " which continued till next morning after ſun-riſe, and " which had the offenſive ſmell of a foul ditch newly " drained. That the men were commonly taken ill in " the night-time with a ſhuddering or ſenſe of cold, which " was ſoon followed by a violent head-ach, intenſe heat, " and other feveriſh ſymptoms †. That at this time the " pulſe was ſo ſmall and depreſſed, that if a vein was " opened the blood at firſt would ſcarce run out, but that " after ſome vent it flowed briſkly, and then the pulſe " roſe. That a profuſe ſweat ſucceeded the heat, and " with that a remiſſion, or intermiſſion of the fever. " That the paroxyſms returned every evening, and if care " were not ſoon taken to ſtop the fever, it was apt to " change into a continued form with malignant ſymp- " toms. That in three caſes he obſerved petechial ſpots; " and in a fourth, a mortification under the left breaſt, " which however was cured by the Bark. Laſtly, that

* Part i. ch. viii.

† It is to be remarked, that the dragoons having better pay generally hired beds of their landlords, or at leaſt lay warm in their cloaks; but that the foot ſoldiers wanting theſe advantages, lay in barns and other damp places without any covering.

" there was one inſtance of a man, who being ſuddenly
" ſeized with the uſual head-ach, and not immediately
" bled, got out of his quarters and ran about the fields
" like one diſtracted."

In the greateſt heat of the weather and rage of the diſtemper, moſt of theſe fevers anſwered the deſcription of the καῦσος or ardent fever of the ancients, which *Hippocrates* does not rank with the inflammatory diſeaſes of the winter and ſpring, but with the bilious epidemics of ſummer and autumn *, though later writers have applied this term to all fevers attended with great inflammation.

But it was obſervable, that even in the worſt parts of that country, as ſoon as the weather cooled in the decline of autumn, the fevers began to aſſume a milder form; and in the end of the ſeaſon, differed little from the common intermittents of other places.

There were but few quartans, and thoſe did not appear till late, nor were they hard to cure unleſs when they ſucceeded

* Aphor. lib. iii.

The ardent fever of the ancients was either continued, or remittent; of which laſt GORRÆUS gives the following deſcription: *Eſt ὁ καῦσος tertianæ febri ὁμογενὴς, utique ab iiſdem cauſis, eodem anni tempore & iiſdem corporibus provenit, a quibus & tertianæ febres excitari ſolent. In tertianâ intermittente primùm rigor, deinde ἀπυρεξία eſt: verùm ardentis exacerbationes nullo cum rigore fiunt, nec unquam integrè ſolvuntur, ſed modicè tantùm remittuntur.*" *Vide Definit. in voce* Καῦσος.

ceeded to ſome other form of this fever, which had already produced obſtructions in the *viſcera*.

When the ſickneſs was at the worſt many voided round worms, which were not the cauſe of the fevers, but, as we obſerved before, concurred with other circumſtances to retard the cure.

At the height of the epidemic it appeared, that both intermittents and remittents, by extending or doubling their paroxyſms, frequently changed into a continued, putrid and dangerous form, and that moſt of thoſe whom we loſt died in this way. Theſe men, as we remarked, had a corrupted ſmell for a day or two before their death, and ſoon after it their bodies mortified. Some had petechial ſpots, though the place where they lay was neither crouded with ſick, nor too cloſe; and to theſe ſpots were added ſome other ſymptoms, the ſame with thoſe of the hoſpital-fever.

But in general, the mortality was not in proportion to the number of the ſick, nor to the alarming nature of the ſymptoms. Although the diſtemper was violent, yet it yielded to medicine, and no kind of acute diſorder ſeemed to require it more; for a great number of the country people periſhed for want of it, whilſt moſt of our men recovered by the care of their regimental ſurgeons. Of the *Greys* and *Rothes*'s dragoons, who were the moſt ſickly, 31 died in all; which will not appear a conſiderable number,

ber, if we reflect what a multitude of bad cases there were (and those much dispersed) and how few to attend them *.

One of the most unfavourable circumstances was the proneness to a relapse, the danger of which was greatest during the hot weather, less in the decline of autumn, and least of all after the frosts began. But in the following spring, relapses became so frequent that those regiments, who had served in *Zealand* in the preceding autumn, had in the next campaign above four times more sick than any other corps in the line.

Frequent relapses brought on visceral obstructions, which made the intermittents more obstinate and irregular, and terminate in a dropsy, or jaundice. In this bad state of the *viscera*, a hard tumour was frequently felt on the left side of the belly lower than the false ribs called by the common men the *ague-cake*. But as none of those who died with this tumour were opened, the part affected could not be ascertained. I conjectured it to be the spleen. It was often accompanied with swelled legs, a distention of the whole belly, or with some other hydropical symptom; and whilst it remained, the fits could not be safely stopped by the Bark. It was a bad but not a mortal sign, since many who had it recovered.

* Part i. chap. viii.

I likewise

I likewise met with a few cases of the *tympanites*, a distemper which I suspected to be chiefly owing to a premature use of the Bark before proper evacuations. But as to other obstructions, and in particular those which brought on the *ascites*, I observed that they happened as often without, as with the Bark, and therefore seemed generally to depend on the long continuance and obstinacy of the intermittent.

It was remarkable, that whilst the sickness raged among the common men, it appeared in a mild degree among the officers, who seldom had the fever in a continued form, or attended with malignant symptoms, but in the shape of single and double tertians, or of quotidian remittents. The reason seemed to be, that they were less exposed to the sun and fogs, that they had drier quarters, better diet, and the use of wine.

§ 3.

Of the causes of the remitting and intermitting fevers of the camp, and those of low and marshy countries.

THE heat and moisture of the air appear to be the chief *remote* and *external cause* of these fevers; and this cause is most prevalent not only in proportion to the warmth and closeness of the weather, but to the quantity of vapour with which the air is loaded in the drought of summer.

ſummer. Rains in general leſſen the moiſture of the air by draining it of ſo much water; and by deſcending from a colder region, they not only refreſh the atmoſphere but the earth alſo, and thereby check immoderate exhalations. The moſt healthful campaigns have therefore been thoſe in which the heat and moiſture of the air were moderated by frequent ſhowers. But if the air in its greateſt heat receives not only the aqueous, but the putrid *effluvia* from marſhy grounds, or from any large ſurface of corrupted water, the remote and external cauſe of ſickneſs will be aggravated, the diſeaſes will be more numerous and attended with more alarming ſymptoms.

The relaxation of the fibres and greater tendency in the humours to putrefy, conſequent on this ſtate of the atmoſphere, may be conſidered as the *internal* and *predispoſing cauſe* of theſe fevers. For, a hot and moiſt air unbraces the ſolids, reſolves the blood, and obſtructs perſpiration. When the air is filled with vapour, it admits the perſpirable matter with difficulty; and when part of that is retained, the blood not only thereby receives a ſeptic ferment, but is more heated by having leſs evaporation. Nor can the want of a free perſpiration be ſupplied by ſweating, as ſweating tends to weaken the body and render it more ſubject to diſorders.

Although theſe two cauſes may be ſufficient of themſelves to produce this fever, yet for the moſt part a third

is wanting to bring on the diſeaſe: this is called the *exciting* or *occaſional cauſe*, which always ariſes from ſome error in the *non-naturals* ſuch as heating the blood by fatigue, intemperance, or inſolation; or by ſuddenly checking the perſpiration by improper food, wet clothes, lying on wet ground, *&c.*

To theſe laſt errors in regimen *Sanctorius* muſt allude, when he refers the cauſes of the autumnal tertian fevers to a ſtoppage of perſpiration; and we can ſcarce doubt of the juſtneſs of that obſervation, though from *Keil*'s Tables it would ſeem that this excretion may not only be diminiſhed, but for ſome time wholly ſuppreſſed without any injury to the health. But we are not to compare the ordinary checks given to perſpiration in this country (where the weather is ſeldom cloſe and hot for any conſiderable time) with what happens in other climates ſubject to ſuch intemperature, where the inhabitants having in ſummer and autumn long and uninterrupted heats (and by that means blood of a more putreſcent nature) require a more conſtant evacuation of what is recrementitious. *Sanctorius* himſelf ſays, "that ſuch a ſtoppage of "perſpiration as in ſummer might occaſion a malignant "fever, will in winter ſcarce affect the health *."

* Adiapneuſtia, quæ æſtate malignam febrem, hyeme vix minimam alterationem efficere poteſt: corpora enim acriori perſpirabili æſtate referta ſunt quam hyeme. Med. Stat. ſect. II. aphor. xxxv.

Thus far we have endeavoured to trace the *remote*, the *predisposing*, and the *occasional causes* of these fevers, and it were to be wished that with the same probability we could explain their *causa proxima* or *immediate cause*, that is, could shew how these vitiated humours act upon the vital principle, so as to excite a fever of a remitting or intermitting form, accompanied with such symptoms as were mentioned above. But in these researches, as so much depends upon the action of parts which have laws peculiar to themselves and are imperfectly known, it seems better not to form an *hypothesis* at present, but to wait till further discoveries be made in the animal oeconomy.

These fevers have been long called *putrid*, and not without foundation; since, from what we have observed, there seems at this time to be such a predisposition in the humours to putrefaction. They have still more anciently been distinguished by the name of *bilious*, but with a more disputable propriety; as the first authors did not confine that term to the appearances only, but extended it likewise to the *cause* of the disease. Yet it was no wonder that the ancients should believe that these fevers arose from bile, when they observed that nature cured them by a *cholera* or violent discharge of the gall both ways; and that physicians could also succeed, in the same manner, by a vomit and a purge. But after all, the bile seems to

to be more the effect than the cause; for whenever these fevers come to fair intermissions they give way to the Bark, a medicine which so far as we know has no direct influence upon that humour. All therefore that can be said in favour of the ancient doctrine is, that though the bile be not the first cause, yet, from its redundance and depravation, owing perhaps to the fever, it frequently becomes a secondary cause of irritation and supports the disease.

I should now proceed to the cure, but as it may be proper to examine these principles, by considering what form the summer and autumnal disorders assume in other places, under the influence of a warm, moist and putrid air, I shall produce a few instances for this purpose from such authors as seem to have made the proper observations.

§ 4.

The remitting and intermitting fever of the camp and cantonments compared with the summer and autumnal fevers of other places.

I SHALL begin with the *morbus Hungaricus*, a disease frequently mentioned by authors, but, as I imagine, not thoroughly known. It is described as a malignant fever, attended with sickness at the stomach, a pain and hardness about the epigastric region, great thirst, a parched

tongue, and a conſtant head-ach ending in a *delirium*. Theſe were the common ſymptoms, to which were generally added petechial ſpots, or blotches. This diſtemper was contagious and mortal, though it uſually run out from 14 to 20 days. It was firſt taken notice of in the year 1566, in the Imperial army in *Hungary*, and from thence it ſpread over a great part of *Europe*. As I have read no author who was an eye-witneſs, I ſhall take the liberty to infer from this account, which we have from *Sennertus* *, that the *Hungarian* diſeaſe was a compound of the bilious and hoſpital-fever, taking its riſe in the camp, but acquiring that high degree of malignity from the foul air of the places in which the ſick were crouded. It appears that the climate there is one of the worſt for an army in the field; which is eaſily underſtood, from the cold and damp nights that ſucceed the ſultry days in a marſhy country †. And ſince the autumnal fevers and fluxes are more

* De morbo Hungarico.

† The moiſture of that country is to be underſtood only of ſuch low parts of it as lying upon the great rivers, particularly the *Danube* and *Drave*, are expoſed to frequent inundations. For, the land-floods form marſhes, and theſe corrupting begin to infect the air about the end of ſummer. The reſt of *Hungary* is ſaid to be dry and healthful; but the campaigns being always made near thoſe rivers, the troops on that account have been generally ſickly.

Dr. BRADY, phyſician-general to the *Auſtrian* army, who ſerved three campaigns in *Hungary*, informed me, that upon the drying up of the inundations, he has ſeen large tracts of thoſe grounds ſwarming with aquatic inſects; and he confirmed the above account of the moiſture of the air, and of the remarkable difference between its temperature

more frequent and worſe in *Hungary* than elſewhere, in order therefore to account for the great mortality and peſtilential nature of this epidemic, we need only ſuppoſe that the weather in that year was more than ordinarily unwholeſome throughout *Europe*, that the ſick were crouded together, and that the dead frequently lay unburied *. But theſe reflections will be better underſtood after conſidering the nature of the jail or hoſpital-fever, to which claſs this diſeaſe may in part be referred. We ſhall therefore proceed to examine ſome other epidemics of a leſs doubtful nature.

At *Copenhagen*, in the year 1652, a fever began in autumn after an unuſually hot and dry ſummer †. That city

perature by day and by night. Now, the ſudden changes from heat to cold are not only to be aſcribed to the damps (the air after ſun-ſet being always colder in proportion to its moiſture) but, according to that gentleman, to the winds blowing from the *Carpathian* mountains, which are ſome of the higheſt in *Europe* and conſtantly covered with ſnow. Theſe lying at ſo great a diſtance, he ſuppoſed that the ſtream of air from that quarter was in the day-time thoroughly heated before it could reach the camp, but which could not happen after ſun-ſet.

Dr. BRADY alſo told me, that the deſcription here given of the bilious fevers of the marſhes agreed with the obſervations which he had made of the autumnal fever incident to the Queen's troops in *Hungary*, not only with regard to the ſymptoms, but to its cure by the Bark, which he, the firſt of any *Auſtrian* phyſician, had given in that diſtemper. And he added, that the courſe of the other military diſeaſes, both there and in *Bohemia*, had been ſimilar to what he found (by reading the firſt edition of theſe Obſervations) had occurred in our campaigns in *Germany* and in the *Low-Countries*.

* This very circumſtance is mentioned by SENNERTUS, vid. loc. cit.

† BARTHOLIN. Hiſtor. Anatomic. Rar. cent. ii. hiſt. lvi.

is ſituated in a low and moiſt country. The fever was accompanied either with quotidian or tertian paroxyſms, with bilious vomitings, a burning heat, violent head-achs, often with a *delirium*, and with petechial ſpots which came out in the fits and diſappeared in the remiſſions. Theſe ſpots, with an extraordinary debility, ſhewed the malignant nature of the diſeaſe, which was further aſcertained by the fever's ending in profuſe ſweats, abſceſſes, a *diarrhœa*, or dyſentery. The author of this account, *Thomas Bartholine*, upon diſſecting the bodies, and finding the ſtomach and *duodenum* always inflamed or mortified, aſſigns to theſe parts the ſeat of all malignant fevers.

In the year 1669, a like fever raged at *Leyden*, deſcribed by Profeſſor *Sylvius de le Boe* *, who lived at the time, and practiſed there. The ſituation of this place is alſo low and damp. The ſpring and beginning of ſummer were cold, but the remainder of the ſummer and the autumn were unuſually hot, with little or no rain, and with a conſtant calm or ſtagnation of the air. The water of the canals and ditches was highly corrupted, and the more ſo, as the author obſerves, by an inlet of ſalt water mixing with the freſh †. The air being thereby rendered more impure brought on an epidemic fever of a remitting, or intermitting form, and very fatal. Beſides a diſorder of the

* Prax. Med. append. tract. x.

† The reaſons of this may be learned from the experiments in the Appendix, paper iii. and iv.

ſtomach,

ſtomach, great anxiety, bilious vomitings, quotidian or tertian paroxyſms, and other ſymptoms the conſtant attendants of this illneſs, he mentions ſpots, oozing of blood from the noſe and hæmorrhoidal veins, dyſenteric ſtools, putrid urine, great debility, *aphthæ*, and other appearances which argued an uncommon reſolution and putrefaction of the blood. And yet, which is ſtrange, *Sylvius* aſcribed the cauſe to a prevailing acid *, and treated the diſtemper accordingly: ſo that we cannot help remarking, that the great mortality among the principal inhabitants of that city (of which, he ſays, two thirds died) might have been owing, in ſome meaſure, to the method of cure by abſorbents and other medicines, agreeably to the notion which that ingenious and learned man and his followers entertained of its cauſe.

Theſe and other inſtances of the ſame kind may confirm what was obſerved before, of the danger ariſing from hot and dry ſummers to moiſt and low countries †.

But the putrid diſeaſes are ſtill more frequent and fatal in the marſhy countries of the ſouth, where the heats are longer and more intenſe. In ſome parts of *Italy*, and in other tracts of the ſame latitude, theſe fevers have appeared with ſuch dangerous and putrid ſymptoms, as not only to have been called peſtilential but confounded with

* SYLV. Prax. loc. cit. DCXXVII. † Part i. ch. i. Part ii. ch. i. § 2.

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the plague itſelf. In this ſenſe we are to underſtand *Celſus* *, in the terms *peſtilentia* and *febris peſtilentialis*, which he deſcribes as peculiar to the *grave anni tempus* and the *graves regiones*. His meaning is, that the bilious and malignant fever is the diſeaſe of the latter part of ſummer and of autumn, when the air is thickeſt and moſt foggy, and that it is moſt frequent in low and marſhy countries.

Rome was always liable to theſe fevers. *Galen* calls the *Hemitritæa* the epidemic of that city, and ſpeaks of its moiſt air †. Nay, in the beginning of the republic, before the *Romans* ſeem to have been aware of the noxious effects of ſtagnating water, or at leaſt before they knew how to let it off, that place appears to have been ſo very ſickly, that from the beginning of the ſtate to the year U. C. 459, I find fifteen plagues mentioned by *Livy* ‡, which yet, from other circumſtances, appear to have been only ſo many malignant and deſtructive epidemics occaſioned by the putrid *effluvia* from the neighbouring marſhes. But when drains and common ſewers were made, *Rome* became more healthful, and then only the low and wetter places of *Latium* remained ſickly. Afterwards, when the city fell into the hands of the *Goths*, the drains being ſtopped and the aqueducts cut, the *Roman* territory became

* Cels. De Medicin. lib. i. cap. x. lib. iii. cap. viii.

† De Temperam. lib. ii.

‡ Lancisius reckons up ſeveral more from the ſame author: *vide Diſſert. de Advent. Rom. Cœli Qualit. cap.* iii,

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one continued marſh, which for a ſeries of years occaſioned an incredible deſolation *. And though theſe evils have been ſince remedied, yet ſtill, by neglecting to draw off the ſtagnating and corrupted water (after inundations of the *Tyber* ſucceeded by great heats) the malignant remitting, and intermitting fevers become both general and fatal. The diſſections made by *Lancisius*, added to his excellent account of thoſe epidemics, are a full proof of their putrid nature †.

Although it does not appear that the countries in which *Hippocrates* practiſed were either marſhy or ſubject to inundations, yet we find him frequently mentioning theſe fevers as common in ſummer and autumn, and as prevailing moſt when wet ſprings with ſoutherly winds were ſucceeded by hot and cloſe ſummers. A remarkable conſtitution of this kind is deſcribed in his Epidemics ‡, at which time the diſeaſes were ardent, remitting, and intermitting fevers of a bad kind, attended with fluxes, parotids, and eruptions of a peſtilential nature.

Proſper Alpinus obſerves, that the ſtagnating canals at *Grand Cairo* breed every year a malignant kind of ſmall-pox, as alſo the putrid and peſtilential fevers that prevail in March, April and May, which the ſoutherly winds make the hotteſt months in that country §. He alſo re-

* Id. loc. cit.

† De Nox. Palud Effluv. lib. ii. epid. i. cap. vi.

‡ Lib. iii. § iii.

§ De Med Ægypt. lib. i. cap. xiv.

marks, that the peſtilential fevers are both epidemic and fatal at *Alexandria* in autumn after the receſs of the *Nile*. They begin with a *nauſea*, great ſickneſs at the ſtomach, extraordinary inquietude, and a vomiting of an acrid bile*; and many have bilious and putrid ſtools. Now, as theſe diſtempers rage in both thoſe cities every year, it is not ſurpriſing, if in ſeaſons uncommonly hot and moiſt they ſhould be raiſed to a true plague. For, though the learned author aſſerts, that the true plague is not properly indigenous in *Egypt*, but is brought thither from *Greece*, *Syria*, or the more ſouthern parts of *Africa*, yet he thinks that it may ſometimes begin there after extraordinary inundations of the *Nile*, when the water, extending itſelf beyond the uſual drains, ſtagnates and forms ſome large putrid marſhes †.

Java, lying between 5 and 10 degrees of ſouth latitude, is ſo near the line, that the ſeaſons are not ſo properly divided into ſummer and winter, as into the dry and the rainy. The rains begin in November and continue till May, in which time an immenſe quantity falls. There are alſo a great number of marſhes and canals with ſtagnating water at *Batavia*, and by their exhalation the air is rendered moiſt, foggy and unhealthful. *Bontius* obſerves, that at this time the humidity is great, and that even in

* The author's phraſe is *bilis virulenta*.

† Ibid. cap. xv.

the dry months the metals ruſt *, and the clothes rot in that country ſooner than in any part of *Europe*. Nevertheleſs, the plague is unknown in *Java*, though from theſe circumſtances one might expect that this iſland ſhould be greatly expoſed to it. But we are to conſider, that when the ſun is moſt vertical in that country, it is alſo moſt clouded; by which circumſtance, and the continual interchanges of the ſea and land-breezes, the heat of the air is moderated, and its ſtagnation in a great meaſure prevented. The diſtempers are the *cholera*, flux, and a continued putrid fever. This laſt comes on ſuddenly with a *delirium*, and is attended with conſtant watchfulneſs, a vomiting of bile of various colours, but chiefly green. The extremities grow cold, whilſt the inward parts burn, and the thirſt is exceſſive; but the fever comes ſoon to a *criſis*. The evacuation of the firſt paſſages is the principal part of the cure; and next to that, the author recommends ſaffron †, a powerful antiſeptic as well as a cordial medicine ‡.

* The ruſting of metals is perhaps only an ambiguous ſign of moiſture in any place near the ſea within the tropics. For, I have been told by a gentleman, who made the experiment in *Jamaica*, that though iron ruſts very ſoon in that iſland, yet that ſalt of tartar ſeemed to attract moiſture from the air more ſlowly there than in *Britain*. I imagine therefore that the ſpeedy ruſting of metals, in hot climates, near the ocean, is owing to the great exhalation of the ſpirit of ſalt, which flies off from the ſea-water by means of the heat.

† BONT. Method. Medend. cap. xiv.

‡ Append. Paper II. exp. xi. Paper III. exp. xvi.

The *Britiſh* ſettlements on the *Gold-coaſt*, in *Guinea*, are as near the line on one ſide as *Java* is on the other. In that country, the rainy ſeaſon begins about the end of April and continues till paſt the middle of June; from that time the weather is cold for the climate, and the air very moiſt, from the exhalation of ſo much rain. During this cold ſeaſon, remitting, and intermitting fevers with quotidian paroxyſms are epidemic. Theſe fevers are accompanied with great thirſt, with a *nauſea* and inquietude, and frequently with a vomiting and purging of putrid bile; nor do they uſually abate till that is evacuated. If a diſcharge of that humour is not made in time, the diſtemper aſſumes a continued and malignant form, the pulſe ſinks, and a *delirium* comes on, which is generally fatal. Fluxes are likewiſe frequent at this ſeaſon; and both fever and flux are not leſs common on board the ſhips lying off the coaſt, than on ſhore, but do not affect ſuch as keep out at ſea beyond the limits of the foggy air. The ſea and land-breezes here, with the hazineſs of the weather during the hot ſeaſon, ſeem to be of the ſame uſe as at *Java* for preventing peſtilential diſeaſes *.

Nor do the bilious fevers of the *Weſt-Indies*, though of a putrid nature, ever turn to a plague; becauſe the ſame kind of breezes prevailing there, may prevent that degree of ſtagnation and corruption of the air which is

* This account of *Guinea*, I had from perſons of obſervation who had lived ſome years in that country.

neceſſary to produce it. But the heats being great, and the atmoſphere loaded with vapours, fevers of remitting and intermitting forms, with bilious vomitings, become epidemic throughout June, July and Auguſt (April and May are always rainy months in *Jamaica)* and rage moſt after the wetteſt ſeaſons. Theſe fevers are incident to the natives as well as to ſtrangers. But the new-comers are liable to a more putrid and a more dangerous fever, or rather to a higher degree of this bilious diſorder, which, though not confined to any certain time of the year, moſtly coincides with the former. This laſt is diſtinguiſhed by vomitings of matter, ſometimes green or yellow, at other times black and bloody, but chiefly by the yellowneſs of the ſkin, which gives it the name of the *yellow fever*. The blood is ſo much reſolved, that before death it enters the ſmalleſt veſſels and tinges the *ſaliva*, and the *ſerum* diſcharged by a bliſter *.

The

* DR. WARREN (in his treatiſe concerning the malignant fever in *Barbadoes)* mentions ſeveral other ſymptoms indicating a putrefaction of the humours, and nervous ſpaſms conſequent thereupon. This ingenious author appears however to have miſtaken the nature of the yellow fever, by referring it to the peſtilential claſs of diſeaſes: but though he died young, we are informed that he was ſenſible of his error, and had he lived longer, would have corrected it. By DR. HILLARY's Account, we can ſee a ſimilarity in the ſymptoms, and in the treatment, with the bilious fevers of other hot climates. But, upon this article I received the moſt ſatisfaction from DR. HUCK, who having been upon the expeditions to the French and Spaniſh iſlands, in the late war, made the following remark upon the paragraph above: "Even in the moſt ardent and worſt kinds of the yellow fever, I think a paroxyſm "may generally be perceived once in four and twenty hours; for the patient is com-

The result of the whole is, wherever the greateſt cauſes of putrefaction exiſt, there alſo will be ſeen the greateſt number of remitting, intermitting, or bilious and putrid fevers.

Before I conclude, it may be proper to take notice, that we have alſo fevers of a bilious kind in *Britain*; and that

" monly worſt towards the evening, or at night. And if the yellow fever was to " be diſtinguiſhed, in its beginning, from the common remitting or intermitting fe- " ver which was ſo fatal to our army, it was only by all the ſymptoms running " higher, and by a greater degree of the fever when one might have expected freer " remiſſions. Both fevers began with nearly the ſame ſymptoms; ſometimes, " though rarely, with a ſhivering. But whenever the fever ran high with burning " heat, violent pains of the head and loins, profuſe ſweats without relief, redneſs " and burning pains of the eyes, inflamed countenance, watchfulneſs, anxiety, op- " preſſion and burning pains about the *præcordia*, frequent vomitings of green or " yellow bile, or (what I think was rather worſe) a conſtant retching to vomit with- " out bringing up any thing, or vomiting the drinks only, one might then almoſt " certainly foretel the yellowneſs; and if this appeared on the ſecond, third, or " fourth day, the diſeaſe was generally mortal. I have often ſeen patients labouring " under moſt of theſe ſymptoms immediately relieved by early evacuations, and " the fever brought to intermit. Nay, I have more than once ſeen this fever with " all theſe ſymptoms carried off by bleeding and exhibiting, within a few hours from " the firſt attack of the diſeaſe, a medicine which operated pretty briſkly both by " vomit and ſtool; and I have known ſome of theſe very patients, who were ſo " well as to go abroad on the ſecond or third day after, and who continued well " for four or five days, but on committing ſome error, ſuch as expoſing themſelves " too much to the ſun, were again ſeized with the ſame ſymptoms, and died on the " fourth or fifth day, with their ſkin tinged of a deep yellow or copper-colour. " Hence I am apt to think that theſe are different degrees of the ſame diſeaſe, and " that it ſometimes depends upon the manner in which the patient is treated in the " beginning, whether he ſhall have the yellow, or only a remitting or intermitting " fever."

both

both our remitting and intermitting fevers, and dyſenteries, ſeem no leſs owing to a putrid cauſe than thoſe of other countries. But I muſt add, that ſuch is the dryneſs of the ſoil, and its freedom from marſhes, the conſtant perflation, and the moderate and interrupted heats of our ſummers, that unleſs in extraordinary hot and cloſe ſeaſons, and in marſhy places, theſe diſtempers are mild, and ſcarce ever epidemic.

In fine, during the latter part of ſummer, or throughout autumn, there ſeems to be in moſt places a tendency, more or leſs, to theſe remitting, and intermitting fevers, or to ſome diſorders of the firſt paſſages, connected with a reſolution of both the fluid and fibrous parts of the body. And this holds chiefly in hot and moiſt countries, and in all camps, for the reaſons already given *.

§ 5.

Of the cure of the remitting, and intermitting fevers of the camp, and of thoſe of low and marſhy countries.

I COME now to the cure, in treating of which I ſhall obſerve the following method. In the firſt place I ſhall diſtinguiſh the two *ſpecies* of fevers as before, and then I ſhall mention ſuch remedies as I have found moſt ſucceſsful in them.

* Part i. ch. i. Part ii. ch. ii. § 2.

The

The cure of the camp-fever depends chiefly upon evacuations and a low diet; neutral ſalts and diluting acid liquors * are aſſiſtants; and the Bark is uſeful when there are complete intermiſſions.

I found it neceſſary to begin with opening a vein, and to repeat the bleeding according to the urgency of the ſymptoms. The vernal and latter autumnal remitting fevers are accompanied with pleuritic and rheumatic pains, from the coldneſs of the weather, and on that account require more bleeding. A perſon unacquainted with the nature of this diſorder, and attending chiefly to the paroxyſms and remiſſions, would be apt to omit this evacuation, and to give the Bark prematurely; which might bring on a continued inflammatory fever. A vein may be ſafely opened either during the remiſſion, or in the height of a paroxyſm. For, beſides that I have obſerved the remiſſion to come ſooner and fuller after an hæmorrhage, I have repeated experience of the ſafety of bleeding in the hot fits; and not only in this, but in the marſh-fever, even after it had come to almoſt regular intermiſſions. In order therefore to make *Celſus*'s maxim † conſiſtent with this practice, we muſt interpret his term *impetus febris* in the ſenſe of that chilline's or cold fit which preceded the hot

* The barley-water was acidulated with a little vinegar; and in the convaleſcent ſtate we aſſiſted the Bark with the elixir of vitriol.

† Quòd ſi vehemens febris urget, in ipſo impetu ejus ſanguinem mittere, hominem jugulare eſt. De Med. lib. ii. cap. x.

one

one in the fevers which he deſcribes; for then bleeding would indeed be improper. But as the paroxyſms of our fever, after the firſt attack, were without any coldneſs, his caution was not to be minded; nor any other except the common one, of not bleeding during the ſweat.

Since the firſt two editions of this work, having had more opportunities of ſeeing theſe fevers, I found it the beſt courſe to give a purge, at any time of the day, immediately after bleeding, and the rather as the patient was then generally coſtive:

℞ *Infuſi ſenæ communis* ʒiii. *electarii lenitivi* ʒß. *nitri puri* ʒi. *tincturæ ſenæ* ʒvi. *miſce.*

The half only was taken at once, and if it did not move him twice in four hours, which generally it did not, he then took the remainder. This potion agreed with the ſtomach, purged plentifully and with eaſe, and therefore was a more uſeful than elegant compoſition. Next morning (when there was almoſt always a remiſſion) I gave one grain of tartar emetic, rubbed to a powder with 12 grains of crabs-eyes, and repeated the doſe in two hours, if the firſt had little or no effect; at any rate, in four hours. This medicine not only vomited, but generally opened the body and raiſed a ſweat. By theſe evacuations, the fever generally became eaſier, and was ſometimes quite removed. Some of the regimental ſurgeons had made the

firſt trials with theſe ſmall doſes of the emetic tartar; but having ſeen the operation, as they gave it with diaphoretic antimony, prove too rough, I changed that part of the compoſition for the crabs-eyes. Formerly, inſtead of this powder, I gave in the firſt remiſſion after ſeeing the patient, a ſcruple of ipecacuanha with two grains of emetic tartar, in one doſe. But though this often ſucceeded, yet upon compariſon I preferred the method above-mentioned, *viz.* firſt purging, and then clearing the *primæ viæ* with ſmall doſes of the antimonial preparation. This medicine I uſually repeated next day, or the day following; if not, I opened the body with ſome mild laxative or a clyſter, and continued this method till the fever went gradually off, or intermitted.

I have been ſince confirmed in my good opinion of this practice, by the account which Dr. *Huck* gave me of his ſucceſs in ſuch fevers, both in *North-America* and the *Weſt-Indies*, by a method ſimilar to mine. In the beginning, he let blood; and in the firſt remiſſion, gave four or five grains of ipecacuanha, with from half a grain to two grains of emetic tartar: this medicine he repeated in two hours, taking care that the patient ſhould not drink before the ſecond doſe; for then the medicine more readily paſſed into the bowels, before it operated by vomiting. If after two hours more, the operation either way was ſmall, he gave a third doſe, which commonly had a good effect in carrying off the bile; and then the fever

fever either went quite off, or intermitted ſo far as to yield to the Bark. On the continent, he found little difficulty after the intermiſſion; but in the iſlands, unleſs he gave the Bark upon the firſt intermiſſion, though imperfect, the fever was apt to aſſume a continued and dangerous form. Dr. *Huck* never varied this method, except upon a ſtronger indication to purge than to vomit; in which caſe, he made an eight-ounce decoction, with half an ounce of tamarinds, two ounces of manna, and two grains of emetic tartar; and dividing this into four parts, he gave one every hour till the medicine operated by ſtool *.

As I did not begin to uſe the emetic tartar, in ſmall and repeated doſes, till the late war (and then only during three encampments in England) I had in thoſe eaſy campaigns too few opportunities of trying this practice, ſo as fully to ſatisfy me that it was the beſt; but partly from what I ſaw myſelf, and heard from the regi-

* Since the laſt edition of this work, DR. HUCK told me: "That in the highly "bilious or *yellow fever* of the *Weſt-Indies* (where the ſtronger vomits, if not admi-"niſtered very early in the diſeaſe, are thought to be hurtful, but where neverthe-"leſs it ſeems neceſſary to cleanſe the *primæ viæ)* he preferred this medicine. For, "that though the firſt or ſecond doſe of it generally excited ſome degree of vomit-"ing, yet in three or four hours it alſo purged; and that this laſt operation he en-"deavoured to keep up, by giving from time to time two or three ſpoonfuls more, "until an evident remiſſion appeared, which was uſually on the fourth or fifth day "from the beginning of this diſeaſe. That he watched attentively for this remiſſion, "and upon its firſt appearance began to give a decoction of the Bark, in as large and "as frequently repeated doſes as the ſtomach could bear."

mental ſurgeons, I imagined it was the moſt likely to ſucceed, even before Dr. *Huck* communicated his obſervations. I have been informed ſince, that in other countries, in ſuch fevers, the chief medicine after bleeding is this antimonial preparation, given from a quarter to half a grain, three or four times a day, throughout the diſeaſe; in which doſe it is not intended to puke, but to evacuate the bile by ſtool, and which it does with more certainty when aſſiſted by clyſters.

The neutral ſalts were given after the evacuations, in order to bring the fever ſooner to a *criſis*, or to regular intermiſſions. The ſaline draughts made with lemon-juice being too coſtly for common hoſpital practice, inſtead of that acid, we ſaturated the ſalt with the ſpirit of vitriol; but ſince that time, for the ſame intention, I have preferred the *elixir vitrioli acidum*, as in this *formula:*

℞ *Salis abſinthii* ʒi. *elixiris vitrioli acidi* ʒij. *vel quod ſatis ſit ad ſaturationem, aquæ puræ* vi. *aquæ cinnamomi ſimplicis* ʒi. *ſyrupi e corticibus aurantiorum* ʒß. *miſce.*
Dentur quinquies vel ſexies die cochlearia iv.

I come next to the Bark, and ſhall obſerve, that theſe fevers have often ſuch fair remiſſions, and even with a breaking in the water, as might perſuade a phyſician unacquainted with their nature, that they would always yield to that medicine; but he would be often diſappointed. Whether it be that ſome inflammation hinders the Bark from

from taking effect, or that theſe quotidians are not true intermittents (as not being of a tertian or quartan form) certain it is, that they can be ſeldom ſafely ſtopped by it. For, though the paroxyſms have diſappeared under its uſe, yet having ſo often ſeen the breaſt affected, or a lurking fever remain after giving the febrifuge, at laſt I made it a rule to attempt the cure without it; or at leaſt to delay giving any, till in the convaleſcent ſtate the patient required it only as a ſtrengthener. And indeed there ſeems to be the leſs occaſion for the Bark here, as by bleeding once or twice, clearing the *primæ viæ* by the purge and the emetic, and afterwards by keeping the body open, the paroxyſms commonly leſſen daily till they quite diſappear. But whenever I found that the diſtemper was not likely to take that turn, but that in ſpite of the evacuations, the fits became worſe (which was often the caſe in the *marſh fever)* I then had recourſe to the Bark; and when it was moſt wanted, I have generally had the ſatisfaction of ſeeing it moſt effectual. As the intervals between the end of the ſweats and the beginning of the ſubſequent paroxyſms were very ſhort, in order to have the more time to give the Bark, I began to adminiſter it two or three hours before the ſweat ended. In general, we may conſider the feveriſh paroxyſm as over, when the thirſt and heat have ceaſed, and the patient finds himſelf in a profuſe and eaſy ſweat. But if ever the fever appeared

peared in a tertian or quartan form, after the uſual evacuations the Bark was a ſure remedy.

The Bark anſwered beſt in ſubſtance with *Rheniſh* wine, after ſtanding a night in infuſion; but for common uſe it was made into an electuary, in which, to each ounce of the powder a drachm of *ſal Ammoniacus* was ſometimes added.

This was the practice in the beginning of the fever, and alſo in its remitting and intermitting ſtate. But if the diſeaſe was neglected in the firſt ſtage, or if after remiſſions or intermiſſions it changed into a continued fever, a vein was opened, if the pulſe could bear it; but at any rate, if the head was affected with pain or *delirium*, leeches were applied to the temples, and a large bliſter was laid between the ſhoulders. At this time, neither ſtrong vomits nor cathartics were given; but gentle pukes, repeated clyſters, or ſome lenient purges were adminiſtered: the chief rule to be obſerved was to clear the *primæ viæ*.

But though a ſweat was then the proper *criſis*, we abſtained from the *ſerpentaria*, volatiles, and other heating medicines, unleſs when the pulſe ſunk, and the *petechiæ* or the like bad ſymptoms appeared; in which caſe it was neceſſary to uſe ſome of the warmer alexipharmacs, and to treat the diſeaſe like, what it was in effect, a malignant fever*.

* Chap. vii.

Some-

Sometimes the fever changed into a dyſentery, which was treated in the manner directed in the following chapter. But if a *diarrhœa* came on, though that was never to be ſtopped ſuddenly, it was often found proper to reſtrain it gradually, and to promote a *diaphoreſis**. Although a looſeneſs was the leaſt favourable *criſis*, yet if nature pointed that way (by colic-pains, or a tenſion of the belly, attended with a dryneſs of the ſkin) it was neceſſary to procure ſtools by clyſters, or ſome mild laxative (ſuch as an infuſion of rhubarb with manna) repeated according as the patient could bear the evacuation.

II. The *camp* and *marſh-fevers* are not more alike in their ſymptoms than in their cure. The rules therefore laid

* If the firſt paſſages have not been ſufficiently cleared in the beginning, and the body kept open during the courſe of the fever, we can expect no other *criſis* than by a looſeneſs, which therefore is not to be ſtopped as long as there is ſtrength to bear it. But if there has been no omiſſion at firſt with regard to the evacuations, or if the patient is too much weakened by the flux, after a little rhubarb, let him take twice a day the following bolus:

℞ *Theriacæ Andromachi* ℈i. *radicis ipecacuanhæ in pulverem contritæ gr.* ii. *vel* iii. *cretæ preparatæ quantum ſatis eſt. miſce.*

This medicine, with the proportion of the ingredients varied occaſionally, I have known effectual in checking the purging, and bringing a ſalutary moiſture upon the ſkin. But when the looſeneſs could not be moderated by this bolus, I then ordered the following mixture:

℞ *Extracti Thebaici grana* ii. *terantur ex julepi e cretâ* ℥xvi.

Dentur poſt alternas ſedes liquidas cochlearia iv.

This is my common aſtringent mixture, which, upon compariſon, I have obſerved to be fully as efficacious as the common one with the *confectio Damocratis*, and more agreeable to the taſte and to the ſtomach.

down

down in the preceding paragraphs being applicable to both, I ſhall only offer a few cautions concerning thoſe points wherein they ſeem moſt to differ. When the fever of the marſhes is of an ardent kind, it may ſeem to require large bleeding; but in general as the humours have here a more putrid tendency than common, this diſeaſe admits leſs of bleeding than the camp-fever, in which, by frequent and great colds, the blood becoming ſizy fixes the inflammation. However, in moſt caſes it was neceſſary to open a vein, either upon the firſt attack, or the next day if there was no intermiſſion. But repeated bleedings, unleſs upon evident marks of a fixed inflammation, were ſo far from producing the deſired effect, that they were apt to render the fever more obſtinate. It ought alſo to be remarked, that the rule about bleeding regards the army only, and not the inhabitants of the *Low-Countries*, as having conſtitutions different from thoſe of our men, who were not only young but robuſt and ſanguine. And even amongſt the ſoldiers, bleeding was ſeldom neceſſary upon a relapſe, or after the weather grew cool, as the fever appeared then without inflammation, and as a regular intermittent.

I obſerved that vomits were ſtill more efficacious in the marſhes than in the camp; in ſo much that when a large quantity of bile was evacuated by an emetic, the fever would often be removed at once. But this was not to be obtainedby the ipecacuanha alone, which I have ſeen have a contrary

contrary effect, in making the ſubſequent paroxyſms longer and more violent than the preceding; whether that was by acting weakly, and ſending more of the corrupted humours into the blood than it diſcharged from the *primæ viæ*, or from ſome other cauſe, is uncertain *: for this reaſon I added two grains of the emetic tartar.

The marſh-fever, during the hot ſeaſon, being more apt to run into double paroxyſms, or to change into a continued form, than to remain regularly intermittent, it was neceſſary, after due preparation, to ſtop it in the firſt fair intermiſſion. And for this purpoſe the Bark was found to be no leſs ſpecific in thoſe parts than at home. But I muſt add, that though large quantities were given, relapſes were not only frequent but certain, if the medicine was not repeated more frequently than the ſoldiers could generally be prevailed upon to take it: ſo that upon the whole, the Bark was leſs uſeful than might have been expected. But obſerve, that no bad conſequence aroſe from repeating it often. For, the viſceral obſtructions, which ſucceeded to theſe fevers, were not to be imputed to that medicine, but to a long continuance of the diſeaſe, or to frequent relapſes; againſt which there was no ſecurity, unleſs the patient took an ounce of the powder once every ten or twelve days, throughout the autumn. The moſt effectual

* I had twice experience of this effect of the ipecacuanha by itſelf in my own caſe.

way to make a ſoldier continue the uſe of the Bark, is to mix it with equal parts of brandy and water*.

The next means of prevention depend on a proper diet. The convaleſcents muſt eat moderately, eſpecially of greens and of fruit, and are to abſtain from new ſmall-beer, and whatever is flatulent or tends to relax. In general, whatever produces ſuch effects diſpoſes the ſtomach to indigeſtions, and thereby to a corruption of the humours; and, on the other hand, whatever braces proves antiſeptic. A moderate uſe of ſpirits is at this time neceſſary; but as a ſoldier's pay is inſufficient for providing both wholeſome food and ſtrong liquor, the public ſhould make, on ſuch occaſions, an allowance of ſpirits to the army, as it does to the navy, though perhaps half that quantity might be ſufficient.

For the round worms, which ſo often accompany theſe fevers, I commonly gave half a drachm of rhubarb with twelve grains of calomel, without obſerving any inconvenience from ſo large a doſe of mercury, which with us was always duly prepared. Such anthelminthics as act ſlowly, and do not purge, ſeemed to have little chance for doing ſervice here, as the ſymptoms were generally ſo ur-

* I have ſince obſerved, that the ſureſt way of preventing a relapſe in thoſe who unwillingly return to the uſe of the Bark, is to give four or five ounces in powder, as faſt as the patient can be prevailed upon to take it: this quantity he may finiſh in ſix or ſeven days.

gent as to require ſome quicker remedy. For, though theſe animals will ſometimes lie long in the bowels, without creating much uneaſineſs to a perſon otherwiſe well, yet in a fever, eſpecially one of a putrid kind, the worms being annoyed by the increaſe of the heat, and the corruption of the humours in the *primæ viæ* (conſequent on the fever) begin to move about and ſtruggle to get out. *Lanciſius*, who makes this remark, adds, that ſome of the bodies being opened of thoſe who (at *Rome*) had died of ſuch a bilious fever, they found wounds in the inteſtines made by the biting of the worms: nay, that ſome of them had even pierced through the coats of the guts, and lay in the cavity of the *abdomen*. In our hoſpitals, no diſſection of that kind was made, but I have known many caſes in which the worms eſcaped by the patient's mouth, though there had been no previous retching to bring them up. But, without advancing ſo far, they will occaſion ſome very alarming ſymptoms. I remember, a ſoldier was brought to the hoſpital, about the end of ſummer, ill of one of theſe fevers, but with a more than uſual diſorder in his ſtomach and bowels not yielding to the common evacuations; the muſcles of his face were ſtrangely convulſed, and he was ſo reſtleſs that he could not lie for a minute in the ſame poſture. At firſt I did not ſuſpect worms, but in a day or two after, the patient having voided a round one by ſtool, I then gave him the powder above mentioned, which, either upon the firſt or ſecond doſe, brought away ſeveral

more: after this, the extraordinary ſymptoms ceaſed, and he ſoon got well.

I ſhall conclude this ſubject with an extract of a letter which I received from Dr. *de Monchy* of *Rotterdam*, who, during the time of my ſervice, was phyſician to the *Dutch* troops which then made part of the allied army. This gentleman, after peruſing one of the former editions of this work, favoured me with ſome remarks upon it; and among others, with what follows, upon the bilious fevers. This was the more acceptable, as my learned friend had not only had the ſame opportunities with me of ſeeing theſe diſtempers in the camp, but alſo in his private practice, both before and ſince the war, in his own country, where they are more numerous and of a worſe kind than in *Britain*. Theſe are his words: *Sic ceteræ obſervationes meæ a tuis parum vel nihil differunt, niſi fortè quòd venam ſecandi (rarò ſaltem) non tantam in* febribus biliosis *neceſſitatem invenerim; imò naturam imitando, præcedente emetico, ſubinde vomitum excitando (prout magis minùſve ad ſuperiora materia turgeret) et levem, ſed per dies aliquot protractam diarrhœam eccoproticis efficiendo, feliciter ſine ullâ aliâ notabili criticâ evacuatione centenos curaverim; et adhuc quotannis, tempore autumnali, optimo cum ſucceſſu et brevi curem.*

Quoad tempus vomitorio utendi, Boerhaavium *alioſque practicos ſecutus ſum, dando illud tribus vel quatuor horis ante paroxyſmum, in eâ continuò permanens opinione, quòd major tunc ſit materiæ morboſæ accumulatio*

accumulatio et activitas; et poſtea major ſubactio, et facilior per urinam evacuatio.

Simplex hæc fuit mea ſemper methodus curandi febres biliosas *cum oris amaritie, nauſeâ, vomitu, &c. dum ægri adhuc in primo initio morbi verſabantur.*

Quantocyus in continuis, *vel parum tantum* remittentibus, *æquè tempore veſpertino quàm matutino præſcribebam vomitorium ex pulvere ipecacuanhæ ſcrupulis ij. et tartari emetici granis ij. et ſtatim horâ poſt hujus remedii finitam operationem, ut purgans, cremorem tartari ad unciam i. ex lacte ebutyrato aſſumerent ægri ſedulò curabam. Hæc poſtero die, ſi eadem fomitis adeſſent ſigna in primis viis, imò et tertio die iterabam. Si verò febrem, ut et pleraque ejus ſymptomata imminuta videbam, alvum tantùm laxam ſervare conabar ſimplici decocto hordei et tamarindorum cum nitro.*

CHAP.

CHAP. V.

Obſervations on the obſtructions conſequent on the remitting, and intermitting fevers of the camp, and thoſe of marſhy countries.

A LONG continuance of theſe fevers, or frequent relapſes into them, brought on viſceral obſtructions ending in a dropſy, or a jaundice.

The dropſies ſeemed to be chiefly owing to obſtructions of the liver and ſpleen, in which caſe the watery ſwelling generally began at the feet and roſe gradually to the belly.

But when the belly alone was ſwelled, and that ſuddenly, after the unſeaſonable uſe of opiates in the dyſentery, or of the Bark in intermittents, the *colon* then became diſtended with air, and the diſtemper was a true *tympanites*. Such caſes indeed did not often occur; but when they did, they yielded to the following remedies. If there was any degree of fever, I began with bleeding, and gave the common ſaline mixture, with rhubarb *; but if there was no fever, a few grains of the *ſpecies aromaticæ* were joined to the laxative; and the patient drank ſome ſtrong camomile tea. Every night at bed-time, till the tumour diſappeared, I gave fifteen grains of rhubarb, or as much as

* See page 204.

was

was ſufficient to procure one or two ſtools the next day. When the ſwelling gave way, if the pulſe was ſlow, and if there was no thirſt, without omitting the rhubarb, I endeavoured to ſtrengthen the bowels, by an electuary of camomile flowers and ginger, with a ſmall proportion of ſteel.

All ſtrong phyſic, and carminatives without laxatives were hurtful.

A man, who had been ſome weeks ill of this diſtemper and was feveriſh, died ſuddenly in the night time, upon his belly ſubſiding all at once, after three or four looſe ſtools occaſioned by taking ſome ſquills. The body being opened, neither air nor water were found in the cavity of the *abdomen*; but the *colon* was ſo large and relaxed, that it ſeemed to have contained air enough to have been the cauſe of the tumour. This caſe ſuggeſted the uſe of a ſwathe in ſuch diſorders; as the patient may thereby always make a compreſſion ſuitable to the decreaſe of the air in his bowels.

The *aſcites* comes on more ſlowly, and is generally attended with anaſarcous ſwellings, and a paucity and thickneſs of urine. Sometimes the intermittent goes off when the ſwelling begins; at other times it continues, or comes and goes in an irregular manner. I obſerved that theſe dropſies were not to be cured by purging alone, nor by ſoap, nor mercurials;

mercurials; but chiefly by the lixivial ſalts, either in the form of broom-aſhes, ſalt of wormwood, or ſalt of tartar. The common method was this: about forty grains of ſalt of wormwood (or of tartar) were diſſolved in about ten ounces of an infuſion of the *abſinthium vulgare*, to which were added about two ounces of the ſpirit called *Holland-Gin*; and this mixture was taken at three draughts and repeated daily. The patient had no other medicine, except, once in four or five days, half a drachm of *pilulæ ex colocynthide cum aloë* for a purge; and in the decline of the diſeaſe, ſome common chalybeate. Sometimes the *diureſis* was promoted by ſwallowing garlic or muſtard-ſeed. Although the *aſcites* was accompanied with the hard ſwelling formerly mentioned *, nothing was further done, except fomenting the part, or covering it with a warm plaſter. Some irregular and obſtinate agues were removed by the ſame medicines; or if they returned after the cure of the dropſy, they were then ſucceſsfully treated with the Bark †.

The jaundice, without fever, was likewiſe cured by the lixivial ſalts, and the ſame purge; and both in that diſtemper and in the dropſy I have obſerved good effects from antimonial vomits.

* Part iii. ch. iv. § 2.

† Since that time, I have given in caſes of irregular agues, where I ſuſpected obſtructions of the *viſcera*, the following mixture (little different from that mentioned above) for a continuance, and with good effects:

℞ *Florum chamæmeli* ʒβ. *aquæ puræ bullientis* ʒviii. *macera per dimidium horæ et colaturæ admiſce ſpiritûs vini Gallici* ʒii. *ſalis abſinthii* ʒi.

Detur quater, quotidie, cochlearia iv.

CHAP.

CHAP. VI.

Obſervations on the camp-dyſentery.

THE putrid or bilious diſorders of the camp were divided into fevers and fluxes*; having fully treated of the former, I now come to the latter, but ſhall confine myſelf to that *ſpecies* called the dyſentery, as it is the leaſt known out of the field, and is often general and fatal there. I ſhall firſt deſcribe the diſeaſe; then give an account of the diſſections of ſome who died of it; after which, I ſhall inquire into its cauſe; and laſtly, propoſe what I obſerved to be moſt ſucceſsful in the cure.

§ 1.

A deſcription of the camp-dyſentery.

SOME dyſenteries appear upon firſt taking the field; but the caſes are never ſo bad, nor nearly ſo frequent, as towards the end of ſummer, or in the beginning of autumn. At that time they become epidemic and contagious, prevail for about ſix weeks, or two months, and then ceaſe. They are always moſt numerous and worſt after hot and cloſe ſummers, eſpecially in fixed

* Part ii. ch. i.

camps, or when the men lie wet after a march in warm weather.

The ſure diagnoſtics of the dyſentery, beſides ſome feveriſh ſymptoms, are a diſorder at the ſtomach and wind in the bowels, ſmall, but frequent ſtools of a ſlimy and frothy matter, a *teneſmus*, and gripes. Blood mixed with the *fæces* is a common, but not a conſtant ſymptom; for, many have all the other marks without this, at leaſt in the beginning, and others have blood in their ſtools from various cauſes without a dyſentery: but as this diſorder is moſtly attended with blood, for that reaſon it has been called the *bloody-flux*.

Such are the pathognomonic ſymptoms, which are ſufficient to diſtinguiſh this diſtemper from a *diarrhoea*, an hæmorrhoidal, and all other fluxes. Agreeably to this deſcription, *Sydenham* and *Willis* uſe the term *dyſentery*, and apply it to every caſe of that flux which raged at *London* in the year 1670; though *Sydenham* ſays, that ſome of his patients voided no blood*; and *Willis* obſerves, that his, for the moſt part, had none but watery ſtools †. The name is one of the few particulars in which thoſe celebrated authors agree, in their account of that diſeaſe. And *Morgagni* mentioning that epidemic, takes notice of the propriety with which *Willis* applies the word *dyſenteria*

* Morb. Acut. ſect. iv. cap. iii. † Pharm. Rat. ſect. iii. cap. iii.

to

to a flux with the ſymptoms above mentioned, though without blood, but would, for more diſtinctneſs, call it the *dyſenteria incruenta* *.

It may be remarked, that in confining this appellation to ſuch ſymptoms, I have deviated from the ancients; and therein may be the more blameable for having upon another occaſion found fault with others for the like freedom †. But the caſe is not the ſame, ſince thoſe authors had made an unneceſſary change, by giving different names to two ſtages of the ſame diſeaſe, whilſt here, the ancients having uſed a term, either in ſo lax an acceptation as to include ſeveral diſorders of a different kind, or in ſo confined a ſenſe as not to comprehend all the varieties of the ſame diſtemper, I was forced to leave them, and take the definition from thoſe who were become better acquainted with the nature of this flux.

Thus, the word *dyſentery*, in the original *Greek*, importing *a diſorder of the bowels* in general, we find *Hippocrates* uſing it not only to ſignify all ulcerations, but all hæmorrhages of the inteſtines (even thoſe which are critical and ſalutary) and likewiſe every kind of flux, with, or without blood ‡. It would ſeem however, that after his time ſome

* De Sed. et Cauſ. Morb. epiſt. xxxi. § 11. et 13.

† Part iii. ch. ii. § 6.

‡ Dyſenteria eſt exulceratio inteſtinorum---alii verò, inter quos ipſe HIPPOCRATES eſt, dyſenteriam interdum appellant non ipſam modò exulcerationem inteſtinorum,

of the *Greeks*, whoſe works are loſt, were ſenſible of this want of preciſion, and therefore confined the meaning of the term to an ulceration of the bowels attended with gripes and *teneſmus*, and with mucous and bloody ſtools. For, a diſeaſe with theſe ſymptoms *Celſus* calls *tormina*, and ſays, it is the δυσεντερίη of the *Greeks* *; and *Cælius Aurelianus* retaining the *Greek* name, deſcribes the dyſentery much in the ſame manner with *Celſus* †.

Yet *Galen* returns to the looſer acceptation of the word, ſometimes defining a dyſentery *an ulceration of the bowels*; at other times mentioning four ſpecies of that diſtemper, all with bloody ſtools; but whereof we find one only agreeing with the *tormina* of *Celſus*, or the *dyſentery* of the moderns ‡. I have conſulted none of the other *Greeks* upon this article (ſuppoſing that they followed *Galen*) excepting *Aretæus*, who confining the term intirely to an ulceration of the bowels, accounts for all the ſymptoms, according to the particular gut affected and the circumſtances of the ſore, which if deep and corroding ſome

rum, verùm omnem etiam cruoris per inteſtina vacuationem: GORRAEUS in voce Δυσεντερίη.

Ejus etiam dyſenteriæ quæ plerunque morbos plurimos ſalutariter ac judicatoriè ſolvit, meminiſſe videtur HIPPOCRATES (Prorrh. 2.) Δυσεντερίην etiam pro quovis alvi profluvio capere videtur HIPPOCRATES (lib. ii. Epidem.) FOESII *Oeconom. Hipp.* in voce Δυσεντερίη.

* De Med. lib. iv. cap. xv.

† De Morb. Chron. lib. iv. cap. vi.

‡ De Cauſ. Sympt. lib. iii.---De Loc. Affect. lib. ii.

large

large blood-veſſel, he ſuppoſed might occaſion a fatal hæmorrhage *.

From this it appears that the term *dyſentery*, as uſed by *Hippocrates* and *Galen*, conveys no preciſe notion of a diſeaſe; and that unleſs thoſe ſymptoms, which I have called pathognomonic, are always joined to an ulceration of the bowels (which is not always the caſe) the *dyſentery* of *Celſus*, of *Aretæus*, and of *Cælius Aurelianus* muſt be accounted a different diſorder from that which I am now treating of. Not but that the bowels are liable to be ulcerated in the true *dyſentery*, but that ulceration is accidental and not eſſential to the diſeaſe. *Morgagni* in one place obſerves, that in this diſtemper the inteſtines are ſometimes affected with ulcers, and ſometimes not †; and, in another place, he takes notice of the ulceration happening only in its more advanced ſtate ‡. Further, from the diſſections of that excellent anatomiſt, compared with thoſe collected by *Bonetus*, and thoſe made by Mr. *Cleghorn* §, and by myſelf, there will appear more inſtances of the ſoundneſs of the inteſtines, in this reſpect, than the contrary.

This opinion, concerning the conſtant ulceration of the bowels continued till *Sydenham* and *Willis* conſidered the *dyſentery* as a diſorder independent of any ulcer; and upon

* De Cauſ. et Sign. Diut. Morb. lib. ii. cap. ix.

† De Sed. et Cauſ. Morb. ep. xxxi. § 12, 13.

‡ Somewhere in the ſame epiſtle.

§ Obſerv. on the Epidem. Diſeaſes of Minorca, ch. v.

their

their authority, phyſicians ſeem to have relinquiſhed their former ſyſtem. And indeed *Sydenham*'s account is upon the whole ſo juſt, that believing it unneceſſary to enter upon a further enumeration of ſymptoms, I ſhall refer the reader to that well known author; confining myſelf to a few obſervations, to aſcertain ſome points which he has left doubtful; and adding ſome others for rendering the hiſtory of the diſeaſe more complete.

Sydenham having little inquired into the nature of any *dyſentery* excepting that which he himſelf deſcribes, therefore queſtions whether there may not be as many kinds of that diſtemper as of the ſmall-pox and other *epidemics*; which, according to him, ſo much vary, as in ſome particulars * to require a different treatment.

Sydenham ſeems to have been led into this opinion of the varying nature of epidemics, though appearing in the ſame form, from a belief that the wiſdom of Nature was moſt manifeſted in its variety: "For (ſays he) we are not "to be ſurpriſed at theſe *luſus naturæ*, ſince it is univerſally "acknowledged that the deeper we penetrate into Na"ture's works, the more we ſhall ſee of the vaſt diverſi"ty, and the almoſt divine contrivance of her operations,

* ---cum fieri quidem poſſit, ut variæ enaſcantur dyſenteriarum ſpecies, ut ſunt variolarum, et epidemicorum aliorum, diverſis conſtitutionibus propriæ, et quæ proinde medendi methodum in aliquibus diverſam ſibi ſuo jure vendicant. De Morb. Acut. ſect. iv. cap. iii.

"which

"which far ſurpaſs our comprehenſion."---"So that who"ever has undertaken to comprehend all thoſe matters, "and to trace the multifarious operations of Nature, "will find himſelf diſappointed *.

But does Nature manifeſt its wiſdom more by perplexing mankind, with varying diſtempers every ſeaſon, or, by preſenting them over and over, to teach us their nature and cure? In the firſt ſteps of our inquiry, we meet indeed with great variety and obſcurity; but as we penetrate further into Nature, we find ſo much analogy amongſt her works, that we are forced to acknowledge and revere her ſimplicity.

In the preſent caſe, I can affirm that all the epidemic *dyſenteries* which I have ſeen in the army have been of the ſame nature; and I have been aſſured by Dr. *Huck*, and by other phyſicians employed, during the late war, not only in *Germany* but in *America*, that this diſtemper appeared with the ſame ſymptoms, and yielded to nearly the ſame medicines which were obſerved to be moſt ſucceſsful in the military hoſpitals before. I may add, that both in *Scotland* and in this country, whenever I had an

* Neque eſt, cur hos Naturæ luſus hâc in re tantopere demiremur; cum in confeſſo apud omnes ſit, quòd quò profundiùs in quæcunque Naturæ opera penetremus, eò luculentiùs adfulgeat ingens illa varietas, et divinum penè artificium operationum ejus, quæ captum noſtrum longiſſimè ſuperant. Adeò quiſquis ille fuerit, qui in ſe receperit hæc omnia mente adſequi, et multifarias Naturæ operationes κατα τοδας indagare, partim magnis auſis excidet, &c. ibid.

oppor-

opportunity of treating ſuch fluxes in my private practice, I never could ſee that they required any different method of cure. Nor do I find that *Deguer* had reaſon to conſider that flux which he deſcribes, as a *ſpecies* different from others, and diſtinguiſhable by its contagious and bilious nature *. For, I have never known the dyſentery epidemic, unleſs in ſummer, or in autumn, when the bile is moſt liable to be vitiated; nor have I ſeen any number ill of this diſtemper, without hearing ſeveral of them complain of ſickneſs at the ſtomach and vomiting of gall. As to the violence of the ſymptoms mentioned by that author, I own it exceeds any thing that I have obſerved, upon the firſt ſeizure; but, when a number of men, even with the moſt favourable caſes, have been crouded into the hoſpitals of the army, the dyſentery has then appeared with all the virulence that it did at *Nimeguen*.

Sydenham obſerves: "That as all epidemics, at their firſt "appearance, ſeem to be of a more *ſpirituous* or *ſubtile* na"ture than in their advanced ſtate, ſo in the like manner "the dyſentery proceeded; for the longer it continued, "it grew the more *humoural*. For inſtance, in the firſt au"tumn, *ſeveral had no ſtools at all*; but with reſpect to the "ſeverity of the gripings, the violence of the fever, ſud"den decay of ſtrength, and other ſymptoms, it much "exceeded the dyſenteries of the following years †."

* Hiſt. Medic. de Dyſent. Bilioſo-Contag. cap. i § 1.

† Vid. loc. cit.

Here

Here then we ſeem to have a *ſpecies* of the diſeaſe very unlike the common ſort. But, beſides that this remark was never, ſo far as I know, made by any one before *Sydenham*, nor has been confirmed by any author ſince his time, I muſt obſerve, that though we approved of his having conſidered the dyſentery as a diſorder in which there might, or might not be blood in the ſtools, yet we cannot juſtify him in calling that a dyſentery, "in which there are no ſtools at all."

But if there is any miſtake here, it is of little conſequence, though I cannot ſay ſo much of that obſervation with which *Sydenham* concludes his ſubject. He ſays, "that though evacuations both by bleeding and purging "were indiſpenſible before *laudanum* could be admini"ſtred, in thoſe years in which the dyſentery was epidemi"cal, yet in any other conſtitution of the air, which has a "leſs tendency to breed this diſeaſe, they may ſafely be "omitted, and the cure completed by a ſhorter me"thod, *viz.* by *laudanum* alone *." In this, I ſay, I muſt declare my diſſent; for, though we cannot doubt, upon *Sydenham*'s authority, that ſome ſlight caſes of the dyſentery have been cured in that manner, yet I have ſeen

* —quòd tametſi in his annis, quibus dyſenteriæ adeò epidemicè graſſarentur, evacuationes priùs memoratæ prorſus neceſſariæ erant, antequam ad uſum laudani deventum fuiſſet, attamen in *conſtitutione* quavis huic morbo minùs faventi, iſtæ tutò omitti poſſunt, ac curatio compendioſiori viâ, ſolo nempe uſu laudani, abſolvi eo quem diximus modo. Loc. cit.

 ſuch

ſuch bad effects from this practice, both in the army and elſewhere, that I will venture to ſay, that no dyſenteric caſe ought to be treated with *laudanum* before the *firſt paſſages* are thoroughly cleared.

The dyſentery, as *Sydenham* obſerves, ſometimes begins with a *rigor* ſucceeded by heat, but often with gripes without any feveriſh ſenſation. This laſt part is perhaps not ſtrictly true; for, though the patient himſelf may not mention any feveriſh ſymptom, yet upon examination we ſhall find, that interchanges of heat and cold, laſſitude, loſs of appetite, and the like febrile affections have always been more or leſs the forerunners of the diſeaſe. Frequently, the beginning of a flux will have the appearance of a bilious fever; for the patient will have a fever, with a diſorder in his ſtomach and bowels, for two or three days before the purging comes on; but after that, the feveriſh ſymptoms ſenſibly give way. At other times, upon fatigue and expoſition to cold during the dyſenteric ſeaſon, the men will be more ſuddenly ſeized with the flux, but ſcarce ever without ſome degree of fever. The ſenſible diminution of the fever upon the appearance of the looſeneſs, ſeems to juſtify that expreſſion of *Sydenham*, when he calls the dyſentery "the fever of the "ſeaſon turned in upon the bowels *."

Beſides this previous fever, the patient is liable to one of a low and more dangerous kind. For the moſt part I have

* Loc. cit.

have obſerved this to be brought on by neglecting the diſeaſe in the beginning, or by having recourſe to opiates, and other aſtringents before evacuations. Sometimes, though rarely, I have ſeen the ſame kind of fever accompany the flux from the beginning and end in death, without diſcovering any error committed either in the regimen or medicine. But the moſt fatal ſort of fever which ſo often attends the dyſentery of the army, though not eſſential to it, is the *hoſpital* or *jail-diſtemper*, which at all times infects foul and crouded places, but never ſo much as when they are filled with patients ill of ſo putrid a diſeaſe. This fever combined with the bloody-flux is commonly mortal.

The ſtools at firſt are generally copious and excrementitious, but the next day, or ſoon after, they become ſmall, watery, and ſlimy, and are attended with teaſing gripes and *teneſmus*. From this time till the favourable turn, natural *fæces* are ſeldom ſeen, except when a purge operates briſkly and carries them down; then indeed the patient is leſs griped, has fewer motions, and leſs *teneſmus*.

Beſides the *mucus* in the ſtools, *Sydenham* ought to have mentioned a watery humour which is always mixed with the ſlime. This *ſerum* is perhaps one cauſe of the irritation, and deſcends from ſome higher parts of the inteſtines, whilſt the *mucus* is moſtly ſecreted from the *rectum* in ſtraining.

Streaks of blood denote the opening of ſome ſmall veſſels at the end of the *rectum*, but a more intimate mixture is a ſign that the blood comes from a higher ſource. This hæmorrhage which alarms moſt is the ſymptom leaſt to be dreaded; for, though the oozing be conſtant, the quantity of blood loſt, except in a few caſes, is inconſiderable. *Morgagni* obſerves, that moſt of the blood may come from the inteſtines, without any rupture of the blood-veſſels, and only by their greater dilatation; and this opinion is moſt agreeable to what I have ſeen in diſſections.

Nor are we to be alarmed at the loſs of ſo much of the ſerous humour; for the amount of the whole is not nearly ſo great as in a common *diarrhœa*. Yet the frequency of the motions has given a falſe indication for the early uſe of aſtringents, whilſt, in fact, the paſſage through the inteſtines is already ſo much obſtructed, that to reſtore and preſerve it, is the moſt eſſential as well as the moſt difficult part of the cure.

There are ſome other ſubſtances, omitted by *Sydenham*, which are leſs commonly ſeen in the ſtools, *viz.* round worms, balls of hardened excrements, and ſome ſmaller bodies of the colour and conſiſtence of ſuet.

Worms we never conſidered as the cauſe of the flux, but as concurring with other cauſes to make it worſe. It would ſeem that in this morbid ſtate of the bowels, by ſtruggling

ſtruggling to get out they increaſed the irritation. Sometimes I have known them make their way by the mouth.

The balls of hardened *fæces* may come away at any time of the diſeaſe, but I have obſerved them moſtly in its advanced ſtate, and when I ſuſpected that purging had been too long neglected. I have commonly ſeen the *teneſmus* and all other ſymptoms give way, after they were carried off by a briſk doſe of phyſic. Theſe *ſcybala* are of ſo firm a texture, and ſo round, that they ſeem to have been formed in the cells of the *colon*, and to have lain there from the beginning: for, we can ſcarce ſuppoſe them to have afterwards acquired that figure and conſiſtence during a conſtant irritation of the inteſtines, and the low diet which patients then uſe.

As to the white ſubſtances, which I compared to ſuet, I do not know whether they are the ſame which *Hippocrates* calls σάρκες *(carunculæ)* but they are plainly deſcribed by *Aretæus* and *Cælius Aurelianus*, and have ſince been taken notice of by later writers under the name of *corpora pinguia*, and variouſly accounted for. Although I had frequently ſeen them, I had neglected to examine them till the autumn 1762, when Dr. *Huck* and I viſiting a patient ill of a dyſentery, who voided ſuch ſubſtances, we preſerved one of them which we viewed at leiſure, and were both ſatisfied that the ſubject of our inquiry was nothing but a bit of cheeſe; though the patient aſſured us afterwards, that he had taſted none ſince the beginning of his illneſs,

illneſs, which had been of above a fortnight's ſtanding. Now, whether this cheeſe had been collected from ſmaller particles which had paſſed from the ſtomach to the *colon* before he was taken ill, or had been ſince formed of milk which he had always uſed (and which might have curdled in his ſtomach) we could not determine: but we were both convinced that, in whatever manner this ſubſtance was produced, it muſt have been of the ſame nature with all thoſe *corpora pinguia* which we had ſo often ſeen in the dyſentery.

With regard to the abraſions of the villous coat, and other ſubſtances ſaid to have been obſerved in the ſtools, I can ſay nothing, having never ſeen them; though I do not call in queſtion what has been ſo often mentioned by others*. The offenſiveneſs, and even danger of ſuch an inquiry, will ſerve as ſome excuſe for not carrying it further.

The ſtools are all along diſtinguiſhed by a certain ſmell different from that of common excrements; it is faint, and not rank at firſt, but towards the end, when the bowels begin to mortify, the *fætor* is cadaverous and intolerable. At ſuch times they are probably moſt infectious. I

* Hæc ſunt ramenta ξύσματα dicta HIPPOCRATI, quæ meritò damnavit.—Teſtatur GALENUS ſe multos vidiſſe et ſæpe, quibus, cum morbis gravibus et diuturnis conflictatis, maxima inteſtinorum pars ſic corrumpebatur, ut compluribus in locis tota interior tunica eſſet deſtructa, imprimis in morbis dyſentericis. VAN SWIET. Comment. in Aphor. BOERH. § 721.

have

have obſerved elſewhere, that in a natural ſtate the *fætor ſtercoreus* is owing to a mixture of putrid matter with an acid, and that by this combination the *fæces* acquire a particular, and a ſtronger ſmell than they would otherwiſe have, and are leſs apt to ſpread infection*. But in this diſtemper, it would ſeem as if the acid, which is generated in the ſtomach and ſmaller inteſtines, were hindered by the ſpaſms from paſſing through the large inteſtines, and that the *fæces* were thereby deprived of their proper corrector.

Among other ſymptoms omitted by *Sydenham*, is the flatulence, of which the moſt obvious ſource is from the aliment that in this diſorder of the ſtomach ferments too ſtrongly, and generates both this air and an acid, as appears from the Experiments ſubjoined to this work†. Another ſource may be from the blood and other humours which ſtagnate and putrefy in the larger inteſtines; for, it is well known that all animal and vegetable ſubſtances yield much air when reſolved by putrefaction. Beſides, the maſs of blood having acquired a more than natural putreſcency, by the abſorption of corrupted matter from the inteſtines, may from that cauſe be more diſpoſed to part with its air, and to throw it upon the *primæ viæ*. But however this may be, it is evident that the air, which abounds at this time in the *firſt paſſages*, occaſions often a

* Appendix, Paper vii. exp. xliii. † Paper v. and vi.

ſenſe of oppreſſion, or increaſes the gripes, according to the place where it is collected, whether in the ſtomach or in the ſmaller or greater inteſtines, and in proportion to the ſpaſms which impriſon it. I have known more than one caſe of a *tympanites* (or an immoderate diſtenſion of the *colon* by air) from the premature uſe of opiates and aſtringents in the dyſentery. Early in the diſeaſe, the ſtools are of a frothy conſiſtence like yeaſt; but this is only the natural ſtate of the *mucus*, which is mixed with the air when it comes out of the glands. For, by M. *de Haller*'s experiments, upon pricking the internal coat of the inteſtines of a living animal, this kind of frothy matter is expreſſed from the mouths of all the ſecretory veſſels around the irritated part *.

It might be of uſe to know what gut is particularly affected when the gripes are moſt ſevere. But this cannot be well aſcertained, conſidering how much the inteſtines may change their place by the periſtaltic motion †, how their ſituation may vary in different perſons, and how readily the pain of the *colon* may be confounded with that of the ſmaller guts which are ſurrounded by it. In general, the irritation of the ſtomach and higher inteſtines is attended with more ſickneſs than gripes; and therefore when the gripes are moſt acute without ſickneſs, it is probable that the ſpaſm is in the lower guts. When the pain is about the middle of the belly, we may preſume that

* Opera Minora, p. 394, & ſeq. † Ibid. p. 301, & ſeq.

the ſpaſm is in the ſmaller inteſtines; but of this we cannot be certain, as in ſome ſubjects the upper flexure of the *colon* has been found as low as the umbilical region. Pains in the ſides, back, and region of the kidneys, may be referred to the *colon*; but if the pains are felt towards the *os ſacrum*, we may then ſuſpect that the upper part of the *rectum* is affected. For, the pain ariſing from the irritation of that gut may be referred equally to the back, and to the lower part of the belly, as a ſtone deſcending from the ureters is felt both ways, behind as well as before. But when the lower extremity of the *rectum* is irritated, the ſpaſm ſeems not then to be ſo much productive of pain, as of a violent *niſus* drawing into *conſent* the muſcles of that part, as well as others which act in diſcharging the *fæces*.

The ſtools are always preceded by ſharp gripings, and ſucceeded by ſome reſpite; but the motions being ſo frequent, the patient can have no conſiderable eaſe, unleſs the ſpaſms are removed by opiates, fomenting the belly, raiſing a ſweat, or by evacuating the acrid and irritating matter with a purge. Indeed when the bowels begin to mortify, the patients, though reſtleſs, complain of little pain or *teneſmus*; nay I have known them quite free from theſe laſt ſymptoms not only for ſome hours, but for ſome days before their end. At ſuch times they have ſome degree of *delirium*, though I have known ſeveral who were ſenſible to the laſt.

It may be remarked, that *Sydenham* mentions nothing of the *teneſmus* till the patient is in a convaleſcent ſtate, though that ſymptom is certainly one of the firſt which characteriſes the dyſentery. But this is no omiſſion of our author; for what others underſtand by a *teneſmus*, and what I meant by that term in treating of the pathognomonic ſymptoms, *Sydenham* expreſſes by *inteſtinorum depreſſio cum dolore*, and by *moleſtiſſimus viſcerum omnium quaſi deſcenſus*. As to his obſervation, "of the inteſtines being affected ſucceſſively "downwards, till at laſt the diſeaſe is driven to the *rectum*, "where it ends in a *teneſmus*," ſtrictly ſpeaking it cannot be admitted. For, though the *rectum* is generally the laſt part that recovers, and the *colon* remains longer diſeaſed than the ſmall inteſtines, yet there is properly no ſuch progreſſion as *Sydenham* deſcribes. From the beginning, the whole inteſtinal tube is affected at once, and the *teneſmus* is very early as violent as it is ever after in the courſe of the diſeaſe. The obſtinacy of the *teneſmus* ſeems ſometimes to be the cauſe of death; for, by the conſtant irritation, the *rectum* at laſt mortifies. In thoſe bodies which I have opened, I found the gangrene in the inteſtines always worſt the nearer it was to the extremity of the *rectum*.

Sydenham obſerves, that the *teneſmus* remaining at the end of the flux is not owing to an ulceration of the *rectum*: according to him, "in proportion as the bowels recover "their tone, they depoſite the remains of the morbific "matter

"matter in this gut; which being continually irritated "thereby, diſcharges at every ſtool part of the *mucus* with "which the inteſtines are naturally lined." But does it not ſeem more natural to aſcribe this remaining *teneſmus* to the ſoreneſs of a part, which has been ſo much inflamed and excoriated in the courſe of the diſeaſe, and which by its conſtant irritation is ſtill kept from recovering? Add to this, the obſervation that has frequently been made, of the *teneſmus* giving way upon the patient's voiding ſome hardened excrements (ſuch as were mentioned above) the chief cauſe of the irritation. That the *teneſmus* which ſucceeds the dyſentery may be ſometimes owing to an ulcer, is aſſerted by *Morgagni*, but who gives only one inſtance of it in his practice.

Sydenham does not mention a *procidentia ani* nor a ſtrangury, which I have known accompany bad caſes of the dyſentery. The former ſymptom ariſes from the violent ſtraining; and the latter, from the inflammation ſpreading from the *rectum* to the neck of the bladder.

Nor does *Sydenham* take notice of any contagion that attended his epidemic; *Willis* expreſsly ſays, that the dyſentery deſcribed by him (which was the ſame with *Sydenham*'s) was not infectious. But all that can be inferred from thence is, that either the dyſentery, which they ſaw, was of a milder nature than the diſtemper uſually is when it becomes general, or that this circumſtance

eſcaped their notice. It is true indeed, that this diſorder is not ſo catching as moſt others of the contagious kind; but whenever it has been epidemic, I always found it in ſome degree infectious; and eſpecially in military hoſpitals, and in the houſes of the poor, who want the means of cleanlineſs.

The duration and iſſue of the dyſentery are uncertain; much depending upon medicine, good air, attendance, and the care which the patient takes of himſelf. If nothing is wanting, and the flux recent, it will be generally cured: but theſe favourable circumſtances occur amongſt the officers only. The caſe is different with the private men, who not only apply late for aſſiſtance, but are either expoſed to colds in the field, or, which is worſe, ſhut up in the foul air of an hoſpital.

It is the ſign of a bad caſe when the firſt vomit and purge do not relieve; when the hectic fever increaſes; when the diſorder of the ſtomach does not yield to evacuations; when the countenance alters much; when the pulſe ſinks and intermits; when the patient is reſtleſs, without complaining of gripes. In the beginning, a hiccup is little to be dreaded; but in the low and advanced ſtate, if obſtinate, it is commonly a ſign of a mortification. The diſeaſe, when fatal, ends in a proſtration of ſtrength, a ſore throat, or *aphthæ*, involuntary and cadaverous

verous ſtools. Sometimes, before the end, when the ſpaſms give way by a putrid reſolution, the aliment, as in a lientery, will paſs through the inteſtines with little alteration.

In the moſt favourable event, thoſe men who have been ſent to an hoſpital can be of little ſervice for the reſt of the campaign; as no diſtemper is ſo apt to return upon any error in diet, or expoſition to cold. Not that theſe returns are ſo much relapſes into the true dyſentery, as they are *diarrhoeas*, but with more of the dyſenteric ſymptoms than are common in the white flux. For, though the original diſorder takes a favourable turn, yet the diſpoſition to a looſeneſs continues; as the bowels are too tender to bear the natural *ſtimulus* of the bile, and of the other ſecretions without being irritated by them.

Such are the obſervations which I have been enabled to add to *Sydenham*'s, from the frequent opportunities that I have had of ſeeing the diſtemper in all its forms.

§ 2.

Of the diſſections.

HAVING deſcribed the dyſentery, I ſhall next relate the changes which I have obſerved in the bodies of thoſe who died of it, and were opened. This is a part of the hiſtory

hiſtory of that diſtemper in which both *Sydenham* and *Degner* have been defective.

1. In autumn 1744, a ſoldier, who had been ill of the bloody-flux for about three weeks, was ſent with ſome other ſick from *Tournay* to the hoſpital at *Bruſſels*. His pulſe was low, his ſtrength waſted, the gripes and *teneſmus* were great and inceſſant, and his ſtools were no longer bloody but of an ichorous colour; a change which often happens from the corruption of the blood. On the third day after his arrival, the pains abated, his pulſe ſunk, his extremities grew cold, a ſlight *delirium* ſucceeded, and he died on the fourth.

I found the larger inteſtines black and putrid, the coats preternaturally thick (the ſure mark of a preceding inflammation) and on the inſide ulcerated; eſpecially in the *rectum* and lower part of the *colon*, where the villous coat was either abraded, or changed into a corrupted ſlimy ſubſtance of a greeniſh colour. The *cæcum* and its *appendix* were leſs corrupted; and the ſmaller inteſtines and ſtomach were neither mortified, diſcoloured, nor abraded, but only diſtended with air. The fat of the *omentum* was greeniſh; but neither the liver nor ſpleen ſeemed to be tainted; only the bile was thick, ropy, and of a dark hue. The part of the *vena cava* which lay on the *vertebræ* of the loins was very tender. The lungs adhered a little to the left ſide, but were otherwiſe ſound. In the right ventricle of

of the heart the blood was clotted, but in the larger veſſels it was more fluid and of a blackiſh colour.

2. About the ſame time, a ſoldier of the artillery, after recovering of a *diarrhoea* was ſeized with a dyſentery, upon having drunk immoderately of ſome cold liquor whilſt he was hot on a march. Three days afterwards, he was brought into the hoſpital; and beſides the common ſymptoms, he complained of the piles and the gravel. This man could not lie down, but ſupported himſelf on his knees and hands, leaning his head forward upon the bolſter till his death; which happened three or four days after his admiſſion.

Upon opening the *abdomen*, I obſerved that the greateſt part of the *omentum* was in the left ſide under the ſmall inteſtines, but that it was large and full of fat. The liver was ſmall and ſound; but the gall-bladder was of an uncommon ſize, and full of a dark coloured bile, thin, though ſomewhat curdled. The biliary ducts were clear. The *pancreas* was in a natural ſtate. The ſpleen, though of a common ſhape, was of an extraordinary bulk, being little leſs than the liver, and weighed three pounds eleven ounces; but it ſeemed otherwiſe ſound, without indentations, having only upon the ſide next to the blood-veſſels a ſmall protuberance like the *portæ* of the liver. The kidneys were ſmall and flaccid, and the *pelvis* of both, eſpecially that of the left ſide, was larger than common; and both theſe and the bladder (which was in a corrupted ſtate)

ſtate) contained ſome urine, but neither ſtone nor gravel. The *rectum* was moſt putrid; and from thence the gangrene ſeemed to have ſpread itſelf to the *colon*, which was plainly mortified, and chiefly at its lower end. The villous coat was partly conſumed, and what remained was blackiſh, tender, and eaſily to be ſeparated. The vaſcular coat had the appearance of a preparation well injected with red wax. The ligaments, which contract the *colon* and form the cells, were half corrupted, and adhered looſely to the outer coat. Part of the *cæcum* was alſo mortified; the reſt, as well as the ſmaller inteſtines, were of a firmer texture, but of an inflamed colour; and both theſe and the ſtomach were full of air. It was remarkable, that notwithſtanding this diſeaſed ſtate of the bowels, no part of them was ulcerated. The cavity of the *thorax* ſeemed to be uncommonly ſmall; for the convex part of the diaphragm reached as high as the inſertion of the third rib into the *ſternum:* the lungs were nevertheleſs ſound. The heart was large, and contained in its right ventricle ſome coagulated blood of a coriaceous firmneſs, which did not adhere to the ſides, but was entangled with the tendinous fibres of the *valvulæ ſemilunares*. Both the ſinuſes were full of blood, partly congealed, partly fluid, and of a blackiſh colour.

3. In the ſame ſeaſon, a foot-ſoldier was ſent into the hoſpital, ſuppoſed to be ill of a dropſy. His belly was much

much diſtended, but the tumour was greateſt above the navel. He complained of a difficulty in breathing; his ancles were a little ſwelled, but he made water freely; his cheeks were florid, while the reſt of his face was pale. By his own account, he had been taken ill of a bloody-flux, about three weeks before, which being ſuddenly ſtopped by ſome drug (I preſume by opium) given him in the camp, his belly then began to ſwell.

This man ſoon after his admiſſion was ſeized with an inflammatory fever, of which he recovered, and then took ſuch medicines as were judged proper for curing a *tympanites;* during the courſe of which, one night a looſeneſs coming on ſuddenly, his belly ſubſided all at once, and he died before the morning.

The body was opened about thirty hours after his death; but in that time ſo much air had been generated anew, that the belly had ſwelled again, though not ſo much as before. There was no air, and ſcarce two ſpoonfuls of water in the cavity of the *abdomen*; but all the inteſtines were much inflated, except the *colon*, which, though then flaccid, was large enough to have contained, as it probably did, all the air which at firſt had made the tumour. The ligaments of this gut were either deſtroyed, or ſo relaxed that the diviſions of the cells were obliterated; but no part of the inteſtines ſeemed either mor-

tified or inflamed. The liver was of an extraordinary bulk, reaching almoſt to the navel and ſpleen, and weighing about ten pounds. Its ſubſtance was tender, and in the poſterior part of it, next to the diaphragm, was found a large abſceſs. The gall-bladder was of a moderate ſize, and full of a thin dark-coloured bile. The lungs were ſound. We found little or no water in the *thorax;* but more than uſual in the *pericardium.* The heart was ſmall, without any clot, and indeed with ſcarce a drop of blood in the ventricles.

4. Some time later in the ſeaſon, a ſoldier was received into the hoſpital, about the twentieth day of a hectic fever ſucceeding a dyſentery. His pulſe was then low, his tongue parched, his cheeks florid, though his body was waſted. He complained of great debility, of pain in his bowels, of a looſeneſs, and of retchings to vomit. In a few days after, he was ſeized with a hiccup, and died.

Although the body was opened the next day, the ſmell was intolerable. The inteſtines were wholly mortified, and the ſtomach partly ſo. The outward coat of the liver was alſo putrid; and in its ſubſtance were ſeveral abſceſſes containing a purulent, or ichorous matter. The ſpleen was likewiſe corrupted; but the kidneys, heart and lungs appeared to be ſound.

Theſe diſſections were made during the former war; and no opportunity of a further inquiry offered till three years

years ago *, when after an unuſually warm and dry ſummer the dyſentery was frequent in *London.*

5. A young woman, of 17 years of age, was taken ill in the beginning of October with the malignant ſymptoms of this diſorder. Her pulſe ſunk, and her ſtrength failed early in the diſeaſe; the ſtools were inceſſant, ſlimy, watery, and bloody; and whenever ſhe was free from gripes ſhe complained of ſickneſs: nothing gave her relief, and ſhe died on the 11th day. About a fortnight after, the father, who had been much affected, and indiſpoſed ſince the death of his daughter, was ſeized with the ſame diſtemper. This perſon was in his 46th year, of a full habit, and had lived freely. Till within three or four years of this illneſs, he had been ſubject to frequent returns of a fever; but from the time that a tetter broke out on ſeveral parts of his body, he had been free from every complaint, excepting the cruſts and blotches occaſioned by that eruption. The dyſentery began with ſickneſs and heat at his ſtomach, with gripes, *teneſmus* and a looſeneſs. In a day or two, the ſtools were inceſſant, ſlimy and bloody. I was called early in the diſeaſe, and believing that evacuations had not been timely enough made in the daughter's caſe, I began by taking away a large quantity of blood; but as the patient was not thereby relieved, as the blood was not ſizy, and as his pulſe was never hard nor full, the bleeding was not repeated.

* Viz. in autumn 1762.

I ſhall not enter into further particulars, but obſerve, that though various medicines were tried, ſuch as evacuants, antiſeptics, demulcents, and anodynes, none of them were of any ſenſible benefit, excepting a decoction of *ſerpentaria* with *theriaca*, which was given him when his pulſe began to ſink and intermit. He died on the 20th day after I was called; but, for ſome days before his death, I obſerved his countenance alter, and the hectic fever increaſe; and though his gripes and *teneſmus* had ceaſed, yet the motions were more frequent than ever, and more watery and bloody. From the firſt, he was feveriſh, reſtleſs, and complained of a ſickneſs at his ſtomach, which was augmented by every thing he ate or drank; towards the end he was troubled with a hiccup, he could retain no clyſters, and his ſtools were extremely offenſive. He was ſometimes ſlightly delirious; but it was uncertain whether that might proceed from his fever, or the opiates. On the day after his death, the body was opened by Mr. *Hewſon* ſurgeon and anatomiſt; Dr. *Huck* and I being preſent.

Upon cutting into the *abdomen*, we found the *tunica adipoſa* of a conſiderable thickneſs, notwithſtanding the long continuance of the diſeaſe. The ſtomach and ſmaller inteſtines were inflated, but otherwiſe in a natural ſtate, excepting at the extremity of the *ileum* where it joins the *cæcum*; for at that part the coats of the gut were thicker and more tender than they ought to have been; and on the

the inſide we found that gloſſy colour which has been conſidered as a mark of inflammation.

But the larger inteſtines, from the *cæcum* to the end of the *rectum*, were not diſtended, and the *rectum* was even more contracted than in a natural ſtate. Their colour, externally, was of a purple black; and this gangrenous appearance increaſed gradually from the *cæcum* to the extremity of the *rectum*. Upon cutting them open, we found the coats thickened, the inſide as black as the under part of the *coagulum* of blood, and the whole ſurface more or leſs covered with a dark coloured bloody ſlime. In the *rectum* theſe morbid appearances were worſt. The blood did not ſeem to have come from any ruptured veſſel (for it was collected no where in any quantity) but to have gradually oozed through a number of fine pores into the cavity of the inteſtines. The ſmell of theſe parts was exceedingly offenſive.

At firſt ſight the villous coat ſeemed to have been reſolved into the ſlime above mentioned; yet upon a nearer inſpection we thought it more probable, that in both the *cæcum* and *colon* the villous coat, though diſeaſed, was not ſeparated, whatever it might be in the *rectum* which was too putrid to be minutely examined.

The Diſſecter having cleared away the blood and *mucus* from the inſide of the *cæcum*, and of the *colon* and upper part of the

the *rectum*, made us take notice of certain protuberances of a lighter colour than the reſt of the ſurface. They were of a roundiſh figure, nearly equal in their height (which was about a twelfth part of an inch) but of unequal breadth. We all agreed that we had never ſeen any thing ſo nearly reſemble the ſmall-pox, of a flat ſort at the height of the diſeaſe. Theſe excreſcences ſtood as thick on this tract of the inteſtines, as variolous puſtules, when numerous, do upon the ſkin; but differed from them in this, that as far as we examined them they were of a firm conſiſtence without any cavity. Mr. *Hewſon* told us, that he believed they took their riſe from the cellular membrane which lies immediately above the villous coat; for that ſome days before, having opened another perſon, who had likewiſe died of the dyſentery, he had found the appearances much the ſame as in this ſubject, and particularly with regard to theſe tubercles, which he had examined at more leiſure. He added, that he had preſerved a part of the *colon* in ſpirits, which he would ſhew us at another time. Theſe protuberances were only in the larger inteſtines; for though we likewiſe opened the ſmaller, we could obſerve nothing ſimilar to them there.

In the whole inteſtinal tube we found neither worms, *ſcybala*, nor any formed feculent matter; though the nurſe told us, that on the day before his death he had voided ſome hard ſubſtances of a roundiſh ſhape.

The

The meſentery was loaded with fat of a natural colour and conſiſtence; as was alſo the *meſocolon*, even to the proceſs belonging to the *rectum*, which of all the inteſtines was obſerved to be the moſt putrid.

The urinary bladder was quite contracted; that part which lay next the cavity of the abdomen was found, the other was not examined. I ought to have obſerved, that the patient could retain his urine to the laſt, though in the beginning of the diſeaſe he had complained of a ſtrangury. The kidneys were not inſpected.

The liver was in a ſound ſtate, not only as to outward appearance, but in its ſubſtance. The gall-bladder was empty of bile, and contained only a little air. The ſpleen was without any apparent fault. But the *pancreas* was of a ſmall ſize, and ſomewhat hard; yet it was not *ſcirrhous*; and Mr. *Hewſon* even doubted whether in any degree it could be called morbid. As the cartilages of the ribs were intirely oſſified, the *thorax* could not be opened but by a ſaw, with which we happened not to be provided: but we cut through the diaphragm, and obſerved that the lungs were ſound. No water had been collected either in this cavity or in the *abdomen*; nor were there any ulcers or purulent matter to be ſeen in either.

Some time afterwards, Mr. *Hewſon* ſhewed me that portion of the *colon* which he had cut out of the other body,

and

and had preſerved in ſpirits: he ſaid, that to the beſt of his remembrance he had taken it from the lower part of the gut. I could eaſily trace the reſemblance between this preparation and that which I had ſeen in the recent ſubject; though the tubercles were here more numerous, and generally higher than in the other. Dr. *Hunter*, who was preſent, did not recollect to have ſeen that kind of morbid appearance before, but was ſatisfied that the villous coat had not been ſeparated, though here and there ſome partial abraſions might have been ſeen on diſſection.

Theſe are the only diſſections which I have ſeen of thoſe who have died of the dyſentery. Although there was ſome variety in every caſe, yet they all agreed in the bad ſtate of the larger inteſtines. The colour and ſmell were proofs of the putrefaction of the blood in thoſe parts; and the tenderneſs of the coats ſhewed that they were in ſome degree mortified. In an external gangrene, we commonly obſerve ſome veſicles of air in the cellular membrane, which being wanting here, it may be diſputed whether the mortification of the bowels was complete without that circumſtance.

The tubercles, which were found in the large inteſtines of the laſt body, might have been conſidered as a ſingularity, if the Diſſecter had not taken notice of the ſame appearance in that body which he had opened before; for I can

I can well ſuppoſe that they might have been ſeen in the other ſubjects, if I had more narrowly inſpected them; and I am the more inclined to this opinion, from finding in two authors ſome remarks to the ſame purpoſe. Thus *Linnæus*, in treating of the bloody-flux, ſays, *dyſenteria epidemica ſcabies eſt inteſtinorum interna, ut ex diſſectionibus cadaverum dyſenteriâ defunctorum patet* *. Upon what grounds that learned author uſes the term *ſcabies*, he does not inform us; but from his uſing it, I would infer that he had either ſeen ſome ſuch appearances, or had an account of them from others upon whoſe teſtimony he could rely. And Mr. *Cleghorn*, who had frequent opportunities, at *Minorca*, of ſeeing the epidemic dyſentery, obſerves, "that upon o-"pening the bodies, he conſtantly found the great guts "either intirely mortified, or partly inflamed, partly mor-"tified; that the *rectum* was moſtly affected; and that in "many he had ſeen *ſcirrhous tubercles* ſtraitening the cavity "of the *colon* in ſeveral places †." Now, though thoſe tubercles, which I deſcribed in my patient, were too flat to be taken notice of, as ſtraitening the cavity, yet in Mr. *Hewſon*'s preparation they were perhaps protuberant enough to have had that effect.

On the other hand it may be remarked, that ſuch protuberances are ſcarce mentioned in the *Sepulchretum* of *Bonetus* ‡,

* Amoenit. Academ. vol. v. diſſert. LXXXII. p. 97.
† Obſervations on the Epidemic Diſeaſes of *Minorca*.
‡ Quer. whether in lib. iii. ſect. xi. additam. obſerv. 5?

or in *Morgagni*'s valuable ſupplement. But the ſilence about them in thoſe two works is perhaps no proof againſt their frequently exiſting, when we conſider that in *Bonetus* we have but a few caſes (and thoſe but imperfectly delivered) of thoſe who died of an epidemic flux; and in *Morgagni*, of that ſort none at all. For, though that excellent anatomiſt has, in his uſual manner, made ſome uſeful remarks upon the diſeaſe, and has added a few diſſections of his own *, yet ſince his caſes ſeem to be all of the ſporadic kind, I muſt conſider them as ſomewhat different from ſuch as we are now treating of. Indeed *Morgagni* acquaints us, that he had generally declined opening the bodies of thoſe who died of any infectious diſtemper †.

In the former diſſections, I mention *the abraſion of the villous coat*, and perhaps in my account of the laſt I ſhould have made the ſame obſervation, had not Mr. *Hewſon* been inclined to think otherwiſe; and had not Dr. *Hunter*, in viewing the preparation (which was mentioned before) been of opinion, that in that portion of the gut the villous coat had not been ſeparated, though perhaps fiſſured, and a little abraded on the top of ſome of the tubercles; and that, from the account which Mr. *Hewſon* and I had given him of the laſt ſubject, there had been no conſiderable abraſion in thoſe inteſtines, more than in that piece which was before him.

* De Sed. et Cauſ. Morb. ep. xxxi. † Ibid. ep. xlix. § 32.

§ 3.

§ 3.

Of the cauſes of the dyſentery.

THE heat and moiſture of the air appear to be no leſs the chief *remote* and *external cauſe* of the dyſentery, than of the autumnal remitting and intermitting fevers *; and therefore when other circumſtances are equal, it generally prevails in the camp towards the end of ſummer, or in autumn, after great and continued heats †, which, as was ſhewn above, are always attended with a loaded atmoſphere. Upon comparing the account which I have given of the flux that occurred in every campaign, with the deſcription of the ſame diſtemper by other authors, we ſhall find this principle ſufficiently verified. *Sydenham* indeed, in the hiſtory of the epidemic dyſentery of his time, takes no notice of the weather, going upon a falſe principle, that the morbid conſtitution of the ſeaſon has never any connexion with the ſenſible qualities of the air. But *Willis* ſupplies this defect, and obſerves that the ſummer of 1670 (which preceded the autumn wherein that flux was at its greateſt height) was remarkably hot ‡. In the year 1762, the ſummer heats and drought were of a longer continuance than I remember to have obſerved them in this country; and accordingly in autumn, the dyſen-

* See part iii. chap. iv. § 3.

† See part i. chap. iii. and vii. part ii. chap. ii. § i.

‡ Poſt æſtatem impenſè calidam et ſiccam. WILLIS Pharmac. Rat. ſect. iii. cap. iii.

tery was so frequent in *London*, that though it could not be properly called epidemic, yet I believe more cases occurred in that season, than in all the sixteen years that I have resided here. Yet I do not advance this as a rule that will hold universally; for that epidemic which raged at *Nimeguen* in autumn 1736 came after a summer that was indeed warm, but to no extraordinary degree; and then none of the neighbouring towns suffered, unless by their communication with the place infected. When the question is about a *remote cause*, it is always understood, that however prevalent it may be, it is not sufficient for producing an effect, without a concurrence of the more *immediate causes*; and that when the *immediate causes* are strong, they will produce the effect, independently of *remoter causes*.

Corresponding to the *remote external*, is the *internal predisposing cause*, namely a more than ordinary putrescent state of the blood, from a constant exposition to the sun in the hottest weather. We may likewise observe, that our men dealing little in vegetables, and not being able to afford the price of fermented liquors, were in such circumstances deprived of two considerable antiseptics. For, in general it may be remarked, that this disease *cæteris paribus* prevails mostly among such as are of a scorbutic (that is a putrid) habit, or among the poorer people, who from foul air, bad diet, and nastiness are most liable to putrid diseases. And there is an old observation, that such seasons as produce most flies, caterpillars, and other insects (whose increase

increase depends so much on heat and moisture, and consequently on corruption) have likewise been most productive of the dysentery.

Hitherto we have seen how similar the causes are of the remitting and intermitting fevers, and of the bloody-flux. Nay, the affinity extends even to the *occasional* or *exciting causes*. For, in the end of summer, or in autumn, when any number of men are exposed to night damps and fogs, especially after a hot day, or lie upon wet ground, or in wet clothes, part of them will be seized with that kind of fever, and part with this flux; and perhaps a third sort will have a disorder compounded of both. Add to this, that those fevers begin to be frequent in camp whilst the dysentery still subsists; that the first symptoms are often similar, such as the rigors, and disorder of the stomach; that the remitting and intermitting fevers of a more malignant kind have sometimes ended in a bloody flux*; that such countries as are most subject to these autumnal fevers, are likewise most liable to the dysentery; and that the analogy continues even as to the method of cure, in so far as the principal part of it consists in clearing the *primæ viæ*. Upon the whole, the nature of the two distempers appears so much alike, that at first sight *Sydenham* seems to have expressed himself justly, when he called this flux, "the fever of the season turned upon the bowels." But

* TH. BARTHOL. Hist. Anatom. cent. ii. hist. LVI.

upon

upon a nearer view we ſhall find this notion more acute than ſolid, ſince the circumſtance of its being contagious ſhews that the dyſentery is a good deal different from theſe fevers. *Degner* offers good reaſons for believing that the fatal dyſentery at *Nimeguen* was owing to the infection communicated by one perſon*; and if the ſtrangers ſuffered ſo little, and in particular the Jews †, we muſt aſcribe that to the little intercourſe which they had with the people of the place.

In camp, the contagion paſſes from one, who is ill, to his companions in the ſame tent, and from thence perhaps to the next.

The foul ſtraw becomes infectious. But the great ſource of infection ſeems to be the privies, after they have received the dyſenteric excrements from thoſe who firſt fall ill. The hoſpitals likewiſe ſpread it; for, thoſe who are admitted with the flux not only give it to the reſt of the patients, but to the nurſes and other attendants on the ſick.

In general, the contagion is not ſuddenly diffuſed. For, whole towns and camps are never ſeized at once by the impurity of the atmoſphere; but the infection is carried from one to another by the *effluvia*, or clothes, or bedding, *&c.* of the tainted perſon, as is the caſe of the

* Hiſtor. Dyſent. Bilioſo-Contag. cap. ii. ſect. XLVI. et ſeq.

† Ibid. cap. i. ſect. XXXV.

plague

plague, ſmall-pox and meaſles. But the dyſenteric *miaſma* is of a leſs catching nature than any of theſe; ſo that in the milder epidemics it may paſs unnoticed, as in that deſcribed by *Sydenham* and *Willis*, as was obſerved before*.

But of what nature is this infection? In the former editions of this work, I conſidered the ſpreading of the diſtemper as owing to putrid exhalations from the humours of thoſe who fall firſt ill of it; and when this *miaſma* is received into the blood, I conceived it to act upon the whole maſs as a ferment, diſpoſing it to putrefaction. But I am now ſenſible that this *hypotheſis* would be inſufficient, without likewiſe ſuppoſing that when the blood becomes tainted, the vitiated part of it, by ſome law in the animal oeconomy, is thrown particularly upon the inteſtines, for excretion. This notion of a putrid ferment was further confirmed to me by a caſe, which ocurred, of one who was ſeized, indeed in a ſlight degree, with a true dyſentery accompanied with bloody ſtools, after having made experiments upon human blood, which had become putrid by ſtanding for ſome months in a cloſe phial. This inſtance ſeemed to be the more deciſive, as it happened at a time when the diſtemper was not heard of, and to a perſon in perfect health, who had formerly attended many dyſenteric patients without being infected.

* Page 125.

For

For theſe reaſons I was inclined to refer the *cauſa proxima* or *immediate cauſe* of the diſeaſe to this putrid ferment: but having ſince peruſed a curious diſſertation publiſhed by *Linnæus*, in favour of *Kircher*'s ſyſtem of contagion by *animalcula*, I think it reaſonable to ſuſpend all *hypotheſes* till that matter is further inquired into *.

In

* *Amœnit. Academ.* vol. v. *diſſert.* LXXXII. This diſſertation, which is intitled *Exanthemata Viva*, is, as well as all the reſt of that work, in the form of an academical *Theſis* propoſed by a ſtudent; but the whole having been publiſhed by LINNÆUS, is conſidered as his own doctrine. I ſhall tranſcribe what the ingenious author ſays upon the dyſenteric contagion, as the book may not be in the hands of all my readers.

'Hanc (ſcil. dyſenteriam) per ſeceſſus et cloacas communes propagari, ne ul-
'lus quidem medicinæ peritus ambigit. Medicum Danum, priori ſeculo *Helſing-*
'*burgi*, dyſenteriâ ſæpius correptum, excreta ſua alvina obſervaſſe vivis referta, vix
'obſervabili motu ſe agitantibus, inſectis BARTHOLINUS narrat. Quo loco non
'nobis eſt prætereunda obſervatio rem maximè illuſtrans. Quatuor adhinc annis
'Dom. ROLANDER, in ædibus N. D. Præſidis enutritus, dyſenteriâ infeſtabatur;
'rhabarbarinis & paregoricis, more recepto curabatur. Octiduo abhinc in eundem
'incidit morbum, ſimiliterque ſanatur; octo verò aliis diebus præteritis dyſenteriâ
'tertiùm corripitur: in cauſſam omni ſtudio inquiritur, non verò invenitur, quum
'æger eâdem menſâ, vitæque genere cum cohabitantibus ſanis frueretur. Itaque
'N. D. Præſes ægro, Entomologiæ præcipuè ſtudioſo, excreta ſuadet ſcrutari, quo
'certiùs adpareret, utrùm allata BARTHOLINI obſervatio obtineret, nec ne. Hoc
'facto, in hiſce myriades animalculorum ſe vidiſſe, quæque accuratè deſcripta, eſſe
'acaros, & acaris quidem farinæ ſimiles, æger dixit. Cauſſam verò non nemo in
'potum nocturnum conjiciebat: ſed neque hæc aliis videbatur ſufficiens. Inter e-
'dendum bibere inſuetus erat: noctu igitur ſiti preſſus e poculo, ex ligno juniperi-
'no confecto, potum ſæpe hauriebat tenuiſſimum. Vas hocce introſpiciens, lineo-
'lam quaſi albicantem, oculis nudis vix conſpicuam, inter coſtarum rimas reperie-
'bat; armatis verò obſervavit, omne hoc albidum non aliud eſſe quàm innumeros
'acaros, et ejuſdem quidem ſpeciei cum illis quos in excretis obſervaverat. Potu in
vas

In accounting for the dyſentery, it may be remarked, that I have not attributed the diſeaſe either to fruit, or to the bile; though moſt authors in treating of it have accuſed one or other, and ſometimes both. *Sydenham* indeed ſhould be excepted. As to fruit, having in other parts of this work offered ſeveral reaſons for believing that it has no ſhare in producing this flux*, or indeed any of the military diſeaſes, I need not repeat them here. But with regard to the gall, as I have called the dyſentery one of the bilious diſorders, ſome reaſon may be expected for my taking no notice of that humour upon this occaſion. It may be remembered, that I have always uſed the term *bilious*, more in compliance with the ancients, to diſtinguiſh a certain claſs of diſeaſes, than from an opinion that they are really occaſioned by the bile. In this light I conſider the autumnal remitting and intermitting fevers,

'vas infuſo, non mutabantur; eos verò relictis ſedibus, mediâ nocte, potûs ſuperfi-
'ciem petere, ubi ad horam uſque decimam a. m. paſtum quærebant, dum priora
'loca repetebant, crebrâ tandem inveſtigatione invenit. Exemptis acaris orbiculo
'humectato impoſitis, quàm parum, variis adfuſis liquoribus, irritarentur, et quòd
'per oleum ipſum ſalvi tranſirent, animadvertit. A ſpiritu vini lædebantur, max-
'imè verò a tincturâ rhabarbari, quod imprimis notatu dignum; quum autem rha-
'barbarum dyſenteriæ ſit ſpecificum, lapathumque acutum ei valde cognatum, &
'quotidiana ſcabiei medicina, affinitatem invenimus & analogiam. Vaſi, ter licet
'aquâ calidâ abluto, adherebant. Illos in aliis etiam locis quærebat, inque vaſis
'potûs acidi, & ſub doliorum obturamentis ſæpius reperiebat. Dyſenteria, quæ
'*Scaniæ* territorium *Gyinge* quotannis ferè, tempore meſſis, vexat, æquè ac ea, quæ
'in caſtris eſt vulgaris, ex iiſdem acaris, in potu acido latentibus, qui inde per feceſ-
'ſus propagantur, & contagium generant, originem ſuam fortaſſis traxerit. *&c.*"

* Part i. ch. iii. Part ii. ch. ii. § 4.

which I often call *bilious*. And as to the dyſentery, I ſhall obſerve, that though at firſt, from the ſickneſs at the ſtomach and vomiting, the gall may ſeem to be concerned, yet in the advanced ſtate of the diſeaſe it muſt be wholly acquitted; ſince upon diſſection, the liver and ſmaller inteſtines are generally found in a natural ſtate, though theſe parts ought to be moſt liable to be affected by diſorders of the bile. And as to the bile itſelf, we ſee it ſometimes in a large, ſometimes in a ſmall quantity, ſometimes of one colour, ſometimes of another, ſometimes thick, ſometimes thin, and at other times of a natural conſiſtence. Now had it any ſhare in bringing on or ſupporting this diſeaſe, ſhould we not find a greater uniformity in its appearance? Nay, I have even imagined, that ſuch medicines as could procure a more copious ſecretion of the bile would often prove uſeful, having generally obſerved the patient moſt relieved, whenever an evacuant acted in ſuch a manner as to carry down with it much of that humour.

§ 4.

Of the cure of the dyſentery.

THERE are few acute diſtempers leſs beholden to nature for a cure, or attended with more deceitful indications. The hæmorrhage ſeems to require repeated bleedings; the flux, ſtrong aſtringents; the pain of the bowels, conſtant opiates; and yet unleſs theſe remedies are

are uſed with caution, they tend more to confirm than to remove the diſeaſe. On the other hand, emetics and purges have been either wholly condemned, or too ſparingly uſed; yet later experience ſhews them to be the chief means of the cure. But ſetting aſide for the preſent all indications (which, from our imperfect knowlege of the animal oeconomy, we are ſeldom enabled to form) I ſhall proceed to offer the reſult of my experience, and add ſome obſervations from others whom I can moſt rely on, and who have likewiſe been much converſant with the dyſentery. With theſe further lights the nature of the diſorder being more clearly ſeen, the reader may perhaps be directed to ſome more ſimple and certain method of cure.

In order to proceed with more clearneſs, I ſhall diſtinguiſh the dyſentery into three *ſtates*: viz. the firſt, whilſt it is recent, or whilſt the ſick can eaſily bear evacuations; the ſecond, when the diſtemper is of a malignant kind, or has continued long, and has much impaired the ſtrength, inflamed the inteſtines, and brought on a hectic fever; and the third ſtate, when the patient, though recovering, is kept low by a *teneſmus*, or ſome other remains of the diſeaſe, or is ſubject to frequent returns of a looſeneſs, from the weakneſs of his bowels.

I. IN the *firſt ſtate*, I begin with a moderate bleeding; though it may be true that a dyſentery of itſelf does

not require that evacuation *: but as this diſorder is partly of the inflammatory kind, and is often accompanied with a fulneſs of blood, bleeding is ſometimes indiſpenſible, and indeed is generally conducive to the cure. Yet unleſs the fever be kept up by ſome inflammation not peculiar to the diſeaſe (as it frequently happens in the winter and vernal caſes) repeated bleedings are either unneceſſary or hurtful, as may be obſerved in moſt diſtempers ariſing from a putrid cauſe. In weakly habits, and where there are few feveriſh ſymptoms, I wholly omit this evacuation.

In the evening of the ſame day I give an emetic. In the beginning of my practice in the army I uſed the *vitrum ceratum antimonii*, which I had formerly obſerved to be the beſt medicine in this caſe for relieving both the ſtomach and the bowels. But as the virtues of that antimonial preparation have been fully ſet forth elſewhere †, I ſhall ſay nothing of them here, and only obſerve, that though I was convinced of its being a powerful remedy (by ſeeing it often ſucceed when other things had failed) yet the roughneſs of its operation, and the prejudice conceived againſt the *glaſs of antimony*, as a medicine, having deterred the other phyſicians of the army, and the regimental ſurgeons from uſing it, I alſo deſiſted, being deſirous of aſcertaining the efficacy of ſome method that might be leſs

* Dyſenteria quâ dyſenteria venæſectionem nunquam indicat. BARBETTE Prax. lib. iv. cap. v.

† Med. Eſſays, vol. v. Mem. de l'Acad. des Sc. A. 1745.

exceptionable. Inſtead therefore of this preparation, I ordered a ſcruple of ipecacuanha; and for the common men, I generally added one grain or two of emetic tartar. Whether I gave the weaker or the ſtronger vomit, I obſerved it to be moſt ſucceſsful when it likewiſe operated by ſtool. This effect was the more certain, when inſtead of the uſual quantity of ipecacuanha, five grains only were given at once, and repeated at an hour's diſtance, twice or thrice, till a purging was brought on, which uſually happened ſoon after the third doſe. Fifteen grains exhibited in this manner were commonly ſufficient. *Piſo*, who firſt deſcribed this root, and recommended it in the dyſentery, appears to have relied chiefly on its purgative quality, though he adds, that it ſtill had a better effect when it vomited alſo *. When the ſtomach

* Perhaps the medicine is more cathartic while freſh than after long keeping; and better in decoction, or infuſion, than in ſubſtance. We may obſerve, that PISO recommends the ſecond and third decoction for weak patients, as leſs cathartic and more aſtringent. The following is one of his principal paſſages relating to the uſe of this ſpecific. 'Dehinc ad radicem *ipecacuanhà* tanquam ad ſacram anchoram 'confugiendum, quâ nullum præſtantius aut tutius, cum in hoc, tum in pleriſque 'aliis, cum, vel ſine ſanguine, fluxibus compeſcendis, natura excogitavit remedium. 'Quippe præterquàm quòd tutò & efficaciter tenaciſſimos quoſque humores per ip-'ſam alvum, ſæpiſſime autem per vomitum ejiciat, & a parte affectâ derivet, vim 'quoque aſtrictivam poſt ſe relinquit.... Illud vero hoc modo perficitur. Drachmæ 'duæ radicis *ipecacuanha* in ℥iv. liquoris appropriati coctæ, vel per noctem macera-'tæ, cujus infuſum cum, vel ſine oxymellis ℥j exhibetur. Poſtridie ſemel atque 'iterum, pro re natâ, ſecundâ imo tertia ejus decoctio repetenda; tam quòd ægri de-'biliores eam faciliùs ferant, quàm quòd aſtrictoria ejus vis tunc magis efficax appa-'reat." GUL. PISON. Hiſt. Nat. et Med. Indiæ Occident. lib. ii. cap. ix.

is chiefly affected, I give the ipecacuanha, either by itself, or with the tartar emetic, in the doſe above mentioned; but when the perſon complains more of gripes than ſickneſs, I direct the root to be divided as above, with a view to its more certain operation upon the bowels. In one or other of theſe forms, I give the emetic on the firſt day of my ſeeing the patient, whether he has been bled or not. If the full quantity be given, the operation is aſſiſted, in the common way, with repeated draughts of camomile tea. But if the ſmall doſes be uſed, he ought to drink nothing till the medicine works downwards, and then he may take ſome water-gruel to promote its effect.

When the ſtools are large and bilious, and the patient fatigued with the operation, I give no medicine on the following day; but if he has taken the emetic all at once, ſo as only to clear his ſtomach, or if the divided doſes have wrought weakly by ſtool, I order a purge next morning, *viz.* five grains of calomel, with five and twenty or thirty of rhubarb, which in ordinary conſtitutions is a moderate, or rather a ſmall doſe. At firſt I gave the rhubarb without any calomel, and my uſual doſe was half a drachm, but afterwards I found it neceſſary either to double that quantity, or to join calomel with a ſmaller doſe, in order to procure a thorough paſſage. I have remarked in the former editions of this work, that "we are "to attend leſs to the doſe than to the effects, which are not "to be judged of by the frequency, but by the copiouſ-

"neſs

"neſs of the ſtools, and the relief which the patient finds "from the gripes and *teneſmus* after the operation; and "that as on the one hand the phyſician ought to avoid "all the rough and ſtimulating purges, ſo on the other "he is not to ſpare thoſe of a lenient kind, eſpecially "rhubarb, which is commonly under-doſed." This is ſtill my opinion, except that with regard to rhubarb, I never found it in this diſorder have ſo good an effect as when combined with well prepared calomel, by which means it becomes more lenient, that is, eaſier in its operation.

At night, after the purge, I uſually give for the firſt time an opiate, *viz.* ten grains of the *pilulæ ſaponaceæ*, with two, or ſometimes with three grains of ipecacuanha, either in a bolus or in a draught: for ever ſince I found that ſome common ſoap-pills had paſſed undiſſolved, I have diſuſed that form in all weakneſſes of the inteſtines. Formerly, I joined to the opiate a ſmall quantity of the *vitrum ceratum antimonii*, in order to promote perſpiration; but when I dropped that medicine as an emetic, for the reaſons already given, I omitted it here alſo, and ſupplied its place with the *Indian* root.

Here I muſt obſerve with regard to opiates in the dyſentery, that it were better perhaps that they were never given at all, than uſed before the firſt paſſages are cleared. For, though from the beginning they are ſure to give ſome immediate

immediate relief, yet by confining the wind and the corrupted humours, they tend to fix the cauſe, and to render the diſtemper more obſtinate in the end. This is the reſult of my experience, which I am ſorry to find does not exactly correſpond with that of *Sydenham*. For, though that excellent phyſician did not omit purging when the dyſentery was moſt epidemic, yet at all other times it appears that he truſted to laudanum alone. Now, whatever was the nature of thoſe fluxes which he treated in that manner, I am almoſt certain that ſuch as are moſt incident to an army are of a leſs tractable nature, and in general are not to be cured without repeated evacuations. As to the beſt kind of opiate, I have made no particular obſervation; and therefore if I have here ſpecified the *pilulæ ſaponaceæ*, it was only becauſe I preferred that compoſition to the ſimple *extractum Thebaïcum*, as there was leſs hazard of an error in the weight. It is well known that ten grains of theſe pills are equal to one of pure opium.

If the firſt two days have been employed in the manner deſcribed, I order no medicine on the third, unleſs the patient ſtill complains of gripes; in which caſe the opiate is repeated at night. But, on the fourth day, if any bad ſymptoms remain, I direct the ipecacuanha to be given once more in divided doſes; or if the patient ſhould expreſs great averſion to a drug which made him ſick before,

before, I repeat the purge, and that in a larger doſe if the former has not operated ſufficiently. The largeſt of this kind, which in ſuch caſes I have uſed, conſiſted of thirty grains of rhubarb with eight of calomel.

By this time moſt of the dyſenteric caſes give way, and ſometimes ſooner. But if ſome *fomes* of the diſtemper ſtill remains, or if the patient has committed any error in diet, or has expoſed himſelf to cold ſo as to relapſe, I have recourſe to the ſame remedies, that is, either to the purge, or to the ipecacuanha, according as the one or the other has agreed with him before. In fine, theſe evacuants are the chief medicines which I truſt to in this ſtage of the diſeaſe.

This method was nearly followed in the laſt war by the other phyſicians of the army, and in particular by Dr. *Huck*, who having been in conſtant ſervice either in *N. America*, or in the *W. Indies*, had the beſt opportunities of ſeeing the dyſentery in all its varieties. He informed me, that notwithſtanding the difference of climates, the diſtemper, when epidemic in the army, appeared with much the ſame ſymptoms every where, and when cureable yielded to the ſame medicines. Believing it would be acceptable to the reader, I have ſubjoined a ſhort account of Dr. *Huck*'s practice, in his own words.

"When the patient is feveriſh, or plethoric, I always be-
" gin with bleeding; and if the fixed pains and the fever

" ſeem to indicate a conſiderable inflammation, I repeat it.
" I have thought, that giving four or five grains of ipeca-
" cuanha with one grain of emetic tartar, without drink-
" ing after this doſe, but ſuffering it of itſelf to work off,
" and repeating it in two hours, with orders to the pa-
" tient to waſh his ſtomach with camomile-tea, was the
" beſt method of clearing the firſt paſſages. Sickneſs at
" the ſtomach, bad taſte in the mouth, giddineſs, heart-
" burn, and ſevere gripes were reaſons for repeating the
" vomit on any of the following days. If the ſtomach
" did not ſeem much diſordered after it, I uſed to purge
" with two ounces of manna and one ounce of *Glauber*'s
" ſalt diſſolved in a quart of water, whereof a quarter of
" a pint was drunk every half hour till it procured two or
" three copious ſtools. This I preferred to rhubarb and
" to every other cathartic, eſpecially in the beginning,
" repeating it every third or fourth day, till the gripes
" *&c.* abated; and giving an opiate every night, after the
" firſt or ſecond doſe of the phyſic. But I never knew an
" opiate of uſe whilſt the fever, the thirſt, the gripes,
" and *teneſmus* were conſiderable. If aſtringents were uſe-
" ful, it was only when a laxity of the bowels remained
" after the diſeaſe."

By this account, we find that Dr. *Huck* not only divided the ipecacuanha, but to each of the doſes added ſome emetic tartar, which upon a comparative trial was found to improve the medicine. And indeed for the future, I ſhould prefer this method, as there is reaſon to believe, from

from our obſervations upon the bilious fevers, that this antimonial medicine may be of ſervice in removing ſome feveriſh ſpaſms, which, though not the original cauſe, may concur with it in ſupporting the diſeaſe.

We may likewiſe obſerve, that Dr. *Huck* thought the ſalts and manna a better purge than rhubarb, in the beginning of the dyſentery; but in talking with him on this ſubject, I found, that though he had frequently given rhubarb by itſelf, he had never given it with calomel, and therefore that he could not determine whether his purge or mine were the beſt in this ſtate of the diſtemper.

I likewiſe underſtand, that moſt of the phyſicians employed in *Germany*, during the late war, preferred ſalts and manna (to which they frequently added ſome oil) to rhubarb alone; and that after bleeding and vomiting, they uſually kept the body open with that medicine *. Poſſibly there may be better ways of giving the rhubarb than with calomel. *Degner* praiſes a tincture of it in a watery *menſtruum*, of which he gave ſmall but frequent

* DR. MONRO, one of the phyſicians on that ſervice, told me, that he had commonly giving this purge in the dyſentery:

℞ *Mannæ* ʒß. *vitelli ovi* ʒi. *contritis ſimul, in mortario lapideo, admiſce paulatim olei olivarum* ʒvi. *ſalis cathartici amari (aquæ puræ* ℥iij. *ſoluti)* ℥j.

This was the doſe for a ſtrong perſon; but to the weakly patients he gave a ſmaller quantity. DR. ARMSTRONG and DR. TURNER alſo informed me, that they had uſed much the ſame compoſition.

doſes: but as I never ſaw his treatiſe till after the concluſion of the former war, I have ſince that time met with too few rebellious caſes, to induce me to compare his preparations with thoſe remedies which I had uſed before with tolerable ſucceſs *.

After clearing the firſt paſſages in the manner deſcribed, I have generally endeavoured to finiſh the cure by combining purges with opiates, in ſuch a manner as to keep the body open, and at the ſame time to appeaſe the gripes, but I have not always ſucceeded to my wiſh. In the year 1760, the brigade of guards arriving in *Germany*, about the end of July, in a rainy ſeaſon, and when there was a ſcarcity of ſtraw for the tents, ſuch numbers of the men were taken ill, and for the moſt part with the dyſentery, that when the camp broke up in the month of December, above half of that corps were unfit for duty. Mr. *Paterſon* (one of the maſter-ſurgeons to the hoſpital, then a mate in the guards) who gave me this information, told me that he had been generally ſucceſsful, by

* It may ſeem ſtrange, that authors have not yet agreed about the proper purge to be uſed in the dyſentery; but we ought to conſider that different conſtitutions require different laxatives. A phyſician, in his firſt practice, not attending to this, and meeting with a dyſenteric patient, with whom rhubarb, for inſtance, agrees, and ſena or ſalts diſagree, will be afterwards apt to adhere to the firſt and condemn the other; and *vice verſa*. But upon the uſe of purges in this diſorder, and the variety of them occaſionally to be employed, according to the difference of conſtitutions, as we have ſuch full and juſt reflexions in YOUNG's Treatiſe on Opium (in his ſection on the dyſentery) I ſhall not further inſiſt on the ſubject, but refer the reader to thoſe judicious obſervations.

treating

treating thoſe of his battalion, who had been ill of the flux, in the following manner. " If the patient was of a " plethoric habit and very feveriſh, he began with bleed- " ing; then gave a vomit of ipecacuanha; and beſides " that, if he had ſeen the ſick perſon early in the day, a " drachm of rhubarb at night for a purge; if not, the next " morning. In the evening of the ſecond day, after the " operation of the phyſic, he gave about twenty drops " of laudanum, or about ten grains of the *pilulæ ſapo-* " *naceæ*. After that, if the diſeaſe continued, he form- " ed a maſs of *theriaca* and *rhubarb* into the conſiſtence of " pills, and of this adminiſtered half a drachm morning " and evening, and ſometimes thrice a day." Mr. *Paterſon* added: " That, the next year, when he himſelf was ſeiz- " ed with the bloody-flux, he had followed the ſame me- " thod of cure. That it was near three weeks before he " recovered, being conſtantly kept in camp, frequently " marching, and being expoſed to cold, wet, and other " hardſhips in the courſe of his duty; but that during all " the time, he had found the greateſt benefit from the " medicine above mentioned. That about half an hour " after every doſe the *teneſmus* abated, and the ſtools be- " came more copious and leſs frequent for three or four " hours following. That on this account, for the laſt " ſeven or eight days, he took half a drachm of the " above compoſition thrice a day, which amounted to

" about

" about one drachm of *theriaca* and half a drachm of rhu-
" barb in the twenty-four hours."

If by the means above mentioned, or by other methods, the diſeaſe is ſo far changed that the patient complains leſs of gripes and *teneſmus*, and begins to have ſtools, though looſe, yet of a natural colour, with leſs ſlime and more *fæces*, he being then in a fair way of recovery, his caſe will be further conſidered when I come to treat of the third ſtate of the diſeaſe. At preſent I am to ſpeak of thoſe who have gone through the firſt ſtate, and who either have had no medicine at all, or received little or no benefit from it; and when their ſtools are as ſmall, as frequent, as ſlimy, and as painful as ever.

II. In the *ſecond ſtate*, though there be often more of a hectic fever than at firſt, and though a mortification be threatened by the retention of the putrid matter and the continuance of the inflammation, yet, ſo far as I have obſerved, bleeding is not the remedy, but laxatives (ſuch as have little irritation, and yet are ſufficient to prevent an accumulation of the ſharp humours) and thoſe medicines which either ſheathe the bowels againſt the acrimony, or procure a reſpite from pain and ſpaſms till nature acquires force ſufficient for the cure. Here for the firſt time I uſed the *ſal catharticus amarus* alone, though probably it might have been more effectual with oil and manna, or given, not at once but in ſmall and repeated doſes,

doſes, as in the *ileus* *. In this ſtate I once gave, to a young woman five grains of ipecacuanha with twelve of rhubarb, which firſt making her ſick, and then working downwards, brought away ſome *fæces* of a natural colour, and gave a favourable turn to the diſeaſe. But as this perſon was one of my lateſt patients in a dyſentery, I have had no opportunity of repeating that medicine.

At this period of the flux, finding emollient and anodyne clyſters to be of conſiderable benefit, I therefore uſed a decoction of linſeed, or of ſtarch, or fat mutton broth, from four to eight ounces, according as a ſmaller or larger quantity could be retained. When the motions were ſo frequent, that the patient could not keep theſe clyſters, I added to each from twenty to ſixty drops of laudanum, or as much as was neceſſary for abating the irritation, without too much affecting the head. As the patient muſt uſe opiates, this will probably be found the beſt way of giving them; for thus they are applied directly to the *rectum*, where the irritation is the greateſt. But in bad caſes the motions are generally ſo frequent, that, notwithſtanding the laudanum, one clyſter given in the evening may be inſufficient for compoſing the patient throughout the night; and if ſo, he muſt either have another, or take the common opiate. Although the advantage of clyſters be conſiderable, yet we cannot

* See page 151.

avail

avail ourſelves of them, in the hoſpital, ſo often as could be wiſhed, partly through the neglect of the nurſes, and partly through the reluctance of the men to uſe them: even in private practice, we muſt often deſiſt from clyſters on account of the tenderneſs of the parts.

For mitigating the gripes and expelling the wind, we are not to uſe the warmer carminatives; at leaſt I have never known them to anſwer. Opiates give immediate relief, but they only palliate, and often increaſe the cauſe. I have met with no remedy that remarkably anſwered this intention: the beſt, was fomenting the belly, and drinking camomile-tea. The infuſion of theſe flowers was firſt thought of on account of their antiſpaſmodic and bracing qualities, but having ſince found them a powerful antiſeptic, I am inclined to think that ſome of their effects may be owing to that principle. The fomentations were made of the common herbs, with the addition of ſome ſpirits; but as they required frequent repetitions, they were leſs uſed by the ſoldiers than by the officers, who were better attended. The flatulent pains would ſometimes affect the ſide, as in a pleuriſy; but a laxative medicine, or the fomentations juſt mentioned, removed them without bleeding.

When the patient complained of a heart-burn, and of every thing turning ſour on his ſtomach, I ordered from time to time four ſpoonfuls of the *julepum e creta*; and when at the ſame time the gripes and inceſſant motions required

required ſome palliative, I diſſolved two grains of *extractum Thebaïcum* in a pint of that julep, and gave it in the manner mentioned before *.

At other times, when there was no complaint of an acid but of gripes and frequent motions, I endeavoured to blunt the acrimony, and in ſome degree to ſheathe the bowels againſt the irritation, by food of a mucilaginous quality (which ſhall be mentioned hereafter) and by giving for drink, a decoction of ſtarch with gum arabic, ſeaſoned with ſome ſimple cinnamon water and ſugar. A pint of this liquor commonly contained three drachms of ſtarch with half an ounce of the gum. For the ſame intention, a ſolution of wax was uſed in the hoſpitals in *North-America*, and, as Dr. *Huck* tells me, often with good effects †. Preparations of wax have been long in repute for their virtues in this diſorder: *Bates* recommends a ſolution of it in ſpirits ‡; and *Diemerbroeck* gives inſtances of its extraordinary effects, when diſſolved in milk, and men-

* Page 207.

† ℞ *Ceræ flavæ raſæ* ʒiß. *ſaponis Hiſpani duri raſi* ℈i. *aquæ puræ* ʒi. *liquefcant leni igne, et aſſiduè agitentur donec in unum coeant; dein effunde materiam in mortarium lapideum, eique paulatim admiſce aquæ puræ* ʒviij. *aquæ nucis moſchatæ* ʒj. *et ſacchari albi quod ſatis ſit ad gratum ſaporem.*

This makes a ſmooth mixture of no diſagreeable taſte, whereof the patient takes as much at proper intervals, as to conſume the whole quantity in a day, which is then to be renewed. The ſoap is only uſed as a diſſolvent of the wax.

‡ Pharmacop. BATEAN. in formulâ *Butyrum Ceræ*.

tions ſome other authors who praiſe this medicine for the dyſentery*.

When the flux continues till the ſtrength is much impaired, and the pulſe ſinks whilſt the hectic heat remains, the caſe becomes very dangerous; though there are ſtill hopes, as long as there are neither involuntary ſtools, nor *aphthæ*, nor a hiccup; and when the patient does not complain of great lowneſs, and the *anxietas præcordiorum:* for then the caſe is bad indeed, and ſcarcely admits even of palliatives; ſince opiates have but little effect, either in eaſing the pain, or checking the frequency of the ſtools. Sometimes the diſeaſe is complicated with the hoſpital-fever; in which caſe few recover. But when there is room for medicine, I have commonly uſed a decoction of the Bark with Snakeroot (deſcribed in the next chapter) to which I added a few drops of laudanum. At other times, and eſpecially when the pulſe was ſunk, I have experienced the good effects of the following decoction, of which four ſpoonfuls were given every four or five hours:

℞ *Radicis ſerpentariæ Virginianæ contuſæ* ʒiij. *coque ex aquæ puræ* ℥xij. *ad* ℥viij. *adjecta ſub finem coctionis theriacæ Andromachi* ʒj. *cola.*

In the year 1760, Dr. *Whytt* wrote to me: "That in this "bad ſtate of the dyſentery, when the mouth and ali-

* Obſervat. et Curat. Med. obſ. xxviii.

"mentary

"mentary canal were threatened with *aphthæ*, and even "ſometimes after they appeared, he had ſucceſsfully giv"en the Bark; having firſt made ſuch evacuations as the "caſe required, or the patients could bear, by bleeding, "vomiting with ipecacuanha, and purging with rhubarb. "That to a pint of a ſtrong decoction of the Bark, he ad"ded three drachms, or half an ounce of *confectio Japonica* "(a compoſition of the *Edinburgh* diſpenſatory of the "ſame intention with *diaſcordium*, but ſimpler) and or"dered two ſpoonfuls, every four hours, of this medicine, "without any other, except ſome laudanum at bed-time. "That when by the continued uſe thereof the body be"came coſtive, he then gave rhubarb; and after that, "went on with the decoction of the Bark, but with leſs "of the *confectio*, or even without it".

At this time, ſuppoſing that the *rectum*, from the irritation occaſioned by the inceſſant motions, tended to a mortification, I endeavoured to quiet the ſpaſms by repeated anodyne clyſters, but without any antiſeptic ingredient. Something however of that kind has been tried by others. For, Mr. *J. Hunter*, one of the maſter-ſurgeons on the expedition to *Portugal*, told me, that he had frequently uſed antiſeptic clyſters with good effect, when the patient was worn down with continual motions and the *tenеſmus*. His firſt trial was with four ounces of a ſtrong decoction of the Bark, in which he diſſolved ſome grains of opium;

and afterwards, he found that a decoction both of the tormentil-root, and of oak-bark, with opium, anſwered the ſame purpoſe. He added, that theſe clyſters were repeated often, and eſpecially if they came away at firſt without having had the deſired effect.

Hitherto I have ſaid nothing of the diet, as it was nearly the ſame in both theſe ſtates of the diſeaſe. It conſiſted chiefly of rice or barley-gruel, ſago, panada, and ſome puddings; and to thoſe who were but a little feveriſh, ſome mutton broth was allowed: but this laſt article was omitted afterwards, as I obſerved that, in general, animal food was improper. For drink, I ordered rice or barley-water, toaſt and water, or the decoction of calcined hartſhorn. During the former war, we uſed no ſalep in the hoſpital. Although that root has been accounted ſpecific in the diſtemper, yet from my own experience I can ſay nothing particularly in its commendation. Mr. *Triquet*, ſurgeon-major to the ſecond regiment of guards, told me (at the camp in the iſle of *Wight*, in the year 1758) that in his regimental hoſpital, no kind of diet agreed ſo well with the men, who were ill of fluxes, as a meſs made of flour boiled in milk, ſweetened with ſugar, and taken for breakfaſt and ſupper. But though all theſe ſubſtances are of the ſofteſt, and leaſt heating kind of food, yet I have obſerved, that for the moſt part the patient could not eat any of them, nor ſwallow any of the liquors

liquors mentioned above, nor almoſt any other, except plain warm water, without being ſick or griped immediately after. It was therefore natural to conclude, that until the ſtomach and bowels were able to bear ſome ſtronger nouriſhment without ſickneſs or pain, nothing but water ſhould be given for the whole diet. In this notion I was confirmed by ſome curious obſervations on the dyſentery, communicated to me about ten years ago by *M. de Senac*, who, during my ſervice in the *Low-Countries*, in the former war, was phyſician-general to the *French* army, and who by that means became well acquainted with the diſtemper. That learned phyſician informed me, that having had good evidence for believing that ſeveral had been cured by only drinking large quantities of warm water for five or ſix days together, he had ſucceſsfully made the experiment upon himſelf, and upon fourteen more who ſubmitted to this regimen. He added, that after having tried ſeveral other methods, without being ſatisfied with any of them, he had at laſt fallen upon one which had anſwered to his wiſh, and by which he had made numberleſs cures. This, after evacuations by bleeding and by a vomit of emetic tartar, conſiſted chiefly of one grain of emetic tartar diſſolved in a pint of common whey, or chicken-water, given every day, for all food, drink and medicine till the patient recovered. His intention was to keep a free paſſage from the ſtomach to the *rectum* by the mildeſt laxative, and which he found was beſt anſwered by that minute quantity

tity of the antimonial *. In caſe the gripes proved more obſtinate than uſual notwithſtanding the evacuations, he then endeavoured to quiet them by giving ſome ſyrup of white poppies every night at bed-time. But though this courſe (in which the lowneſs of the diet is a material circumſtance) was not only agreeable to my ſentiments upon the nature of the diſeaſe, but was recommended to me by a perſon in whoſe judgment and veracity I had intire confidence, yet I have never been able to avail myſelf of the communication, on account of the difficulty, I may ſay the impoſſibility, of making the people of this country ſubmit to ſo low a diet, even for a few days.

Under the article of diet, muſt not be omitted a caution with regard to the kettles of the hoſpital, which are all made of copper tinned; but as the tinning ſoon wears off, the metal is corroded by every thing that is ſalt or acid; and we may well imagine how apt the nurſes will be to let ſuch things ſtand long in thoſe veſſels, and to neglect cleaning them before they are again uſed. It is to be preſumed that this is often the cauſe of miſchief, and eſpecially during the dyſenteric ſeaſon, when the ſtomach and bowels are otherwiſe ſo much affected. Therefore,

* As the emetic tartar is not every where made to the ſame ſtandard, it is eaſily underſtood that the laxative doſe muſt vary according to the preparation of that medicine.

one

one conſiderable improvement in the military hoſpitals would be, to have a Braſier conſtantly attending.

III. I come now to the *third ſtate* of the diſeaſe, in which the patient, though ſeemingly recovering, is kept low by a *teneſmus*, almoſt his only complaint, or by frequent returns of a looſeneſs, through the weakneſs of his bowels.

The *teneſmus* is not always owing to one cauſe. Sometimes I have known it occaſioned by the hard *ſcybala* formerly mentioned, which coming away in ſmall parcels, for ſeveral days together, have made a conſtant irritation. The diſcharge of theſe, I have haſtened by an ounce of *Glauber*'s ſalt diſſolved in half a pint of water, and given at different draughts in a morning. If one or two ſuch doſes have no effect, the continuance of the *teneſmus* muſt be imputed to an excoriation, or ſome ſore of the *rectum*, by which the part becomes ſo tender as to be irritated by the humours of the inteſtines, though perhaps they may now be reſtored to a ſound ſtate. For medicine, if the *teneſmus* is great, and the motions frequent, we muſt ſtill have recourſe to opiates, and eſpecially to the anodyne clyſters firſt mentioned *. In every caſe of great irritation, during this ſtate of the diſeaſe, I uſed formerly to give the decoction with ſtarch and gum Arabic, deſcribed above †, but of late I have more frequently preſcribed mutton-ſuet, prepared according to the following receipt,

* See above page 271. † Page 273.

which

which has been for ſome time in uſe here: " Take two " ounces of freſh ſuet, and a pint of new milk, ſet them " over a ſlow fire, and let them be ſtirred till they boil, " then add a heaped ſpoonful of ſtarch finely powder- " ed, and mixing it well with the reſt, let them boil " a little together." This preparation may be ſweetened or not, according to the taſte. The whole quantity may be conſumed in a day; and it will have the better effect if the patient takes no other aliment. I have ſometimes attempted to give this medicine in the firſt and ſecond ſtate of the diſeaſe, but it never anſwered; for, at that time the ſtomach was too much diſordered to bear it.

Sydenham has ſaid that the *teneſmus*, at the end of a dyſentery, is never occaſioned by an ulcer in the *rectum;* in which he is corrected by *Morgagni*, who mentions one caſe to the contrary that had occurred in his own practice*: but by quoting that caſe only, it appears that *Morgagni* knew but of few exceptions to *Sydenham*'s rule, which indeed, from my own obſervation, I ſhould reckon a pretty general one.

As to the frequent returns of purging, we are not, as I obſerved before, to conſider them ſo much as relapſes into the dyſentery, as into a *diarrhoea* or white-flux, owing to the weak ſtate of the bowels.

* De Sed. et Cauſ. Morb. ep. xxxi. ſect. 27, 28.

When-

Whenever therefore the patient is in this condition, I begin with giving a ſcruple of ipecacuanha, and the next day, I put him upon a courſe of thoſe medicines which, from their effects in ſtopping a looſeneſs, have been called aſtringents. For this purpoſe, during the former war, I commonly uſed the following mixture:

℞ *Extracti ligni Campechenſis (ex aquæ cinnamoni ſpirituoſæ* ℥iß. *witi)* ʒiij. *aquæ puræ* ℥vij. *tincturæ Japonicæ* ʒij. *miſce.*

Of this the patient took two ſpoonfuls once in four or five hours, and ſometimes alſo an opiate at bed-time. I underſtand that in one of the hoſpitals of this city, where this *formula* is uſed for old and obſtinate diarrhoeas, and for dyſenteries not yielding to the common methods, they order, at the ſame time, a bolus to be taken every night, conſiſting of a ſcruple of *philonium Londinenſe* with two grains of ipecacuanha, and that with theſe two medicines they have been generally ſucceſsful.

Since that war, having read the account which *Degner* and others had given of the virtues of the *ſimaruba*, I made a few trials of that medicine, and which were moſtly in its favour. *Degner* not only recommends it as a mild reſtringent, but as a corrector of the bile; for, according to his theory, the depravation of that humour was the cauſe of that epidemic flux which he treats of. On that account he gave it early in the diſeaſe, whilſt the gripes and *teneſ-*

mus continued, and whilſt blood was yet found in the ſtools. But from my experiments, I could diſcover none of the ſalutary effects of the *ſimaruba* before the third ſtate. Dr. *Huck*, who had uſed it often in *North-America*, told me, that he had never ſeen it anſwer in the beginning, nor even in the advanced ſtate of the diſeaſe, till the gripes and *teneſmus* had in a great meaſure ceaſed, and till the blood had diſappeared in the ſtools; but that when only a looſeneſs remained, he had often found it ſucceed. This was his *formula*:

℞ *Corticis radicis ſimarubæ* ʒij. *vel* iij. *coque ex aquæ puræ ſeſquilibrâ ad libram, et cola.*

This quantity was given every day in ſeveral draughts. He began with the weakeſt decoction, and when the patient's ſtomach could eaſily bear it, he then ordered him the ſtrongeſt. Dr. *Huck* obſerved, that unleſs the ſick found themſelves ſenſibly better within three days from the time they began the medicine, they ſeldom afterwards received any benefit from it. Dr. *Mitchell*, who formerly practiſed in *Virginia*, where the dyſentery is frequent, alſo informed me, that he had likewiſe uſed this vegetable, but not with ſucceſs, except when the patient either voided an immoderate quantity of blood during the height of the diſorder, or had a *diarrhoea* after the inflammatory ſtate was paſſed. He added, that he had uſually made a ſtronger decoction than that which *Degner* preſcribed, who probably was

was led to give the *ſimaruba* with more caution, as the bowels were ſo much inflamed when he began it.

I have alſo known good effects from ſmall doſes of ipecacuanha joined to opiates, ſuch as two grains of that powder with fifteen of the *philonium*, taken twice a day. Others have received benefit from ipecacuanha alone. Dr. *Huck* obſerved, that a ſoldier, after getting over the inflammatory ſtate of the dyſentery, was much reduced by a white-flux of the lienteric kind; and that after giving him ſeveral aſtringents without effect, he had at laſt ſucceeded, by ordering him ſix grains of ipecacuanha in powder, to be taken every morning faſting; that this man was puked by the medicine for the firſt three or four days only, but that he afterwards took it without complaining that it made him ſick.

During this aſtringent courſe, the men are ſtill to be attentive to their diet, abſtaining from greens, fruit, malt-liquor, and acids. In this ſtate I have allowed them ſome fleſh meat, and for drink, water mixed with a little rum or brandy: to the officers and private patients, I have given ſome wine when they were very deſirous of it. But from further experience, I am convinced, that at this period of the diſeaſe, the cures would be both more frequent and ſpeedy, could we prevail upon our patients to abſtain altogether from animal food, and from vinous and ſpirituous liquours: for, when no

aſtringents have availed, I have frequently known the cure obtained by a milk and vegetable diet without them.

Therefore when the aſtringents fail, and eſpecially when the pulſe is quick, and the patient complains of inward heat, I firſt give a vomit of ipecacuanha, and then begin that low regimen, which I continue till the hectic ſymptoms have ceaſed, and the bowels have recovered their tone. During this new courſe, I have ſeldom had occaſion for medicines, excepting the chalk-julep mentioned before, which I uſe for correcting that ſtrong acid ſo incident to relaxed ſtomachs. Sometimes I add an opiate, in order to procure reſt at night; but after a few days both theſe are laid aſide. All that I require (which indeed is often hard to obtain) is a ſtrict perſeverance in the diet; and now and then a repetition of the vomit, upon any new diſorder of the ſtomach, or greater laxity of the bowels.

Whilſt the patient continues in this ſtate, I forbid all animal food; and beſides milk, I allow only the preparations of grain, ſago, and ſalep. In large hoſpitals the ſoldiers cannot be fully ſupplied with milk; but in ſuch circumſtances they muſt be contented with a ſmaller quantity, and with the other parts of diet here preſcribed; without eating cheeſe, eggs, or other things which are heavy or heating to men in their condition. Although greens and fruit may ſeem to favour the general intention of cooling, yet as they are moſtly looſening, I have thought that the uſe

uſe of them at this time was leſs proper; but it is poſſible, that upon further experience we may find ſome kinds both of the one and the other conducive to the cure. And I am the rather inclined to this opinion, from having obſerved in one of the lateſt caſes, that when the patient drank butter-milk, he received more benefit than could have been expected from ſweet milk; though the other, from an acidity, reſembling that of ſome fruits, might be ſuppoſed to be contrary to the nature of the diſeaſe.

In this regimen I allow of neither fermented liquors nor ſpirits. The chief drinks are the decoctions of barley, of rice, or of calcined hartſhorn, toaſt and water, or milk and water. Having obſerved in my private practice, that ſome were better for drinking *Briſtol*-water, not only at the ſpring but at a diſtance, I deſired one of my patients (who had come from the *Havannah*) to obſerve whether he found any difference between drinking the river-water and the pump water in this city; and after ſome trials he aſſured me, that he was leſs liable to a return of his flux when he uſed the latter. Now *Briſtol*-water and moſt of the pump-water in *London* agree in not lathering with ſoap; that is, in being in reality hard, however ſoft they may be to the taſte. But I would not from thence infer, that this mineral water has no other advantage than hardneſs, when drunk warm at the ſpring, conſidering how long it has been in repute for its efficacy in caſes of this kind, eſpecially when hectic heats were joined.

Pure

Pure air being of ſuch conſequence in the cure, the phyſician can ſcarce be ſucceſsful in full hoſpitals unleſs the wards be uncommonly well aired. The beſt expedient in the dyſenteric ſeaſon, is to divide the ſick, and lay them in churches, or in barns, or in ruinous houſes only, where neither they nor their nurſes can confine the air. Not but that expoſitions to cold are hurtful, and that a conſtant free perſpiration is favourable to the cure; but when warmth is not to be had with a purity of air, we muſt chiefly regard the latter. Not only in the camp, but in the hoſpitals, the privies ſhould be covered every day with a layer of earth; and at theſe times, particularly, the wards ſhould be fumigated and kept clean. Such men as have long languiſhed in the hoſpital under a hectic, and a laxity of the bowels, have been ſurprizingly reſtored by cantoning them in the country, for the benefit of milk and the freſh air.

Laſtly, as conducive to the cure, and as a preſervative againſt a relapſe, eſpecially when the weather begins to grow cold, the convaleſcents ought to be provided with under-waiſtcoats: ſome of the officers who were ſubject to relapſes have informed me, that they found great benefit from wearing a flannel waiſtcoat next their ſkin.

CHAP.

CHAP. VII.

Obſervations on the jail or hoſpital-fever.

I Come now to the laſt fatal diſtemper incident to an army, namely the hoſpital-fever. In treating of this, I ſhall, 1. deſcribe its riſe, and the manner of the infection; 2. the ſymptoms; 3. the prognoſtics; 4. the diſſections of ſome of thoſe who died of it; 5. the method of cure: and laſtly, from theſe and other materials, I ſhall inquire into the cauſes of ſuch fevers.

§ 1.

Of the riſe of the jail or hoſpital-fever, and the manner of the infection.

THE hoſpitals of an army, when crouded with ſick, or when the diſtempers are of a putrid nature, or at any time when the air is confined, eſpecially in hot weather, produce a fever of a malignant kind, and very mortal*. I have obſerved the ſame ſort to ariſe in full and crouded barracks; and in tranſport-ſhips, when filled beyond a due number, and detained long by contrary winds;

* Part i. ch. ii. ch. iii. ch. iv. ch. viii. Part ii. ch. ii. § iii.

or

or when the men have been long kept at ſea under cloſe hatches, in ſtormy weather. Hoſpital-ſhips for diſtant expeditions have, for this reaſon, been generally deſtructive both to the ſick and their attendants.

As ſoon as I became acquainted with this fever in the hoſpitals abroad, I ſuſpected it to be the ſame with what is called here the *jail-diſtemper*, which I had never ſeen, and was confirmed in my opinion by having an opportunity of comparing them, furniſhed by an accident mentioned in the firſt part of theſe obſervations *.

This diſorder is incident to every place ill-aired and kept dirty, that is, filled with animal ſteams from foul or diſeaſed bodies. And upon this account jails and military hoſpitals are moſt expoſed to this kind of peſtilential infection, as the firſt are in a conſtant ſtate of filth and impurity, and the latter are ſo much filled with the poiſonous *effluvia* of ſores, mortifications, dyſenteric and other putrid excrements. I have ſeen inſtances of its beginning in a ward, when there was no other cauſe but one of the men having a mortified limb. Nay, there is reaſon to apprehend, that when a ſingle perſon is taken ill of any putrid diſeaſe (ſuch as the ſmall-pox, dyſentery, or the like) and lies in a ſmall and cloſe apartment, he may fall into this malignant fever. This I have

* Page 36.

known

known happen in the camp, when any one who has been ſeized with ſuch a diſorder, has kept his tent too cloſe. But, excepting a few of theſe occurrences, this fever is not properly one of the camp-diſeaſes, though it be univerſally accounted ſuch; for being frequently ſeen in camp-hoſpitals, it is therefore erroneouſly ſuppoſed to come from the field.

I have obſerved ſome inſtances of a high degree of contagion attending it; but the common courſe of the infection is ſlow, and catching to thoſe chiefly who are conſtantly confined to the bad air, ſuch as the ſick in hoſpitals, and their nurſes, and priſoners in jails. But when there is no great quantity of infectious matter, or when a perſon has not breathed long in ſuch dangerous ſteams, or when it is not particularly virulent, he will either eſcape, or have the ſymptoms come on ſo ſlowly as to leave time for prevention before the fever be formed. Much will alſo depend on the conſtitution: ſome will have the diſorder hanging about them for ſeveral days before it confines them to their bed; others will complain for weeks of the ſame ſymptoms without any regular fever; and others, after leaving the infectious place without the fever, may afterwards be ſeized with it *.

* Part i. ch. vi.

§ 2.

Of the ſymptoms.

WHEN the diſtemper comes on ſlowly, the firſt complaints are ſmall interchanges of heat and cold, a trembling of the hands, ſometimes a ſenſe of numbneſs in the arms, weakneſs of the limbs, loſs of appetite; and the diſorder being greateſt at night, the body is hot, the ſleep interrupted and not refreſhing. With theſe ſymptoms there is ſome pain or confuſion of the head, but never violent. The pulſe is at firſt a little quicker than natural, the tongue is white, but the drought is inconſiderable. Thoſe who are thus affected find themſelves too much indiſpoſed to go about buſineſs, but too well to be wholly confined. In this ſtate, ſometimes a vomit, ſometimes a change of air will remove the diſorder, ſometimes a ſweat: I have had experience of the two laſt methods of preſervation in my own caſe.

The diſeaſe is not eaſily to be diſtinguiſhed, in the beginning, from any common fever *. I have obſerved the *tremor* of the hands to be one of the moſt conſtant ſigns: but in order to form our diagnoſtics we muſt take other

* Febres malignas in principio ſtatim cognoſcere difficile eſt, cum malignitas ſæpe diu lateat, et non niſi ubi vires ſumſit ſeſe prodat. SENNERT. Epit. de Febrib. lib. iv. cap. x.

circum-

circumſtances into conſideration. We are to inquire whether the perſon has been expoſed to the uſual cauſes of fevers, or to foul air and infection; as alſo, if he has been bled, whether he has been relieved by the evacuation; becauſe, in inflammatory fevers, bleeding generally moderates all the ſymptoms, but in this it ſeldom has that effect.

When the fever advances, the ſymptoms already mentioned are in a higher degree, and in particular the patient complains of great laſſitude, of a *nauſea*, pains in the back, a more conſtant pain and confuſion in the head; and then we perceive an uncommon dejection of ſpirits. At this time the pulſe is never ſunk, but beats quick, and often varies, in the ſame day, both as to ſtrength and fulneſs. The pulſe is little affected by once bleeding, if a moderate quantity of blood be taken away; but if the evacuation be large, and eſpecially if repeated to anſwer a falſe indication of inflammation, the pulſe increaſing in frequency is apt to ſink in force, and often irrecoverably, whilſt the patient becomes delirious. But withal we muſt obſerve, that in every caſe, independent of evacuations, the pulſe ſooner or later ſinks, and gives then certain indication of the malignity of the diſeaſe.

The appearance of the blood is various; for, though commonly it is little altered, yet it is ſometimes ſizy, both upon the firſt attack, and after the fever is well formed. The worſt appearance is when the *craſſamentum* is reſolved;

though this does not happen till the advanced ſtate of the diſeaſe: but as blood has been ſo ſeldom taken away at that period, I cannot tell whether this be a frequent occurrence or not.

The urine is alſo various. Sometimes it is of a reddiſh or flame-colour, which it preſerves a long time; but it is oftener pale, and varies from day to day in colour as well as crudity, being ſometimes clear, ſometimes clouded: towards the end, upon a favourable *criſis*, it becomes thick, but does not always depoſite a ſediment.

If the ſick lie warm, and have had no preceding flux, the body is generally coſtive; but when they lie cold, as they often do in field-hoſpitals, the pores of the ſkin being ſhut, a *diarrhoea* is a common ſymptom, but is not critical. In the worſt caſes a flux appears in the laſt ſtage; then the ſtools are involuntary, colliquative, ichorous, or bloody, and have a cadaverous ſmell, the effects of a mortification of the bowels, and the ſign of approaching death. When the hoſpitals are filled with dyſenteries, ſome of the nurſes will be infected with the flux only, and others with this malignant fever ending in theſe bloody and gangrenous ſtools.

In the beginning, the heat is moderate; and even in the advanced ſtate, on firſt touching the ſkin, it ſeems inconſiderable; but upon feeling the pulſe for ſome time, I have

I have been ſenſible of an uncommon ardour, leaving an unpleaſant ſenſation on my fingers for a few minutes after *. The firſt time I obſerved this, I referred it to the force of imagination; but I was aſſured of the reality by repeated experiments, and by the teſtimony of others, who, without knowing of my obſervation, had made the ſame remark. A day or two before death, if care be not taken, the extremities become cold, and the pulſe is then hardly to be felt.

The ſkin is generally dry and parched, though ſometimes there are ſhorter or longer ſweats, eſpecially in the beginning. Such as are produced by medicine are of no uſe except on the firſt attack, at which time they will often remove the fever; but ſuch as are natural are never critical till the diſtemper begins to decline. Theſe laſt are rarely profuſe, but gentle, continued, and equally diffuſed over the body: ſometimes the diſeaſe will terminate by an almoſt imperceptible moiſture of the ſkin. The ſweats are uſually fetid, and even offenſive to the patient himſelf.

The tongue is moſtly dry, and without conſtant care of the nurſe becomes hard and brown, with deep chops: but

* GALEN, deſcribing the autumnal remitting fevers, makes the ſame remark about the heat. ‘ *Febrium, quæ a putredine oriuntur, maximum indicium eſt mordacitas et* ‘ *acrimonia caloris; quæ perinde ac fumus nares et oculos, ſic ipſa erodere tactum videtur.....* ‘ *Non ſtatim ea qualitas, admotâ manu, diſcernitur, ac per moram prædicta caliditatis* ‘ *ſpecies effertur ex penitioribus partibus.*” LACUN. Epit. GALEN. de Differ. Febr. lib. i. cap. vii.

this

this ſymptom is common to moſt fevers. It may be particular to this, that ſometimes the tongue will be ſoft and moiſt to the laſt, but with a mixture of a greeniſh, or a yellowiſh colour. The drought is ſometimes great, but more frequently moderate. In the advanced ſtate, the breath is offenſive, and a blackiſh furring gathers about the roots of the teeth.

Some are never delirious, but all are under a *ſtupor* or confuſion. Few retain their ſenſes till death; many loſe them early, and from two cauſes; either from immoderate bleeding, or the premature uſe of warm and ſpirituous medicines. They rarely ſleep, and, unleſs delirious, have more of a dejected and thoughtful look than what is commonly ſeen in other fevers. The face is late in acquiring either a ghaſtly, or a very morbid appearance; yet the eyes are always muddy, and generally the *white* is of a reddiſh caſt, as if inflamed. The confuſion of the head often riſes to a *delirium*, eſpecially at night; but unleſs by an unſeaſonable hot regimen, it ſeldom turns to rage, or to thoſe high flights of imagination frequent in other fevers. When the *delirium* is at this height, the face is fluſhed, the eyes are red, the voice becomes quick, and the patient ſtruggles to get up. But when that diſorder is owing to large evacuations, or only to the advanced ſtate of the diſeaſe, the face appears meagre, the eye-lids in ſlumbers are only half ſhut, and

and the voice, which is commonly ſlow and low, ſinks to a degree ſcarce to be heard. From the beginning, there is generally a great dejection of mind and a failure of ſtrength.

A *tremor* of the hands is more common than a ſtarting of the tendons; or if the *ſubſultus* occurs, it is in a leſſer degree than in many other fevers. In every ſtage of the diſeaſe, as the pulſe ſinks, the *delirium* and *tremor* increaſe; and in proportion as the pulſe riſes, the head and ſpirits are relieved. Sometimes, from the very beginning, the patient grows dull of hearing, and at laſt becomes almoſt deaf.

When the fever is protracted, with a ſlow and low voice, the ſick have a particular craving for ſomething cordial; and nothing is ſo acceptable, and ſo cordial as wine. They long for no food, yet willingly take a little panada if wine be added. But ſuch as are delirious, with a quick voice, wild looks, a *ſubſultus tendinum*, or violent actions, though their pulſe be ſunk, bear neither hot medicines, wine, nor the common cordials.

Vomiting, and complaints of a load and ſickneſs at the ſtomach, though uſual ſymptoms, are not eſſential to the diſeaſe; nor are pleuritic ſtitches, difficulty in breathing, or flying pains to be referred to it, ſo much as to the conſtitution of the patient, or to a preceding cold.

There

There is a certain eruption, which is the frequent, but not inſeparable attendant of the fever. This is a petechial efflorescence *, that is ſometimes of a brighter, or paler red, at other times of a livid colour, but never riſes above the ſkin †. The ſpots are ſmall, but ſometimes ſo confluent, that at a little diſtance the ſkin appears only ſomewhat redder than ordinary, as if the colour were uniform; but upon a nearer inſpection the interſtices are ſeen. For the moſt part theſe ſpots are ſo little conſpicuous, that, unleſs looked for attentively they may eſcape notice. They come out thickeſt on the breaſt and the back, leſs on the legs and arms; and I do not remember to have obſerved any upon the face. I have ſometimes ſeen them as early as the fourth or fifth day, and at other times as late as the fourteenth. They are never critical, nor are they to be reckoned among the mortal ſigns, but only concur with other circumſtances to aſcertain the

* It is doubtful whether the ancients knew any thing of theſe ſpots, and the fever which they accompany; but among the moderns, they were, ſo far as I know, firſt deſcribed by FRACASTORIUS, under the names of *Lenticulæ*, *Punctilla*, or *Peticulæ*; for by all theſe, both the fever and the ſpots were commonly called in his time. "*Sunt et aliæ febres, quæ medi e quodammodò ſunt inter verè peſtilentes et non peſtilentes... quales illæ fuere quæ annis* 1505, *et* 1528, *in* Italiâ *primùm apparuere ætate noſtrâ non priùs notæ. certis verò regionibus familiares, ut* Cypro *et vi inis inſulis, majoribus etiam noſtris cognitæ, vulgus Lenticulas, aut Punctilla appellat, quòd maculas proferant lenticulis, aut puncturis pulicum ſimiles. Quidam mutatis literis Peticulas dicunt.*" FRACAST. de Morb. Contag lib. ii. cap. vi.

† For this reaſon they are not to be referred to any of the *ecthymata* of the ancients, which denote puſtules or eruptions higher than the ſkin, as in miliary fevers, with which this malignant fever is not to be confounded.

malignity.

malignity. The nearer they approach to a purple, the more they are to be dreaded. In a few caſes, inſtead of ſpots, I have obſerved purple ſtreaks and blotches, which perhaps are ſtill a worſe ſymptom. The *petechiæ* will ſometimes not appear till after death *; and we had a caſe in the hoſpital, in which, upon bleeding, theſe ſpots were ſeen on the arm, below the ligature, and no where elſe on the ſkin.

This fever, though of the continued kind, yet has generally ſenſible exacerbations at night, with remiſſions and often partial ſweats in the day; and after a long continuance, it is apt to change into a hectic, a remitting, or an intermitting form.

The length of the diſeaſe is uncertain. I have known it end either in death, or recovery in ſeven days; but in the hoſpitals it generally continued from fourteen to twenty days †; and ſome died, or recovered, after four weeks illneſs. From the time of the ſinking of the pulſe till death, or a favourable *criſis*, there is perhaps leſs change to be ſeen from day to day in this, than in any

* A circumſtance incident to the plague. *Vid.* DIEMERBROECK *de Peſte. lib* iv. *hiſt.* v.

† DR. CLEPHANE obſerved, that the moſt ſenſible change to the better was generally upon the 17th day, from the time the patient found himſelf ſo ill as to keep his bed. The common period of the fever is the more diligently to be attended to, as we can ſcarce expect a *criſis* before that time, excepting upon a relapſe, and then I have obſerved the courſe to be commonly ſhorter.

other fever not of the malignant kind. When the courſe is long, it ſometimes terminates in ſuppurations of the parotid *, or axillary glands; and when theſe do not appear, it is probable that the fever is kept up by the formation of ſome internal abſceſs. Many, after the *criſis*, complain of a pain in their limbs and want of reſt; and almoſt all of them mention great weakneſs, confuſion in their head, *vertigo*, and a noiſe in their ears.

Having now related the moſt diſtinguiſhing marks of this fever, I ſhall only add, that there are ſometimes ſlight degrees of it hardly to be deſcribed, and which can only be diſcovered in full hoſpitals, by obſerving the men to languiſh, though the nature of the illneſs, for which they came in, ſhould ſeem to admit of a ſpeedier cure. In ſuch caſes, they have a whitiſh tongue, they complain of ſlight headachs, of want of appetite, and other inconſiderable feveriſh ſymptoms.

§ 3.

Of the prognoſtics.

MEN who have been weakened by diſtempers, or other accidents (as thoſe who have undergone a ſaliva-

* I remember one inſtance of both parotids ſwelling, without any previous indiſpoſition, when the perſon, not ſuſpecting the cauſe, and applying diſcutient cataplaſms, was, upon the tumours ſubſiding, ſeized with the malignant fever. This happened to MR. FORBES, ſurgeon to the ſecond troop of horſe-guards, then a mate in the hoſpital.

tion)

tion) are more ſuſceptible of the infection than the ſtrong and vigorous, and run more riſk. Thoſe who are taken into crouded hoſpitals, with the ſmall pox, however good the ſort may be, and however well they may paſs the height, fall readily into this fever, and die. One who has recovered is not leſs ſubject to a relapſe, than he was to the diſtemper at firſt; but it has not been obſerved, whether ſuch as have had abſceſſes are as liable to relapſe as others. The ſecond fever is attended with double danger, as the patient has been ſo much weakened by the firſt. A ſure ſign of the corruption of the air in an hoſpital is, when many of the nurſes fall ſick.

We cannot draw a prognoſtic from any ſign by itſelf, and all of them together are more fallible in malignant fevers than in others. Generally, the following are good, to have little *delirium*; the ſtrength little impaired; turbid urine in the decline of the diſeaſe; and at that time a gentle ſweat or moiſture diffuſed over the body; or even the ſkin ſoft, and the tongue moiſt; or to have then bilious ſtools ſucceeded by a *diaphoreſis*; the pulſe to riſe by wine or cordials, with an abatement of the *ſtupor*, *tremor*, and other nervous ſymptoms. Deafneſs is rather a good ſign. A ſediment in the urine, without other changes to the better, is no ſure mark of recovery; and ſome have recovered in whoſe water I had ſeen no ſediment.

The bad ſigns are, a *ſubſultus tendinum*; the eyes much inflamed and ſtaring; the ſpeech quick, and the ſound of the

voice altered; a high *delirium;* conſtant watchfulneſs; ſickneſs at the ſtomach, and vomitings; frequent ſtools with a ſinking pulſe, and the diſorder of the head increaſed; involuntary *fæces;* coldneſs of the extremities; and a tremulous motion of the tongue. It is obſerved to be among the worſt ſigns, when the patient complains of blindneſs; when he ſwallows with difficulty; or cannot put out his tongue when deſired to do it; when he can lie on his back only, and pulls up his knees; or when inſenſible, he endeavours to uncover his breaſt; or makes frequent attempts to get out of bed. If to any of theſe are added ichorous, cadaverous and involuntary ſtools, it is a ſign of a mortification of the bowels and approaching death.

It will not ſeem ſtrange to find moſt of theſe prognoſtics common to the advanced ſtate of other fevers, when we conſider, that from whatever cauſe fevers begin, by a long continuance the humours are corrupted, and the brain and nerves affected much in the ſame manner as in thoſe which ariſe from infection.

§ 4.

Of the diſſections.

THE diſſections of thoſe who died of the common hoſpital-fever, or of *Houghton*'s regiment, which had the diſtemper

temper from the jails, were in all ten. In ſome of the bodies, all the cavities were opened; in others, either the brain alone was ſeen, or the bowels. Theſe imperfections of this part I thought proper to mention, that the accounts here given might not be conſidered as complete, or prevent others from purſuing the inquiry further.

The moſt unexpected appearances were abſceſſes of the brain, of which therefore I ſhall take more particular notice. The firſt I ſaw of this kind was at *Ghent;* but the man being brought into the hoſpital from the barracks, no more than two days before he died, I could only conjecture from the ſymptoms, and the imperfect account I had of him, that his death was owing to a fever of this kind, after lingering near a month in it. I found about three ounces of purulent matter in the ventricles of his brain, and obſerved that the whole cortical and medullary ſubſtance was uncommonly flaccid and tender. Nay, ſome of the ſame kind of matter was found in the ſubſtance of the upper part of the *cerebellum:* yet this perſon, with ſome *ſtupor* and deafneſs, had his ſenſes till the night before he died, ſo far, that he anſwered diſtinctly when rouſed and ſpoken to; but about that time the muſcles of his face began to be convulſed.

Of two other inſtances of men who undoubtedly died of this fever, in one the brain was ſuppurated; in the other, the *cerebellum.* In the former caſe, the patient was under a

ſtupor

ſtupor with deafneſs from the beginning, but was never delirious nor altogether inſenſible. His pulſe ſunk very early; and about ten days before he died, his head began to ſwell, and continued very large till within two days of his death, when it ſubſided a little. For ſeveral days before his end he would taſte nothing but cold water; and during his illneſs he lay conſtantly on his right ſide. The head being opened, an abſceſs as large as an egg was found in the ſubſtance of the fore-part of the right hemiſphere of the brain, full of thin matter like whey. At that time five more, ill of the ſame fever, had the like ſwelling of their heads, but recovered*. This extraordinary ſymptom I never obſerved before, nor ſince. In the other caſe, the abſceſs in the *cerebellum* was about the ſize of a ſmall pigeon's egg, and contained alſo a thin ichorous matter: nor had this patient been ever ſo thoroughly inſenſible, as not to anſwer reaſonably when ſpoken to. Two days before he died, his urine turned pale. Both theſe bodies were opened by Mr. *Breach*, apothecary in *Southwark*, then a mate in the hoſpital.

But ſuppurations in the brain were not conſtant; for, another who died about this time, and had been ill about the ſame number of days with the like ſymptoms, the pale water excepted, had no abſceſs either in the brain or

* This happened at *Inverneſs*, and all, or moſt of theſe men were of HOUGHTON's regiment: ſee page 45 et ſeq.

cere-

cerebellum. And two were opened afterwards, in whom the cortical ſubſtance of the brain had an inflammatory appearance, but no ſuppuration. In one of them, the large inteſtines were corrupted: that man went off with a looſeneſs; and juſt before his death he had a diſcharge of an ichorous matter from his noſe. In the military hoſpital at *Ipſwich*, one who unexpectly died of this fever, after having been once in a fair way, had no ſuppuration in his brain. And about the ſame time Dr. *Clephane* told me, that he had ſeen the head of another opened, who died after an abſceſs in each of the orbits; that he had found the brain very flaccid, and about two ounces of a thin *ſerum* in the ventricles; but that neither of theſe two bodies had been further inſpected.

I ſhall not enter into a deſcription of other particulars in theſe diſſections; for, though I have them written at length, it may be ſufficient from what has been ſaid to draw the following concluſions.

That as there is the greateſt tendency to putrefaction through the whole courſe of the illneſs, it generally terminates, when it proves fatal, either in an actual mortification of ſome part, or in an abſceſs of the brain, often ichorous; that the inteſtines more particularly are ſubject to mortify, as few die without cadaverous and involuntary ſtools; and from an obſervation which we made, of

the *petechiæ* not appearing till after death, it ſeems reaſonable to conclude, that thoſe ſpots are owing to a reſolution and a corruption of the blood. The putrid ſweats and ſmell of the body, before death, are a further argument for what is now advanced. And as to the abſceſſes, ſo often found in the brain, the ichorous kind may be conſidered as a *ſpecies* of mortification proper to parts of that texture; and from the preceding caſes, it ſeems probable that theſe ſuppurations are not rare occurrences in this fever *.

From the inflammatory appearance of the brain without ſuppuration, we may account for the ſame remedies having ſometimes oppoſite effects. For, though in the advanced ſtate, wine and cordials are often the beſt medicines, yet there are ſome who cannot take them without increaſing the *delirium:* ſuch therefore have probably ſome conſiderable inflammation about the brain.

The laſt obſervation which I ſhall make upon the diſſections is, that the great tendency of this fever to putrefaction reduces it to the peſtilential claſs of diſeaſes; as all of that kind are remarkable for a proſtration of ſtrength, ſunk pulſe, dejection of ſpirits, putrid ſweats and ſtools, *petechiæ*, livid blotches, and the like ſymptoms.

* From the numerous diſſections of thoſe who died of the laſt plague at *Marſeilles*, it appeared that ſome of the *viſcera* were always mortified and inflamed, and that the brain and lungs were moſt frequently affected in that manner. *Traité de la Peſte, part.* i.

Theſe

Theſe are the inferences which we may reaſonably draw from the diſſection of the bodies: But from thence to aſcertain the firſt morbific matter, where the effects only are ſeen, or to account for all the varieties of this fever, would be too great an attempt from ſuch materials. Nor would it be juſt to propoſe our method of cure as deduced from the inſpection of the dead bodies, ſince the moſt ſucceſsful part of it was taken from the experience of others, or from trials of my own preceding moſt of theſe diſſections.

§ 5.

Of the cure.

IN the cure of this fever, as in all others, we muſt vary our method according to the ſtate of the diſeaſe. I ſhall therefore diſtinguiſh it into three ſtates, and in each propoſe thoſe remedies which I found to be the beſt from experience. Let us ſuppoſe the firſt ſtate to continue as long as the perſon is able to go about; the ſecond, to begin with his confinement, when the fever is manifeſt, the head ſomewhat affected, but the pulſe ſtill full; and the third, when the pulſe ſinks, and a *ſtupor* comes on, with the other ſymptoms already deſcribed.

I. IN the *firſt ſtate*, as well as in all the reſt, the fundamental part of the cure is to remove the patient out of the

foul air. When that cannot be done, the room or ward is to be purified, by making a ſucceſſion of air by means of fires, or letting it in by doors and windows, diffuſing the ſteams of vinegar, or the like; for whatever medicines are given while the corruption of the air continues, or indeed increaſes by the *effluvia* of the ſick, there can be little hopes of recovery. Therefore in every ſtage, though the patient ſhould breathe no other infectious air but that of his own atmoſphere, it will be neceſſary to keep the curtains open, and uſe all other means to procure a free ventilation. On the ſtrict obſervation of this rule the cure will in a great meaſure depend.

For the next article of prevention I gave a vomit, and after its operation half a drachm of *theriaca* with ten grains of *ſal cornu cervi* and ſome draughts of vinegar-whey; and I repeated the ſame, without the vomit, the following night. Sometimes I have uſed the ſudorific medicine alone; and by both methods I have ſeen thoſe ſymptoms removed, which I apprehended to be the forerunners of this fever received by contagion.

I muſt not omit to obſerve, what may appear a minute circumſtance, that as the cure depends ſo much upon a free *diaphoreſis*, I found it conducive to that end, eſpecially with the leſs cleanly ſort, to have their feet and hands waſhed with warm vinegar and water. After ſweating, if the patient

patient was to remain in the foul air, I uſed as a preſervative the alexipharmac decoction which I ſhall treat of afterwards.

II. BUT in the *ſecond ſtate*, when the fever was manifeſt, if the pulſe was full, I generally took away ſome blood, if that had not been done before. When the ſymptoms run high, a plentiful evacuation of this kind ſeems indicated, yet large bleedings have generally proved fatal, by ſinking the pulſe and bringing on a *delirium*. Nor is a moderate bleeding to be repeated without caution; for as ſeveral circumſtances in this fever are contradictory to the common rules, ſo experience ſhews that even thoſe whoſe blood is ſizy, unleſs the lungs be inflamed, are the worſe for a ſecond bleeding. If the head only ſuffered I judged it ſafer to bleed by leeches at the temples, than to open a vein in the arm. But in the *delirium* with a ſunk pulſe, even leeches did no good, ſometimes harm, and therefore phlebotomy was not to be tried. Many recovered without bleeding, but few who loſt much blood.

Vomits are alſo to be uſed cautiouſly. Before the diſeaſe is formed, one was recommended for prevention; and even if the ſtomach was foul, as is uſual in autumn, an emetic was believed to be proper in the beginning of the ſecond period alſo, in order to relieve the ſtomach, and diſpoſe more to a ſweat. In autumn 1757, when our troops returned from the expedition to the *Rade de Baſque*,

ſeveral of the ſoldiers were brought into the hoſpital at *Portſmouth*, ill of a diſorder compounded of the bilious and jail-fever. For when thoſe men, upon being ſeized with the common fever of the ſeaſon, were confined to the holds of the crouded ſhips, their diſtemper ſoon put on a malignant form. All thoſe who were not in the low ſtate, but complained much of a headach, of coſtiveneſs and a diſorder at their ſtomach, I firſt bled, then purged; and afterwards, proceeding with them in the manner deſcribed in the cure of the bilious-fevers *, I gave them twice a day a grain of emetic tartar, which commonly not only puked, and opened the body, but brought on a *diaphoreſis*. All thoſe who were treated in this manner recovered. But in the advanced ſtate of a mere malignant fever, when the patient has all along complained of a ſickneſs at his ſtomach, I judge emetics to be unſafe, from having ſeen in two inſtances the diſeaſe take ſuddenly a worſe turn, when in ſuch circumſtances I had given a vomit of ipecacuanha. Nor can I recommend any other method as ſufficiently aſcertained by my experience in this diſtemper; but in other fevers, which I have treated ſince, and which by a conſtant *nauſea* ſhewed ſome ſimilarity to theſe, I have frequently been able to conquer that ſymptom, by giving the ſaline draughts of *Riverius* †, as uſual,

* Page 201 et ſeq.

† *Huic ſymptomati (ſcil. vomitui) graviſſimo ſtatim medetur, quaſi miraculo, ſal abſinthii ad* ʒi. *in ſucci limonum recentis cochleari exhibitum, ut experientiâ didici.* RIVER. *in cap. de Feb. Peſtilent.* The manner in which this operates may perhaps be deduced

uſual, in the *act* of effervеſcence, but repeated oftener than what is commonly practiſed. This is my *formula:*

℞ *Salis abſinthii* ℈iv. *ſacchari albi* ʒij. *ſolve ex aquæ puræ* ʒiv. *et admiſce aquæ cinnamoni ſimplicis* ʒij.

Dentur omni horâ cochlearia iij. *cum cochleari uno ſucci limonum, donec æger nauſeare deſierit.*

Previouſly to this medicine, I have ſometimes made the patient clear his ſtomach by drinking ſome camomile-tea; at other times, I have omitted that infuſion; but, when coſtive, have always ordered him a clyſter.

The next care is to promote a *diaphoreſis*, which in this ſtate of the fever is only to be attempted by the milder ſudorifics; and for this purpoſe the *ſpiritus Mindereri* has been

ced from Append. paper vii. exp. xliv. I find the quantity of a drachm of the ſalt, in RIVERIUS's draught, marked in two editions of the original, but which muſt be a typographical error for a ſcruple, if the author meant that there ſhould be no more ſalt than was ſufficient to ſaturate the acid, and if the ſalt which he uſed was of the ſame ſtrength with ours. This laſt circumſtance however may be doubted, conſidering that formerly the *ſal abſinthii* was frequently prepared with ſulphur, and by means of the acid there, it became a much weaker alkali than what is now kept in the ſhops. In thoſe days recourſe was had to this ſalt in ſeveral diſorders of the ſtomach, from a notion that it poſſeſſed all the virtues of the original plant; and the acid ſeems chiefly to have been added to make it more grateful to the ſtomach. But now we find, that the lixivial ſalt of every plant will anſwer as well as that of wormwood, and that the lemon juice, or ſome other acid, is neceſſary for producing an effervеſcence, with an evolution of ſome fixed air, upon which the virtue of that uſeful medicine ſo much depends: ſee Append. paper vii. exp. xliv.

uſed.

uſed. But at this time of the diſeaſe, the morbific cauſe is generally too much fixed to be expelled by ſweating; and therefore unleſs a ſweat comes eaſily, and with relief to the patient, it is never to be inſiſted on; nay, if voluntary and profuſe, with a low and quick pulſe, it muſt be checked. Then the fever begins to elude all the force of bliſters, alexipharmacs, and ſudorifics, until the uſual time of its decline. Of this I have ſeen many inſtances, but ſhall mention one only. Mr. *Anneſly*, one of the mates, was ſeized with the hoſpital fever, and after being confined to his bed, for four or five days, and bliſtered, he took ſeveral doſes of muſk, of five and twenty grains each, which opened his body, raiſed his pulſe, and brought on a thorough ſweat; yet the fever continued till about the ſeventeenth day, when it went off with a gentle moiſture of the ſkin, and turbid urine.

As ſoon therefore as the fever was confirmed, I gave ſuch medicines only as were recommended above in the cure of inflammatory fevers*, *viz.* the contrayerva powders with nitre and camphire, and barley-water acidulated with vinegar.

Although coſtiveneſs was prevented by clyſters (leſt an accumulation of the *fæces* ſhould prove a new *fomes* of corruption) yet a looſeneſs was not encouraged, on account of the great weakneſs attending this illneſs.

* Part iii. ch. i.

About

About this time I have uſed bliſters, but without ſucceſs. Nay, upon the firſt attack, the whole head has been bliſtered, and the oozing kept up for ſome days; but without relieving the head, or preventing any of the uſual ſymptoms.

III. I come now to the *third* and longeſt *ſtate*, in which the pulſe ſinks, the *ſtupor* is great, a *delirium* is threatened, and *petechiæ* often appear. This change begins in three or four days after the fever is formed, often later, according to the treatment and other circumſtances. But, what is obſervable, if the patient has been once or twice largely bled, on the firſt ſymptoms, he will be apt to paſs over the ſecond ſtage, and from a condition little removed from health, his pulſe will be apt to ſink, and he ſuddenly become delirious. Now, whether this was occaſioned by miſconduct, or by the courſe of the diſeaſe, I found it neceſſary to vary the method, and to have for my principal intention the ſupport of the *vis vitæ*, eſpecially towards the decline of the fever; but this could not be anſwered without ſome warmer medicines than thoſe which have yet been mentioned. Therefore, as ſoon as the pulſe began to flag, and the urine to turn pale, I left out the nitre in the diaphoretic powders*, and ſubſtituted the *ſerpentaria*.

* Part iii. ch. i.

Some-

Sometimes I have given a plain decoction of that root, adding a ſmall quantity of ſome ſpirituous liquor; at other times, I have preſcribed the ſame in ſubſtance, from two ſcruples to a drachm every day, and with good effects; but at laſt an accident was the occaſion of my adding the Bark. A man ill of this fever, with petechial ſpots, had a bliſter applied to his back, and the part mortified. But a ſtrong decoction of the Bark, together with ſome of the tincture being given, and continued for ſome days, with the uſual cordials, the ſore began to ſuppurate, and the caſe took ſo favourable a turn, that there was little doubt of the patient's recovery, till nauſeating the medicine, he left it off, and then the gangrene recurred, and he died. From this caſe however I was induced to join the decoction of the Bark with the Snake-root in the advanced and ſunk ſtate of the fever. The firſt nine recovered who took this compound medicine, though four of them had the *petechiæ;* and in thirty nine caſes, which were under my care in that ſeaſon, I loſt only four. But it will be juſt to add, that the places in which the ſick lay were uncommonly well aired, and that the fever was not attended with ſo much malignity as I have ſeen it at other times. For at *Ipſwich*, where the kind was worſe, and where the air was ſo much vitiated in the hoſpital, that moſt of the nurſes were infected, as well as the men who were admitted for other diſtempers, I imagine (for I kept no exact account) that I might loſe about double that proportion.

When

When I joined the Bark to the *ſerpentaria* in ordinary caſes, I began with a much ſmaller quantity than what I had uſed for the gangrene, intending to increaſe it by degrees; but finding that ſmaller quantity anſwer ſo well, I ſeldom altered it. This is now my receipt:

℞ *Corticis Peruviani in pulverem contriti* ʒiij. *coque ex aquæ puræ* ℥xvj. *ad* ℥viij. *adjectis ſub finem coctionis radicis ſerpentariæ Virginianæ* ʒij. *ſtent per horam, et colaturæ admiſce aquæ alexiteriæ ſpirituoſæ cum aceto* ʒij. *ſacchari albi* ʒß.

Of this my common doſe was four ſpoonfuls every ſix hours; if the patient was heated by it, he took only three; but if he was lower than uſual, I gave the ſame quantity once in four hours, diminiſhing it, or giving it at longer intervals, according to the circumſtances: ſometimes I have leſſened the proportion of the *ſerpentaria* when I imagined that it heated too much.

In one caſe the fever terminated in a ſuppuration of one of the parotids, which was opened and healed during the uſe of the ſame remedy.

Beſides this medicine, it was ſometimes proper to give a volatile cordial mixture, in this manner:

℞ *Aquæ puræ* ℥vj. *aquæ nucis moſchatæ* ℥j. *confectionis cardiacæ* ʒiß. *ſalis cornu cervi* ʒß. *ſyrupi croci* ʒß. *miſce.*
Dentur ſubinde in languoribus cochlearia ij. *vel* iij.

This quantity was commonly conſumed in 24 hours. But in caſes out of the hoſpital, and where wine was to be had in plenty, I either omitted this cordial, or uſed it more ſparingly. In general, it agreed well with the low ſtate of theſe fevers; and in great ſinkings, which either came after unſeaſonable bleedings, or long want of nouriſhment, it was next to wine the beſt reſource. For, as a grateful and efficacious cordial at this time, there was nothing comparable to wine, of which the common men had an allowance from a quarter to half a pint in a day of a ſtrong kind, made into whey, or added to the panada which was their only food. But to others out of the hoſpital, I commonly preſcribed *Rheniſh*, or a ſmall *French* wine, whereof ſome have conſumed near a quart a day, and part of that undiluted. And indeed ſo great is the virtue of wine in this ſtage of the fever, that I have known many recover from the loweſt condition, when refuſing the decoction, on account of its taſte, they took nothing but a little panada with wine, and the volatile mixture, every two or three hours, by turns. Perhaps there is no rule more neceſſary, than never to let the patient, when low, remain longer without taking ſomething cordial or nouriſhing; as I have ſeen men, once in a promiſing condition, ſunk paſt recovery, by being allowed to paſs a whole night without any ſupport about the time of the *criſis*. Nothing can be lower than the ſick are in the advanced ſtate of this fever, and therefore *Hoffman*

Hoffman rightly adviſes, in all ſuch caſes, that they may be kept conſtantly in bed, and not permitted even to ſit up in it. In the laſt ſtage of this diſeaſe, as well as in that of the ſea-ſcurvy, it ſhould ſeem that the force of the heart is too ſmall to convey the blood to the brain, except when the body is in a horizontal poſture *.

But however neceſſary wine and the decoction abovementioned are in the low ſtate of the fever, we are to remember, that throughout this long ſtage theſe remedies are to be adminiſtered only by way of antiſeptics, and in order to ſupport the *vis vitæ*, without aiming at thoroughly raiſing the pulſe, or thoroughly relieving the head, or at forcing a ſweat by them before nature points that way, which I have ſeldom ſeen happen before the fourteenth day. For, though the patient may ſometimes die before that period, if he has been too largely bled, or if hot medicines have been given him too freely, yet thoſe remedies which I have hitherto uſed have not been powerful enough to bring on a *criſis* ſooner.

We have ſeen how inſeparable a *ſtupor* was from this fever, particularly in its low ſtate, and how apt this *ſtupor* was to turn to a ſlight *delirium* in the evening. If this was all, as being in the common courſe, nothing was done. But if I found the *delirium* increaſe upon uſing wine, if

* See the deſcription of the ſea-ſcurvy in Lord ANSON's voyage.

the eyes looked wild, or the voice became quick, there was occaſion to apprehend a true *phrenitis*, and agreeably to this, I have obſerved that at ſuch times all internal heating medicines aggravated the ſymptoms, whilſt bliſters, before uſeleſs, became then of ſervice: in that emergency therefore I began to uſe them as in the inflammatory fevers. I have had no opportunity of trying, in the *delirium* of theſe fevers, the fomentations of warm water and vinegar to the feet, which I have ſince found efficacious in other fevers *; but I am inclined to believe, that in this caſe alſo they will anſwer better than ſinapiſms or bliſters, provided they be long enough and often enough applied. In the inflammatory fevers, I have known theſe fomentations have little effect for the firſt hour, and yet ſucceed afterwards. For internal medicine, I omitted the decoction for ſome time, but continued the acid †, and gave camphire with the *pulvis contrayervæ compoſitus* and nitre as before. If the *delirium* was with a ſlow voice, and without violent motions, the decoction and wine were given, without any other medicine; for in no inſtance was this ſymptom quite removed till the uſual time of the *criſis*. I have obſerved that a *delirium* would ariſe from two oppoſite errors; one, from large and repeated bleedings; and the other, from wine and the warm cordial medicines given too early. It appears therefore how nice the principles are that regard the cure: thus neither a hot nor a cool

* Part iii. ch. ii. § i. † *Viz.* Barley-water with vinegar.

regimen

regimen will anſwer with every patient, nor with every ſtate of the diſeaſe.

If a *diarrhoea* comes on in the decline of the fever, it is to be moderated (but never ſuppreſſed) by adding a few drops of the *tinctura Thebaïca* to the full quantity of the alexipharmac decoction; or by giving ſome ſpoonfuls of the chalk-julep with opium mentioned before *. For, though the looſeneſs may be conſidered as critical, yet as the ſick are too low to bear great evacuations, it muſt in ſome meaſure be reſtrained; and I have often obſerved, that when it has been treated in this manner, about the uſual time of the *criſis*, the patient has fallen into a breathing ſweat, which has carried off the diſeaſe. In the worſt kinds of the fever, and eſpecially when it coincides with the dyſentery, the ſtools are frequently bloody; in which dangerous caſe, if any thing can be done, we muſt attempt it by the ſame medicines. In proportion to the putrid nature of the ſtools, opiates and aſtringents are to be uſed with the greater caution.

We ſhall next conſider the ſtate of the patient after the fever has ceaſed, or changed into another form. If the diſeaſe terminates in a ſuppuration of the parotid glands, one caution only is needful, which is to open the abſceſs ſoon, without waiting for a fluctuation, or even a ſoftneſs

* Page 207. In order to check the purging and promote a *diaphoreſis*, I ſhould now prefer a bolus of *theriaca* with *ipecacuanha* likewiſe mentioned in that page.

of

of the tumour, which may never happen; the *pus* being here ſo very viſcid, that after it is ripe, the part will feel as hard as if the ſuppuration had not begun *.

Almoſt every patient, after the fever, complained of want of reſt, frequently of a *vertigo* or confuſion of the head, of a continuation of the deafneſs, or of other ſymptoms, ſometimes the conſequence of great lowneſs, at other times, of ſome diſorder not ſo eaſily to be accounted for. I then gave an opiate at night, with medicines of the ſtrengthening kind, ſuch as the Bark, and elixir of vitriol. I have found that the Bark is not only the beſt ſtrengthener, but the ſureſt preſervative againſt a relapſe. For this laſt intention, it is neceſſary that the convaleſcent ſhould take about three drachms a day for ſix or ſeven days together; and afterwards, if he remains longer in the hoſpital, ſome ſmaller quantity daily. When the pulſe was ſlow, a few grains of *aſa fœtida*, given twice a day, have had a good effect. But if there was an appearance of a hectic fever, from an inward abſceſs, the caſe was to be treated accordingly. Upon comparing ſome of the remaining ſymptoms of thoſe who recovered, with the

* This may be the reaſon why theſe tumours have not always proved critical. For RIVERIUS, after the ſwelling of the glands, was obliged to make other evacuations: perhaps from not making timely inciſions: *vid. cap. de Feb. Peſtilent.* The late Mr. GIRLE told me, that he had obſerved that ſuch critical tumours, after malignant fevers, were not to be ripened by poultices of bread and milk, which (by growing cold) are more apt to repel them, but by ſome of the warm gum-plaſters.

condition

condition of the brain in ſuch as died, I have been induced to think that ſome part even of that ſubſtance may ſuppurate, and yet the perſon recover.

Sometimes the patient falls into an irregular intermittent, which, if not of a hectic nature from an internal abſceſs, may proceed from neglecting to clear the *primæ viæ*. For, it is eaſy to conceive, that after a long fever of a moſt putrid nature, attended with a *languor* of the bowels, the *fæces* may be ſo much accumulated as to occaſion various diſorders. In ſuch caſes, after proper evacuation, the Bark was almoſt a ſure remedy.

§ 6.

Of the cauſes of malignant fevers in general.

IT is evident from the preceding account, that this diſtemper is of a truly malignant or peſtilential nature, as appears by the manner in which the head is affected, the dejection of ſpirits, debility, ſunk pulſe, the ſuppuration of the parotid and axillary glands, the putrid ſweats, petechial ſpots, mortifications, and contagion. For, though all theſe circumſtances are not found together in one perſon, yet they are common to the diſeaſe; and it is well known, that in the plague itſelf, the ſymptoms are various, according to the degree of virulence, and the conſtitution of the perſon infected.

It

It would be unneceſſary to ſhew the difference between a malignant or peſtilential fever, and the true plague, as that diſtinction, not clearly comprehended by the ancients, has been well aſcertained by ſome of the later writers on that ſubject. And therefore I ſhall only remark, that though the hoſpital-fever may differ *in ſpecie* from the true plague, yet it may be accounted of the ſame *genus*; ſince it ſeems to proceed from a ſimilar cauſe, and is attended with the like ſymptoms.

The malignant or peſtilential fevers are various, according to the virulence of the *miaſma* or putrid ferment received into the blood; but all ſeem to depend upon ſome internal, or external *fomes* of corruption, whether owing to a putrid habit, or to exhalations from corrupted animal, or vegetable ſubſtances. I ſhall firſt treat of the *remote* and *external cauſes*, and next of the *immediate* and *internal*.

I. The hoſpital and jail-fevers are to be conſidered as the ſame diſeaſe, and little if at all different from ſuch as have ariſen after battles, when the bodies of the ſlain have been left unburied to rot upon the field. This *Galen* notes as one of the cauſes of peſtilential fevers *, and he is ſupported by the teſtimony of other authors, in particular by *Foreſtus*, who was eye-witneſs to a diſtemper of this kind (which indeed he calls a plague) owing to the

* Epit. GALEN. De Feb. Differ. lib. i. cap. iv.

ſame

ſame cauſe, attended with buboes and a high degree of contagion *. The ſame author alſo gives an account of a malignant fever breaking out at *Egmont* in *North-Holland*, occaſioned by the rotting of a whale that had been left upon the ſhore †. We have a like obſervation of a fever affecting the crew of a *French* ſhip, upon the putrefaction of ſome cattle which they had killed in the iſland of *Nevis*, in the *Weſt-Indies* ‡. Theſe men were ſeized with a pain in their head and loins, great weakneſs, and a diſorder of the ſtomach, accompanied with a fever; ſome had carbuncles; and on others, purple ſpots appeared after death.

Hippocrates deſcribes a peſtilential conſtitution, and imputes it to a ſouthern, humid and cloſe ſtate of the air §. The putrid *effluvia* of lakes and marſhes are mentioned by *Galen* as having the ſame effect ‖.

One of the moſt memorable diſtempers incident to an army is recorded by *Diodorus Siculus* ¶, which broke out among the *Carthaginians* in *Sicily*, at the ſiege of *Syracuſe*. That author not only relates ſome of the moſt diſtinguiſhing ſymptoms, but reaſons well about the cauſe. He ſays,

* Obſervat. lib. vi. obſ xxvi.

† *Obſ.* ix. *ſchol.* PARAEUS ſays, that in his time the like happened on the coaſt of *Tuſcany*. *De Peſte. cap.* iii.

‡ Traité de la Peſte.

§ Epidem. lib. iii. ſect. iii.

‖ Epit. GALEN. de Feb. Differ. lib. i. cap. iv.

¶ Bibliothec. Hiſt. lib. xiv. cap. lxx. lxxi.

that pains in the back, and eruptions * were common; that ſome had bloody ſtools; and that others were ſuddenly ſeized with a *delirium*, ſo as to run about and beat all that came in their way †; that they died on the fifth, or at furtheſt on the ſixth day; that the phyſicians knew no cure; and that it was the more fatal as the ſick were abandoned by every body on account of the contagion. As to the cauſe, the hiſtorian takes notice of the multitude of people confined within a narrow compaſs; of the ſituation of the camp in a low and wet ground; of the ſcorching heats in the middle of the day, ſucceeded by the cold and damp air from the marſhes in the night-time ‡: he adds, the putrid ſteams ariſing firſt from the marſhes, and afterwards from the bodies of thoſe who lay unburied.

I obſerved, that I had found the firſt full account of malignant epidemic fevers, attended with *petechiæ*, in *Fracaſtorius*. One of theſe appeared in the year 1505, and another three and twenty years after, both in *Italy*. That author omits the cauſe of the former; but the latter he aſcribes to an extraordinary inundation of the *Po*, which happen-

* In the original, Φλύκταιναι.

† This circumſtance of a ſudden *delirium* agrees with what was mentioned in the deſcription of the marſh-fever, in the cantonments near *Bois-le-duc*. Part iii. ch. iv. § 2.

‡ This is ſaid to be the principal cauſe of the malignant camp diſeaſes in *Hungary*: ſee pages 188, 189.

ing

ing in the ſpring left marſhes, and theſe corrupting infected the air throughout the ſummer.

Foreſtus remarks, that from the putrefaction of the water only, the city of *Delft*, where he practiſed, was ſcarce ten years together free from the plague, or ſome peſtilential diſtemper *. In the year 1694, a fever broke out at *Rochfort* in *France*, which, on account of the malignant ſymptoms and great mortality, was at firſt believed to be the true plague †. But M. *Chirac*, who was ſent by the Court to inquire into its nature, found the cauſe to ariſe from ſome marſhes that had been made by an inundation of the ſea, and obſerved, that the corrupted ſteams, which ſmelled like gun-powder, were carried to the town by the wind that had blown long from that quarter. About two thirds of thoſe who were taken ill died ‡. This fever raged in June, July and Auguſt, and then ended upon a great fall of rain, which purified the air and refreſhed the ſtagnating water.

I might adduce many inſtances of malignant fevers, occaſioned by the putrid *effluvia* of marſhes, from other

* *Obſervat. lib.* vi. He adds, that the magiſtrates upon his repreſentation of the cauſe, erected a wind-mill for moving and refreſhing the water. At that time *Holland* was much more liable to inundations, and to the ſtagnation of water than it is at preſent.

† Traité des Fievres Malignes. Oeuvres Poſthumes de M. CHIRAC. Eloge de M. CHIRAC par M. de FONTENELLE.

‡ In thoſe who were opened, the brain was found either inflamed, or loaded with blood; the fibres of the body were remarkably tender; and the bowels were either ſuppurated or mortified.

authors; but as thoſe already mentioned are ſufficient to prove what has been advanced, I ſhall obſerve upon the whole, that the bilious or remitting and intermitting fevers of low and wet countries, when at the worſt, may be conſidered as *ſpecies* of the malignant or peſtilential fever, ſince they have been ſeen with all the virulent ſymptoms peculiar to that claſs of diſeaſes *.

In general it may be remarked, that the putrefaction of animal or vegetable ſubſtances, in a dry air, is moſt apt to produce a malignant fever of a more continued form; whereas putrid *effluvia*, in a moiſt atmoſphere, have a greater tendency to bring on paroxyſms and remiſſions. But the ſteams of corrupted blood diſpoſe more to a flux than to any other diſorder; for, though ſome will be ſeized with the hoſpital-fever by the contagion of bloody ſtools, yet I have obſerved that for the moſt part this infection produces the dyſentery †.

From this view of the cauſes of malignant fevers and fluxes, it is eaſy to conceive how incident they muſt be, not only to all marſhy countries after hot ſeaſons, but to all populous cities, low and ill aired; unprovided with common ſewers; or where the ſtreets are narrow and foul; or the houſes dirty; where freſh water is ſcarce; where jails, or hoſpitals are crouded, and not

* Part iii. ch. iv. § 2, 3.

† Part iii. ch. vi. § 3.

ventilated

ventilated or kept clean; when in ſickly times, the burials are within the towns *, and the bodies not laid deep; when ſlaughter-houſes are within the walls; or when dead animals and offals are left to rot in the kennels, or on dunghills; when drains are not provided to carry off any large body of ſtagnating or corrupted water in the neighbourhood; when fleſh meats make the greateſt part of the diet, without a proper mixture of bread, greens, wine or other fermented liquors; when the grain is old and mouldy, or has been damaged by a wet ſeaſon; or when the fibres are relaxed by immoderate warm bathing. I ſay, in proportion to the number of theſe or the like cauſes concurring, a city will be more or leſs ſubject to peſtilential diſeaſes, or to receive the leaven of a true plague, when brought into it by any merchandize. I ſhall add a few inſtances to confirm theſe obſervations.

Conſtantinople is not only liable to frequent returns of the true plague, but to an annual peſtilential fever which may be conſidered as the endemic diſtemper of the place †. But, that this is not owing to the climate, appears from its healthful ſtate during the *Greek* empire, and from obſerving that, even now, ſuch as live in the ſuburbs and keep out of the way of infection are ſecure. Nor is the cauſe to be referred only to the crouds, and to the narrowneſs

* SCRETA De Feb. Caſtren. Malign.

† See TIMONI's account of the plague at *Conſtantinople* in Phil. Tranſ. N. 364. Abridg. Vol. vi. part iii. ch. ii. ſect. xxi.

and

and naſtineſs of the ſtreets, ſince ſome of the foreigners are leſs ſubject to the ſickneſs than the *Turks* themſelves *. It muſt therefore be attributed to ſomething peculiar to that people, or rather to ſuch as profeſs their religion. For, beſides that peſtilential diſtempers are frequent in all the cities of the *Levant*, they prevail greatly in *Egypt* †; where the inundations are not ſolely to be blamed, as that country was more healthful before it became a province of the *Ottoman* empire. And in *Sennar*, where Mahometaniſm is likewiſe eſtabliſhed, peſtilential fevers make great ravages, though they but ſeldom viſit the *Abyſſinians*, who border on that kingdom, and live in a hotter climate, but are Chriſtians ‡. Now, for this difference the following cauſes may be aſſigned. The religion of the *Turks* enjoins conſtant ablutions; and it is well known that warm bathing, by relaxing the fibres, diſpoſes the body to putrid diſeaſes §. Add to this, their abſtinence from wine and all fermented liquors, the great antidotes to putrefaction ‖; the

* Although TIMONI obſerves that ſtrangers in general run a greater hazard than the citizens, yet he adds, ‘ *Armeni omnium nationum minimè ad peſtem ſunt diſpoſiti: obſervo illos pauciſſimis uti carnibus: cepis, porris, alliis, vinoque maximè utuntur.*’

† Vid. PROSPER ALPIN. de Med. Egypt.

‡ Lettres Edifiantes et Curieuſes, recueil iv.

§ Therefore CELSUS forbids bathing in time of the *peſtilentia*; that is, as was ſhewn before, during the ſeaſon in which malignant or peſtilential fevers prevail. *De Med. lib.* i. cap x.

‖ We have the following ſingular obſervation in FORESTUS, on occaſion of a peſtilential fever that raged in his time: ‘ *Quincunque aquam ob ingentem calorem febrilem*

the principle of fataliſm, which keeps them from avoiding infection; and their ignorance of the learned arts, by which they might know to prevent or cure ſuch diſeaſes.

In the account of the epidemic malignant fever of *Cork* in *Ireland*, we find the cauſe aſcribed by the author to a concurrence of theſe circumſtances; the moiſture of the air, the impurity of the water, the infection of an uncommon number of ſlaughter-houſes, and the offals left to corrupt in the ſtreets, joined to the immoderate quantity of fleſh-meats eaten by the poorer people, without bread or fermented liquors, during the victualling ſeaſon *.

Foreſtus informs us of a peſtilential fever which raged at *Venice* in his time, produced by the corruption of a ſmall kind of fiſh in that part of the *Adriatic* †. And the ſame author quotes *Montanus* for a deſcription of the peſtilential endemic fever at *Famaguſta* in *Cyprus*, ariſing in ſummer from the corruption of a lake in the neighbourhood.

‘ *febrilem bibiſſent (ut villicus quidam, ad quem curandum alio morbo affectum, accitus eſſem, mihi narravit) correpti intra duos dies moriebantur. Qui vero cereviſiam bibebant, utpote potum magis huic noſtræ regioni conſuetum, iis morbus protrahebatur.*’ Dr. ROGERS obſerves, “ that ſuch as riot on animal food, “ and drink water only, are ſubject to putrid and ſlow fevers.”

* See Dr ROGERS's Eſſay on Epidemic Diſeaſes. In this book we have a full account of the riſe of a malignant fever, and ſmall-pox, deduced from a putrefaction in the air, peculiar to the city of *Cork*, from Auguſt to January. That place is noted for the great number of cattle killed for the uſe of the ſhipping, which is ſaid to amount to above 120,000 head in the year.

† Obſervat. lib. vi. obſ. ix. ſchol.

This

This very diſtemper we find taken notice of by *Fraçaſtorius*, and allowed to be the ſame with what he calls the *lenticulæ* or *punctícula*, ſince known by the name of the petechial fever.

Hiſtory abounds with examples of peſtilential fevers added to the other miſeries of a ſiege: nay, there is ſcarce any inſtance of a town being long inveſted, without ſome diſtemper of this kind. Sometimes it may be owing to the filth of a place crouded with people and cattle brought in for ſhelter, as it formerly happened both at *Athens* * and at *Rome* †; at other times, the ſickneſs has been occaſioned by corrupted grain ‡, and by meats long ſalted becoming putrid.

Although the putrefaction of vegetables is not ſo noxious as that of animals, it is not however without bad effects; for vegetables rotting in a cloſe place yield a cadaverous ſmell; and we have inſtances of malignant fevers occaſioned by the *effluvia* of putrid cabbages §, as well as of plants in marſhes. *Foreſtus* imputes the plague at *Delft*, in the year 1557, to the eating of mouldy grain, which had been long kept up by the merchants in a time of ſcarcity ‖. And I have heard it remarked, that in this

* DIODOR. SICUL. Bibliothec. Hiſt. lib. xii. cap. xlv.

† TIT. LIV. anno U. C. 291.

‡ CÆSAR *De Bell. Civ. lib.* ii. in his account of the ſiege of *Marſeilles*.

§ DR. ROGERS's Eſſay on Epidemic Diſeaſes, page 41.

‖ Obſervat. lib. vi. obſ. ix.

iſland

iſland the dyſentery is obſerved to be moſt frequent among the common people in thoſe parts where they live wholly on grain, when the preceding crop has been damaged in a rainy ſeaſon, or kept in damp granaries.

Jails have been often the cauſe of malignant fevers; and perhaps no where oftener than in this country. Lord *Bacon* makes the following obſervation: "The moſt pernicious infection, next the plague, is the ſmell of the "the jail, when the priſoners have been long, and cloſe, "and naſtily kept; whereof we have had, in our time, "experience twice or thrice, when both the judges that "ſat upon the jail *, and numbers of thoſe who attended "the buſineſs, or were preſent, ſickened upon it and "died. Therefore it were good wiſdom, that in ſuch "caſes the jail were aired before they be brought "forth †." It is probable that one of the times, pointed at by this noble author, was at the fatal aſſizes held in the year 1577, of which we have a more particular account in *Stowe*'s Chronicle, in theſe words: "On the 4th, 5th "and 6th days of July were the aſſizes held at *Oxon*, "where was arraigned and condemned *Rowland Jenkins* "for a ſeditious tongue; at which time there aroſe amidſt "the people ſuch a damp ‡, that almoſt all were ſmother-"ed. Very few eſcaped that were not taken....Here died

* That is, upon the priſoners from the jail.

† Natural Hiſtory, exp. 914.

‡ A damp; an old expreſſion (ſtill retained by the miners) ſignifying *bad air*.

" in *Oxon* three hundred perſons; and ſickened there, but " died in other places, two hundred and odd *.

Of the ſame kind of infection we have an unhappy inſtance ſo freſh in our memory that I need not have mentioned it here, had it not been to inform ſuch as live at a diſtance, or thoſe who are to come after us. In the year 1750, on the 11th of May, the ſeſſions began at the *Old Baily*, and continued for ſome days; in which time there were more criminals tried, and a greater multitude was preſent in the court than uſual. The hall in the *Old Baily* is a room of only about thirty feet ſquare. Now, whether the air was at firſt tainted from the bar by ſome of the priſoners then ill of the jail-diſtemper, or by the general uncleanlineſs of ſuch perſons, is uncertain †; but however that might have been, it will be eaſy to account for its corruption, eſpecially as it was ſo much vitiated by the foul ſteams of the *Bail-dock*, and of the two rooms opening into the court, in which the priſoners were the whole day crouded together till they were brought out to be tried ‡.

* This account is confirmed by CAMDEN: *vid. Annal. Eliz.*

† It has been the cuſtom, ſome days before every ſeſſions, to remove all the malefactors from the other jails into *Newgate* already too much crouded. At ſuch times three hundred have been confined within that narrow ſpace; and it is well known how naſtily both this and all the other priſons are kept.

‡ I have been informed, that at thoſe ſeſſions about a hundred were tried, who were all kept in thoſe cloſe places as long as the court ſat; and that each room was but 14 feet by 11, and ſeven feet high. The *Bail-dock* is alſo a ſmall room taken off one of the corners of the court, and left open at the top: in this, during the trials, are put ſome of the malefactors who have been under the cloſeſt confinement.

It

It appeared afterwards that thoſe places had not been cleaned for ſome years. The poiſonous quality of the air was ſtill aggravated by the heat and cloſeneſs of the court, and by the perſpirable matter of a great number of people of all ſorts, penned up for moſt part of the day without breathing the free air, or receiving any refreſhment. The bench conſiſted of ſix perſons *, whereof four died, together with two or three of the council, one of the under-ſheriffs, ſeveral of the *Middleſex*-jury, and others preſent, to the amount of above forty; without making allowance for thoſe of a lower rank, whoſe death may not have been

* *Viz.* the Lord Mayor, three of the Judges, one of the Aldermen, and the Recorder. Of theſe died Sir SAMUEL PENNANT, Lord Mayor; Sir THOMAS ABNEY and Baron CLARKE, Judges; and Sir DANIEL LAMBERT, Alderman. It is remarkable, that the Lord Chief Juſtice and the Recorder, who ſat on the Lord Mayor's right hand, eſcaped, whilſt he himſelf, with the reſt of the bench on his left, were ſeized with the infection; that the *Middleſex*-jury, on the left ſide of the court, loſt many, whilſt the *London*-jury, oppoſite to them, received no harm; and that of the whole multitude, but one or two, or, at moſt, a ſmall number of thoſe who were on the Lord Mayor's right hand, were taken ill. Some, unacquainted with the dangerous nature of putrid *effluvia*, have aſcribed both this circumſtance, and the ſickneſs in general, to a cold taken by opening a window; by which a ſtream of air was directed to the ſide of the court on the Lord Mayor's left hand. But it is to be obſerved, that the window was at the furtheſt end of the room from the bench, though the judges ſuffered moſt. Nor could the kind of the fever, or the mortality attending it, be attributed to a cold: it is therefore probable that the air from the window directed the putrid ſtreams to that part of the court abovementioned. This indeed muſt be granted, that all ſeptic particles, paſſing into the blood, become more active and fatal if the infected perſon catches cold, or by any accident ſuffers a ſtoppage of perſpiration: for, a free perſpiration ſeems to be the chief means by which the blood is purified from any infectious matter.

heard of; and without including any that did not ſicken within a fortnight after the ſeſſions.

It was ſaid, that this fever in the beginning had an inflammatory appearance, but that after large evacuations the pulſe ſunk *, and was not to be raiſed by bliſters, or cordials; and that the patients ſoon became delirious. Several had the *petechiæ*; and all that were ſeized with the fever died, excepting two or three at moſt. Some eſcaped without a fever by a looſeneſs coming on, which was eaſily cured. This ſickneſs, as far as was known, ſpread no further; there being at that time no diſpoſition in the air, nor other circumſtances, to propagate the infection.

By Dr. *Huxham*'s obſervations, we find that the ſame malignant fever has been frequent at *Plymouth* during the former war, occaſioned by the number of *French* priſoners, and by the hoſpitals and other places being crouded with men taken out of our own ſhips actually ill of this diſtemper †.

It is remarkable how much the plague, peſtilential fevers, putrid ſcurvies, and dyſenteries have abated in *Europe* within this laſt century; a bleſſing which we can aſcribe to no other ſecond cauſe than to our improvement

* See page 291.

† Eſſay on Fevers, ch. v. viii.

in

in every thing relating to cleanlineſs, and to the more general uſe of antiſeptics. *Felix Platerus*, phyſician at *Baſil* in *Switzerland*, gives an account of ſeven different peſtilential fevers (he calls each *peſtis*) which afflicted that city in the ſpace of ſeventy years, all of them within his memory *. *Thomas Bartholine* mentions five that raged in *Denmark* in his time, and all from ſome foreign contagion †. And other authors their contemporaries, throughout *Europe*, are full of the like obſervations. *Foreſtus* remarks, that in his days the plague was moſt frequent at *Cologne* and *Paris*, and refers the cauſe to the multitude of the inhabitants, and the naſtineſs of the ſtreets ‡; yet at preſent both thoſe cities are in general healthful, and not peculiarly ſubject to any putrid diſeaſe. *Timoni* takes notice, that at *Conſtantinople* the cleaner houſes are leſs liable to be infected with the plague than the dirty §.

As to diet, it may be obſerved, that hopped beer, wine and vinous liquors coming more into general uſe, have

* F. PLATER Obſervat. lib. ii.

† Noſtrâ memoriâ quinquies in Daniâ peſtilentia graſſata eſt, 1619, 1625, 1629, 1637, 1654, ſemper aliunde tranſlata: THO. BARTHOL. De Medicin. Danor. Domeſt. diſſert. iv.

‡ *Coloniæ, et Lutetiæ Pariſiorum, peſtis frequentiſſima eſt ob hominum frequentiam & ſorditiem platearum. Obſervat. lib.* vi. *obſ.* v. *ſchol.* At that time, the ſtreets not being paved, we may eaſily conceive how offenſive they muſt have been in ſuch large and populous cities. It will be proper to obſerve, that FORESTUS generally confounds the true plague with peſtilential or malignant fevers, and therefore it is probable that he only means the latter; ſince thoſe two cities were the leaſt liable to the true plague, from their inland ſituation.

§ Philoſ. Tranſact. n. 364. Abridg. vol. vi. part iii. ch. ii. ſect. xxi.

been

been ſome means of ſuppreſſing putrid diſeaſes. Greens and fruit are likewiſe more univerſally eaten *, and ſalted meats make a much leſs part of our diet than formerly. To this add the more general conſumption of tea and ſugar, which I have ſhewn elſewhere to be no inconſiderable antiſeptics †. How far theſe things may be abuſed, or become productive of other diſtempers, is not now the queſtion.

For ſo great a city, perhaps *London* at preſent is one of the leaſt ſubject to malignant fevers, to the dyſentery, or other

* Having aſked Mr. MILLER, keeper of the botanic garden at *Chelſea*, what he thought might be the proportion between the quantity of greens and fruit conſumed now, and an hundred years ago, he told me, "That in former times, he believed, "the tradeſmen and common people, about this city, ſcarce uſed any, and thoſe "of higher rank, very little. For, that he had been aſſured by old gardeners, and by "others of his acquaintance, that ſo late as ſeventy years ago, a cabbage ſold at three-"pence, which now ſells for a half-penny; and that moſt other greens and fruit "were proportionally dear; inſomuch that thoſe, who now eat garden-vegetables "every day, would then only uſe them on Sundays, by way of dainty. From "which circumſtance, and the preſent extent of ground laid out in kitchen-gar-"dens, he inferred, that there was at leaſt ſix times more garden-ſtuff uſed now "than about the time of the Revolution." Nor are we to think that this defect of greens and fruit was ſupplied by a greater conſumption of the *farinacea* in bread, or in other forms; ſince at that time bread was dearer in proportion to meat than it is now. Hence it ſeems reaſonable to conclude, that formerly a greater quantity of fleſh was eaten than at preſent; and it is well known how much more ſalted meats were then in common uſe. Let me add, with regard to the *farinacea*, that they do not ſeem ſo much diſpoſed to reſiſt putrefaction as greens or fruit; as appears by the cure of the ſea ſcurvy, and from ſome experiments that have been made on that ſubject: ſee Append. paper iii. exp. xx. xxi.

† Append. paper iv. exp. xxvi.

putrid

putrid diſorders; with all which it ſeems formerly to have been infeſted little leſs than others, notwithſtanding the natural advantages of its ſituation, *viz.* in a climate not liable to great heats, or cloſe weather, on a gravelly ſoil, and on the banks of a large river, which not only ſupplies freſh water, but freſh air, by the conſtant motion of the tides. Add, that *London* ſtands in a wide plain, where the fields are kept pretty open. Even ſince the days of *Sydenham* there appears to be a conſiderable alteration for the better; for, beſides that there has been no plague, we have known no malignant epidemic fever, or very fatal dyſentery *, and few bilious fevers of a bad kind; or indeed, excepting the ſmall-pox and meaſles, any putrid diſtemper that could be called general. In ſome of the loweſt, moiſteſt and cloſeſt parts of the town, and amongſt the poorer people, ſpotted fevers and dyſenteries are ſtill to be ſeen; but which are ſeldom heard of amongſt thoſe of better rank living in more airy ſituations. Although many things relating to theſe matters might be better regulated, yet ſome of the main points are already attended to; ſuch as regard the privies, the common ſewers, the ſupplies of freſh water; and the people in general are very cleanly.

The common dirt of the ſtreets does not ſeem to affect the health of the inhabitants of great cities; and though

* In autumn 1762, the dyſentery though frequent could not be called epidemic. It prevailed chiefly among the lower people, and in general was of a benign kind: ſee page 251, 252.

the

the more offenſive kind of it may concur with other things to render the air leſs healthful, yet it ſeems to have no direct influence in producing peſtilential diſeaſes. Stale urine abounds with a volatile alkaline ſalt reſiſting putrefaction *; and the common *fæces* are rendered leſs, if at all infectious, by means of a ſtrong acid combined with the parts which are really putrid †. The caſe is different in putrid diſorders, and eſpecially in the dyſentery, where the *fæces*, as we have already ſhewn, are wholly corrupted, and contagious ‡.

I ſhall conclude this part of my ſubject with obſerving, that whilſt great cities furniſh many materials for vitiating the air, they are provided with two conſiderable antidotes; the firſt ariſes from the circulation of the air, by means of the conſtant motion of the people and carriages, and of the draughts made by fires; the other depends on the great quantity of an acid produced by fuel, the ſtrongeſt reſiſter of putrefaction.

II. Thus far the *remote* and *external cauſes* of the hoſpital and other malignant fevers ſeem to be ſufficiently aſcertained. But in what manner theſe cauſes act, and produce the various

* Append. paper i. exp. ii. iii.

† Append. paper vii. exp. xliii. Add the experiments of M. HOMBERG *ſur la matiere fecale. Hiſt. de l'Acad. R. de Sciences, A.* 1711. HOFFMAN *Med. Rat. Syſt. tom.* i. *lib.* i. *ſect.* ii. *cap.* vii.

‡ Part i. ch. iii. Part ii. ch. ii. § 3. Part iii. ch. vi. § 1.

various ſymptoms within the body is not ſo eaſily determined, and therefore what follows is to be conſidered merely as a conjecture.

I conceive that the *miaſma* or ſeptic ferment (conſiſting of the *effluvia* from putrid ſubſtances) being received into the blood, has a power of corrupting the whole maſs *. The reſolution of the blood, and ſometimes even its ſmell in the advanced ſtate of a malignant fever, the offenſiveneſs of the ſweats and other excretions, the livid ſpots, blotches, and mortifications incident to this diſtemper ſeem to be proofs of what is here advanced. By its acrimony the nerves are affected with various ſpaſms; the pulſe is quickened, at firſt raiſed, but ſoon depreſſed when the heart is not ſupplied with the vital principle, or from a reſolution of its fibres occaſioned by putrefaction. I have elſewhere produced inſtances of the heart being ſo far relaxed, in a real peſtilence, as to become uncommonly large by the ordinary force of the blood †.

Yet, were putrefaction the only change made in the body by contagion, it would be eaſy to cure ſuch fevers, at any period, by the uſe of acids, or other antiſeptics. But as the diſeaſe, when once it is formed, is not to be removed by any ſuch means, it would therefore ſeem

* See the Append. paper vii. exp. xlviii.

† Append. paper vii. exp. xlvi.

that the brain is inflamed early, and that the fever is chiefly kept up by that inflammation *; that to this circumſtance moſt of the ſymptoms are owing; and that in the advanced ſtate a cure cannot be expected till the obſtructing matter is reſolved, or ſuppurated.

This laſt part is rendered more probable, by obſerving ſome affinity between the ſymptoms of this fever, and thoſe of the *low* and *nervous* kind, which carry ſtrong marks of an inflammation of ſome part of the brain, though the immediate cauſe has not been from putrefaction. The ſinking of the pulſe, the pale urine, ſweats not critical, confuſion of the head, decay of ſtrength, dejection of ſpirits, and *tremor* of the muſcles are common to both: and therefore, conſidering the appearance of the brain in thoſe who died of the hoſpital-fever, it ſeems reaſonable to conclude, that theſe ſymptoms immediately depend upon the inflammation, or the ſuppuration of that organ.

Another argument may be drawn from the cure. Thus, before the inflammation is fixed, the ſeptic particles may be expelled by ſweating; after that period, the moſt effectual method is to ſupport the ſtrength, but ſo as not to increaſe the inflammation. Near the end of the laſt ſtage of the diſeaſe, the humours being reſolved by putrefaction, the obſtruction is thereby removed; at which time

* See the diſſections.

the

the ſtrongeſt antiſeptic and cordial medicines have place, in order to correct, and to enable nature to expel what is ſo much vitiated. In this low ſtate the volatiles are ſometimes uſeful for raiſing the pulſe; wine is a conſtant cordial; and not only wine, but camphire, *ſerpentaria*, and the Bark are endowed with conſiderable antiſeptic qualities *.

Theſe are all the remarks which I have made on the nature and cauſes of malignant fevers. In the deſcription, I have endeavoured to diſtinguiſh them from all others, as far as can be done in diſtempers whoſe ſymptoms are ſo much alike. The nervous fevers are frequently accompanied with miliary eruptions, which have no reſemblance to the *petechiæ*; nor have I ever happened to ſee miliary eruptions in this malignant kind. The nervous fevers ſeem to belong to the inflammatory and to the bilious claſſes of diſeaſes, though incident to ſuch chiefly as are of a weak or lax habit. But whatever gives the firſt riſe to them, if they end in petechial ſpots, putrid ſweats, or become contagious, we may from thence conclude, that by the long continuance of the fever the humours are become putrid; or, in other words, that the nervous fever is changed into one of a malignant form akin to that of hoſpitals and jails.

* Append. paper ii. exp. xi. xii. xiii.

CHAP. VIII.

Obſervations on the itch.

IN the diviſion of the diſeaſes moſt incident to an army, this was the laſt mentioned. Although it be of a contagious nature, the infection is communicated only by the contact of the diſeaſed perſon, of his clothes, bedding, *&c.* and not by *effluvia*, as in the dyſentery and hoſpital-fever. It is confined to the ſkin, and ſeems beſt accounted for by *Leeuwenhoek*, from certain ſmall inſects which he diſcovered in the puſtules by the microſcope *. So that the frequency of the itch in the army is not to be aſcribed to the change of air, or diet, that ſoldiers are expoſed to upon expeditions, but to the infection propagated by a few (who happen to have it at firſt ſetting out) to others in the ſame ſhip, tent, or barrack †. But of all places the hoſpitals are moſt liable to this contagion, as receiving all ſorts of patients. Hence I have obſerved, that after the *criſis* of fevers the itch generally appeared, though the perſon was free from it when admitted.

* Since the firſt edition was publiſhed, I have ſeen a paper in the Phil. Tranſact. for the year 1730, called, 'An abſtract of a letter from DR. BONOMO to Signior 'REDI, containing ſome obſervations concerning the worms of human bodies, by 'DR. RICHARD MEAD.' By which account, I find that DR. BONOMO was the firſt who diſcovered theſe *animalcula*, and likewiſe who propoſed curing the itch by external applications only.

† Part i. ch. ii.

One

One therefore unacquainted with this diſorder might be apt to miſtake it for a miliary eruption, eſpecially as theſe two bear a nearer reſemblance to each other, than could be expected in two ailments of ſo different a nature. But thoſe who know how ſeldom the miliary eruptions, and how frequently the other are ſeen in the army, will be leſs liable to fall into this error. The two may alſo be diſtinguiſhed by the following marks: the miliary puſtules, though not confined to the neck and breaſt, yet are moſt numerous and viſible there; whilſt the other infect moſtly the parts between the fingers, the inſide of the wriſts, the ſides of the belly, and the hams. The miliary eruption appears before the fever has ceaſed; they are attended with little itching, and go off of themſelves; whereas the itch is not perceived till after the *criſis*, in the convaleſcent ſtate, when it increaſes daily and becomes very troubleſome.

Although an army cannot be intirely freed from the itch, yet the cure of each individual is more certain in this than in moſt other diſtempers; and the remedy is ſo well known that I ſcarce need mention it. But I have ſeen the common method oftener fail with the officers than with the private men; becauſe the latter having no change of dreſs, what they wore was purified at the ſame time that they themſelves were cured; whilſt an officer catching the itch, has run a hazard of keeping it longer,

from

from the circulation of infection between his body and his clothes.

Sulphur is the ſpecific remedy of this diſtemper, and is both more ſafe and more efficacious than mercury. For, unleſs a mercurial ointment touches every part of the ſkin, there can be no dependance upon it; whereas by a ſulphurous application, a cure may be obtained by partial unctions only. It would ſeem as if theſe, as well as other inſects, were killed by the ſteams of brimſtone, though only raiſed by the heat of the body. And as to the internal uſe of mercury, which ſome have accounted ſpecific, we have known ſeveral inſtances, in the hoſpital, of men undergoing a complete ſalivation for the cure of the *lues venerea* without being cured of the itch. The ointment which I moſtly uſed was made in this manner:

℞ *Florum ſulphuris* ℥j. *ſalis Ammoniaci crudi* ʒj. *axungiæ porcinæ* ℥ij. *miſce.*

This quantity ſerved for four unctions; and the patient was rubbed every night. But to prevent any diſorder that might ariſe from ſtopping too many pores at once, only a fourth part of the body was anointed at a time. Some are ſaid to cure this diſeaſe by rubbing the legs only; but that method I never tried, believing it neceſſary that the whole ſkin ſhould be touched.

Although

Although the itch may be thus removed by one pot of ointment, yet it will be proper to renew the application, and to rub the parts moſt affected for ſome nights longer, till a ſecond or third quantity is alſo exhauſted. In ſome bad caſes we are obliged to continue to anoint the whole body for ſeveral nights together, and alſo to ſubjoin the internal uſe of ſulphur; not with a view to purify the blood, but to diffuſe the ſteams more certainly through the ſkin; as the *animalcula* may ſometimes lie too deep to be throughly deſtroyed by a mere external application.

As theſe fumes may heat the blood at a time when the perſpiration is ſo much impeded, it is proper that the patient ſhould live all the while on a cool diet, and guard againſt cold. If he is of a full habit, or in any degree feveriſh, he ſhould bleed and take a purge; otherwiſe neither of theſe two evacuations ſeem to be neceſſary.

The nature of the itch has been often miſtaken, whilſt ſome have referred it to the leprous, and others to the ſcorbutic claſs of diſeaſes; whereas it appears to be a diſtemper *ſui generis*, or at leaſt very different from either of thoſe two. The *pſora* of the *Greek* writers, and the *ſcabies* of the *Latin*, have been generally ſuppoſed to be this very eruption; but as this is not evident from the deſcription which they give of them *, I ſhould conclude, that

* PAULUS ÆGIN. lib. iv. cap. ii. CELSUS lib. v. cap. xxviii.

though

though other diſeaſes of the ſkin ſeem to have been formerly no leſs frequent than at preſent, yet the itch was either altogether unknown, or at leaſt uncommon among the ancients; ſince they take ſuch particular notice of other cutaneous foulneſſes, and wholly omit this.

Further, it may be obſerved, that in the moſt marſhy parts of the *Low-Countries*, where the true ſcurvy is ſo general and bad, the itch is ſcarce known; and that though both the ſcurvy and the itch may meet on board our ſhips, yet they are to be conſidered as two diſtinct ailments; the former ariſing from foul air, bad water, corrupted proviſions, and the want of vegetables; the other, from contagion; each requiring a different cure.

Both the *ſcabies* and the various kinds of the *impetigo* * of the ancients ſeem at preſent to be confounded under the general, but improper appellation of *ſcorbutic eruptions* †. The former are chiefly diſtinguiſhed by the hardneſs of the ſkin in one or more parts of the body,

* It would ſeem, that by the *impetigo* CELSUS means the *lepra Græcorum*. *Vid. loc. cit.*

† The true ſcorbutic ſpots are of a livid colour, not commonly ſcurfy, or raiſed above the ſkin; and are attended with manifeſt ſigns of a lax ſtate of the fibres and a corruption of the blood. For, a real ſcurvy imports a flow, but general reſolution or putrefaction of the whole frame; whereas the *ſcabies*, *impetigo* or leproſy may be found to affect thoſe of a very different conſtitution.

attended

attended with a dry ſcurf, or puſtules, or ſcabs; and always with ſome degree of itching. But they are ſo far from being always cureable by external applications only, that it is ſometimes dangerous to attempt to ſubdue them in that manner. Here it is thought neceſſary to change the humours by a ſpare diet, frequent purges of the ſaline kind, or by mercurial or other medicines, which have little or no efficacy in curing the itch, and which rather increaſe than cure the true ſcurvy.

APPENDIX,

CONTAINING

I. Experiments upon Septic and Antiſeptic Subſtances, with Remarks relating to their Uſe in the Theory of Medicine, in ſeveral Papers read before the ROYAL SOCIETY.

AND

II. An Anſwer to Profeſſor DE HAEN and M. GABER, concerning ſome Remarks made by them on the preceding Work.

Δόξα μὲν ανθρώποισι κακὴν μέγας. Πεῖρα δ' ἄριστον.

THEOGNID. *Sentent.*

APPENDIX,

PAPER I.

Experiments ſhewing that putrid ſubſtances are not to be called alkaline; that neither the volatile nor fixed alcaline ſalts tend naturally to promote putrefaction within the body, being of themſelves antiſeptic. That the combination of two antiſeptics may produce a third weaker than either. Experiments upon the comparative powers of ſome neutral ſalts in reſiſting putrefaction. And of the ſtrong antiſeptic qualities of myrrh, camphire, ſnake-root, camomile-flowers, and the Peruvian *bark.*

Read June 28, 1750, ALTHOUGH an inquiry into the manner how bodies are reſolved by putrefaction, with the means of accelerating, or preventing that proceſs, has been reckoned not only curious but uſeful *, yet we find it little proſecuted in an experimental way: nor is it to be wondered at, conſidering how offenſive ſuch

* Lord BACON calls the inducing or accelerating putrefaction "a ſubject of "very univerſal inquiry;" and ſays, "that it is of excellent uſe to inquire into the "means of preventing or ſtaying putrefaction; which makes a great part of phyſic "and ſurgery. Nat. Hiſt. cent. iv.

opera-

operations are. But as I have been led to make ſome experiments and remarks on this ſubject, by my having had an uncommon number of putrid diſtempers under my care in the hoſpitals of the army, I ſhall venture to lay before the Society what I have found different from the common opinion; as well as ſome facts, which, as far as I know, have not been mentioned before.

FINDING it a received notion, that bodies by putrefaction become highly alkaline, I made the following experiments to enquire how far this may be true.

EXPERIMENT I.

THE *ſerum* of human blood putrefied made, with a ſolution of the corroſive ſublimate, firſt a turbid mixture, and afterwards a precipitation. This is one of the teſts of an alkali, but ſcarce to be admitted here; ſince the ſame thing was done with recent the urine of a perſon in health, which is never accounted alkaline. The ſame *ſerum* did not tinge the ſyrup of violets green, and made no effervеſcence when the ſpirit of vitriol was poured upon it. I made the experiment twice upon portions of a different *ſerum*, both highly putrid; and once on water in which corrupted fleſh had been ſometime infuſed; and the moſt I could find was, that having previouſly given the ſyrup a reddiſh caſt with an acid, this colour

was rendered fainter (which might be the effect of dilution) but was not deſtroyed by the putrid humours. And as to effervеſcence, having dropped the ſpirit of vitriol into thoſe liquors unmixed, and alſo diluted with water, the mixture was quiet, and only a few air-bubbles appeared on ſhaking the glaſſes. Upon the whole, though there were ſome marks of a latent alkali in the putrid *ſerum*, yet they were ſo very faint, that a quantity of water equal to that of the putrid liquors, mixed with only one drop of the ſpirit of hartſhorn, being put to the ſame trial, ſhewed more of an alkaline nature *.

EXPERIMENT II.

IT has been a maxim, that all animal ſubſtances being diſtilled after putrefaction ſend forth a great quantity of volatile ſalt in the firſt water; but Mr. *Boyle* found that this held good in urine only, and that in the diſtillation of the *ſerum* of human blood putrefied, the liquor which came firſt over had little ſtrength, either as to its ſmell or taſte, and did not at firſt effervеſce with an acid †. And here it may be obſerved, that the chemiſts have generally applied thoſe properties which they diſcovered in urine to all the humours indifferently, whereas, in fact, there

* My concluſion from this experiment is too general, as will appear by a remark made by M. GABER: ſee An Anſwer &c. at the end of the Appendix.

† Nat. Hiſt. of the Human Blood, vol. iv. page 178. fol.

is a great diverſity. For, ſome animal ſubſtances, ſuch as the urine, the bile, and the *craſſamentum* of the blood ſoon putrefy; the *ſerum*, the *ſaliva*, and the white of an egg, ſlowly. Yet thoſe that ſooneſt corrupt do not always arrive at the higheſt degree of putrefaction. Thus the bile is ſoon corruptible, but the rankneſs of it is not to be compared to that of fleſh; and the white of an egg is not only much leſs diſpoſed to putrefy than the yolk, but when corrupted yields a different and leſs offenſive ſmell; and it ſeems peculiar to ſtale urine to contain an alkaline ſalt, which, without diſtillation, makes a ſtrong effervescence with acids; whereas moſt other animal humours putrefied, though of a more intolerable *fœtor*, contain leſs volatile ſalt, leſs extricable, and ſcarce effervescing with acids. But what makes the difference between ſtale urine and other putrid ſubſtances ſtill greater, is its inoffenſiveneſs with regard to health; whilſt the ſteams of moſt other corrupted bodies are often the cauſe of putrid and malignant diſeaſes.

Now, upon finding in urine a much greater quantity of volatile ſalt, and that more eaſily ſeparable than in any other humour; and that ſtale urine is the leaſt noxious of putrid animal ſubſtances; ſo far from dreading the volatile alkali as the deleterious part of corrupted bodies, from this inſtance we may rather infer it to be a ſort of corrector of putrefaction.

EXPERIMENT III.

DAILY experience ſhews how harmleſs the volatiles are, whether ſmelled to, or taken in ſubſtance; but ſtill there remains a prejudice, as if thoſe ſalts, being the produce of corruption, ſhould therefore haſten putrefaction, not only in diſtempers where they are unwarily given, but alſo in experiments out of the body.

As to the effects ariſing from the internal uſe of them little can be ſaid, unleſs the kind of the diſorder were preciſely ſtated. For, ſuppoſing they were by their nature diſpoſed to promote putrefaction, yet if that is already begun, from a languid circulation and obſtruction, the volatiles may then, by their ſtimulating and aperient qualities, be the means of ſtopping its progreſs. And on the other hand, though they were really antiſeptic, yet if the humours are diſpoſed to corruption, from exceſs of heat or motion, theſe very ſalts, by adding to the cauſe, may augment the diſeaſe. So that upon the whole it will be the faireſt *criterion* of the nature of theſe volatiles, to inquire whether, out of the body, they accelerate, or retard putrefaction.

1. In order to decide this queſtion, I made repeated experiments of joining both the ſpirit, and the ſalt of hartſhorn to various animal ſubſtances, and I conſtantly

found, that ſo far from promoting putrefaction they evidently prevented it, and that with a power proportioned to their quantity *. The trials were made with the *ſerum* of the blood, and alſo with the *craſſamentum* after it had been dried by keeping. I once ſeparated the thick inflammatory cruſt of pleuritic blood from the reſt of the maſs, and having divided it, I put one portion into diſtilled vinegar, the other into the ſpirit of hartſhorn; and after keeping the infuſions above a month, in the middle of ſummer, I found the piece which lay in the alkaline ſpirit as ſound as that in the acid.

2. Another time, I put into a four-ounce phial about an ounce and an half of an equal mixture of ox's gall and water, with 100 drops of ſpirit of hartſhorn; and in another, as much of the gall and water, without any ſpirit. The phials being corked were ſet by a fire, ſo as to receive about the degree of animal heat, and in leſs than two days, the mixture without the ſpirit became putrid; yet the other was not only then, but after two days longer, untainted.

3. I afterwards infuſed two drachms of the lean of beef in two ounces of water, adding half a drachm of the ſalt of hartſhorn; another phial contained as much fleſh

* Mr. BOYLE had already obſerved, that fine urinous ſpirits added to blood warm from the vein, would make it appear more florid, keep it more fluid, and long preſerve it from putrefaction. Phil. Tranſact. n. 29. Abridg. vol. iii. ch. v. § viii.

and

and water, with a double quantity of ſea-ſalt; in a third there was only the fleſh and the water by way of ſtandard: theſe phials were placed in a lamp furnace, in a heat varying between 94 and 100 degrees of *Fahrenheit*'s ſcale. About eighteen hours after infuſion, the contents of the phial, which ſerved as a ſtandard, were rank; and in a few hours more, that with the ſea-ſalt was alſo putrid; but the fleſh with the volatile alkali was found, and ſo continued after ſtanding four and twenty hours longer, in the ſame degree of heat. And that the ſmell of the hartſhorn might occaſion no deception, the piece of fleſh was waſhed from the ſalt, and ſtill ſmelled ſweet.

4. About the ſame time I took three pieces of freſh beef, of the ſame weight as above mentioned, and laying two of them in gally-pots, I covered one with ſaw-duſt, and the other with bran; but the third piece being ſtrewed with ſalt of hartſhorn powdered, I put into a four-ounce phial which had a glaſs ſtopper. They were all three placed on the outſide of a window expoſed to the ſun, and the weather being warm, the fleſh in the gally-pots began to ſmell on the third day, and on the fourth was quite putrid. Next day, the phial was examined, when the fleſh was waſhed from the ſalt, and found quite ſweet. It was then dried and ſalted again with hartſhorn; and having ſtood in the houſe for ſome weeks, in hot weather, it was inſpected a ſecond time, and found to be as ſound as before. Nor was the ſubſtance at all diſſolved, but of ſuch a con-

ſiſtence as might be expected from its having lain in common brine *. And leſt it ſhould be ſuſpected that the fleſh in the gally-pots, by being more expoſed to the air than that in the phial, became ſooner putrid, I alſo incloſed fleſh in phials, like that with the ſalt of hartſhorn, and found the confinement rather haſten the putrefaction.

Now, by theſe and many other experiments of the ſame kind, finding that volatile alkaline ſalts not only do not diſpoſe animal ſubſtances to putrefaction, out of the body, but even prevent it, and that more powerfully than common ſea-ſalt, we may preſume that the ſame, taken by way of medicine, will *cæteris paribus* prove antiſeptic; at leaſt, we cannot juſtly ſuppoſe them corrupters of the humours, more than wine or ſpirits, which taken in immoderate quantities may raiſe a fever, and thereby accidentally be the occaſion of corruption.

EXPERIMENT IV.

I LIKEWISE made ſeveral experiments with the fixed alkaline ſalts, and found that they had little leſs antiſeptic powers than the volatile. The trials were both with the ley of tartar and the ſalt of wormwood. But here we muſt not confound the diſagreeable ſmell of ſuch mixtures, with one that is really putrid; nor the power which

* The ſame piece being kept a twelvemonth, continued untainted and as firm as at firſt.

theſe

theſe lixivials have of diſſolving ſome animal ſubſtances, with putrefaction *.

EXPERIMENT V.

FROM theſe experiments it was natural to conclude, that ſince acids by themſelves were amongſt the moſt powerful antiſeptics, and ſince the alkaline ſalts were likewiſe of that claſs, a mixture of the two to ſaturation would reſiſt putrefaction little leſs than the acid alone. But in the trials which I made upon fleſh with a *ſpiritus Mindereri* compoſed of vinegar ſaturated with ſalt of hartſhorn, and alſo with the juice of lemons ſaturated with the ſalt of wormwood, I found the antiſeptic virtue conſiderably leſs than when either the acids or alkalies were uſed ſingly.

EXPERIMENT VI.

AS to the comparative powers of theſe ſalts upon fleſh, I obſerved that half an ounce of lemon-juice, ſaturated with a ſcruple of the ſalt of wormwood, reſiſted putrefaction nearly as much as fifteen grains of nitre; and when the trial was made with ox's gall, that two drachms of that mixture were more antiſeptic than a ſcruple of nitre. Again, that nitre compared with the

* In the trials upon fleſh, I obſerved that though the fixed alkaline ſalts ſeemed at firſt to looſen the texture of fibrous animal ſubſtances, yet after infuſion for ſome days, thoſe pieces not only were not diſſolved, but were firmer than others which had lain in water only.

dry

dry neutral ſalts, weight for weight, was more antiſeptic than any which I had tried, in preſerving fleſh. The *ſal Ammoniacus* came next to it, and even exceeded it in the experiment with ox's gall. After theſe, the *ſal diureticus*, *tartarus ſolubilis*, and *tartarus vitriolatus* ſeemed to have nearly the ſame antiſeptic qualities.

EXPERIMENT VII.

THUS far I have examined the common neutral ſalts; which however powerful in reſiſting putrefaction are inferior to ſome reſinous ſubſtances, and even to ſome plants that I have tried. Thus myrrh, in a watery *menſtruum*, was found at leaſt twelve times more antiſeptic than ſea-ſalt. Two grains of camphire, mixed with water, preſerved fleſh better than ſixty grains of ſea-ſalt: and I imagine, that could the camphire have been kept from flying off, or concreting to the ſides of the phial, half a grain, or even leſs would have ſufficed. An infuſion of a few grains of *Virginian* ſnake-root, in powder, exceeded twelve times its weight of ſea-ſalt. Camomile-flowers have nearly the ſame quality. The *Peruvian* bark is alſo antiſeptic; and if I have not found it ſo ſtrong as the two ſubſtances laſt mentioned, I impute that, in ſome meaſure, to my not having been able to extract all its embalming parts in water.

Now,

Now, the watery infuſions of vegetables poſſeſſing this balſamic virtue are the more valuable, in that being uſually free of acrimony, they may be taken in greater quantities than either ſpirits, acids, reſins, or even the neutral ſalts. And as in the great variety of ſubſtances anſwering this purpoſe, there may be ſome offenſive, or uſeful qualities annexed, it would not be amiſs to review ſome part of the *materia medica* with this intention.

I ſhall add, that beſides this extraordinary power in preſerving bodies, I have diſcovered in ſome of thoſe ſubſtances a ſweetening or correcting quality, after putrefaction had actually begun. But thoſe experiments I ſhall lay before the Society at ſome other time, with a table of the comparative force of ſalts, and ſome further remarks upon the ſame ſubject.

PAPER II.

A continuation of the experiments and remarks upon antiſeptic ſubſtances. A table of the comparative powers of ſalts in reſiſting putrefaction. Of the antiſeptic quality of ſeveral reſins, gums, flowers, roots and leaves of vegetables, compared with common ſalt. Attempts to ſweeten corrupted animal ſubſtances by means of camomile-flowers, and the Peruvian *bark. A conjecture about the cauſe of intermitting fevers, and about the action of the Bark in curing them.*

Read Nov. 21, 1750. HAVING in my laſt paper juſt mentioned the comparative force of a few ſalts, and of other ſubſtances in reſiſting putrefaction, I ſhall now lay before the Society a particular account of thoſe experiments, and of ſome other which I have made on that ſubject.

EXPERIMENT VIII.

THREE pieces of the lean of freſh beef, each weighing two drachms, were put ſeparately into wide mouthed phials. Two ounces of ciſtern-water were added to each; in one, were diſſolved thirty grains of ſea-ſalt *; in another, ſixty; but the third contained nothing but fleſh and water.

* All theſe experiments were made with the white or boiled ſalt in common uſe here.

Theſe phials were little more than half full, and being corked were placed in a lamp-furnace regulated by a thermometer, and kept about the degree of the heat of the human body.

In about ten or twelve hours after, the contents of the phial without ſalt had a faint ſmell, and in two or three hours more became putrid *. In an hour or two longer, the fleſh with the leaſt ſalt was tainted, but that which had moſt remained ſweet above thirty hours after infuſion. This experiment was often repeated with the ſame reſult, allowance being made for ſome ſmall variations in the degree of heat.

The uſe of the experiment was for making ſtandards, whereby to judge of the ſeptic, or antiſeptic ſtrength of bodies. Thus, if water with any ingredient preſerved fleſh better than without it, or better than with the addition of the ſalt, that ingredient might be ſaid to reſiſt putrefaction more than water alone, or water with thirty or ſixty grains of ſea-ſalt. But if, on the other hand, water with any addition brought on corruption faſter than when pure, the ſubſtance added was to be reckoned a promoter of putrefaction.

* Theſe pieces were intire. But when they are beaten to the conſiſtence of a pulp, with the ſame quantity of water, the putrefaction begins in leſs than half the time mentioned above.

The following experiments were therefore all made in the ſame degree of heat, with the quantities of fleſh, water, and air above ſpecified; together with ſuch ſeptic, or antiſeptic ſubſtances as ſhall be afterwards mentioned, and were all compared with the ſtandards. But as the ſmalleſt quantity of ſalt preſerved fleſh little longer than plain water, I have always compared the ſeveral antiſeptic bodies with the largeſt quantity; ſo that whenever any ſubſtance is ſaid to oppoſe putrefaction more than the ſtandard, I mean, more than ſixty grains of ſea-ſalt diſſolved in two ounces of water.

EXPERIMENT IX.

I THEN examined other ſalts, and compared them in the ſame quantity with the ſtandard, which being of all the weakeſt reſiſter of putrefaction, I ſhall ſuppoſe it equal to unity, and expreſs the proportional ſtrength of the reſt in higher numbers, as in the following table.

A table of the comparative powers of ſalts in reſiſting putrefaction.

Sea-ſalt	1
Sal gemmæ	1 +
Tartarus vitriolatus	2
Spiritus Mindereri	2

Tartarus

Tartarus ſolubilis	2
Sal diureticus	2 +
Sal Ammoniacus	3
Saline mixture	3
Nitre	4 +
Salt of hartſhorn	4 +
Salt of wormwood	4 +
Borax	12 +
Salt of amber	20 +
Alum	30 +

In this table I have marked the proportions by integral numbers, it being difficult, and perhaps unneceſſary, to bring this matter to more exactneſs; only to ſome I have added the ſign +, to ſhew, that thoſe ſalts are ſtronger than the number in the table by ſome fraction; except in the three laſt, where the ſame ſign imports that the ſalt may be ſtronger by ſome units *. The vitriolated tartar is rated at 2, though more than thirty grains were taken to equal the ſtandard; but as I perceived that all of it was not diſſolved, an allowance was made accordingly. On

* Five grains of borax was the ſmalleſt quantity compared with ſixty grains of ſea-ſalt; but from its holding out ſo much longer, I ſuſpect that three grains would have been ſufficient; in which caſe the force of this ſalt was to be eſtimated at 20: a ſingular inſtance of the ſtrength of a ſalt, which, ſo far from being acid, is rather alkaline, if we may judge by its urinous taſte. One grain of alum was weaker than ſixty grains of ſea-ſalt, but two grains were ſtronger. The power therefore of alum lies between 30 and 60, but by the experiment nearer the firſt of theſe numbers.

the other hand, as part of the hartſhorn flies off, its real force muſt be greater than is ſhewn by the table. The ſalt of amber is little volatile; but as three grains thereof were found more preſervative than ſixty of the ſea-ſalt, it muſt therefore be more than twenty times ſtronger. This is indeed an acid ſalt; but as the acid part in ſo ſmall a quantity is inconſiderable, it ſhould ſeem that the antiſeptic power is owing to ſome other principle. The *ſpiritus Mindereri* was made of common vinegar and ſalt of hartſhorn; the ſaline mixture, of ſalt of wormwood ſaturated with lemon-juice *. The alkaline part in either of theſe mixtures, with water only, would have reſiſted with a power of 4+; ſo that the acid added, rendered theſe ſalts leſs antiſeptic; *viz.* the *ſpiritus Mindereri*, by one half; and the ſaline mixture, by a fourth part, which was a circumſtance quite unexpected.

EXPERIMENT X.

1. I PROCEEDED to try reſins and gums, and began with myrrh. As part of that ſubſtance diſſolves in water, eight grains were made into an emulſion; but moſt of it ſubſiding, I could not reckon on a ſolution of more than one or two grains, which nevertheleſs having preſerved the

* Both the *ſpiritus Mindereri* and the ſaline mixture being in a liquid form are compared with the dry ſalts, upon the quantity which they contain of the alkaline ſalt.

fleſh longer than the ſtandard, we may account the ſoluble part of myrrh perhaps about thirty times ſtronger than ſea-ſalt.

2. *Aloe*, *aſa fœtida*, and *terra Japonica* diſſolved in the ſame manner as myrrh, like it ſubſided, and had the ſame antiſeptic force. But gum *Ammoniacum* and *ſagapenum* ſhewed little of this virtue; whether it was, that they oppoſed putrefaction leſs, or that moſt of the antiſeptic principle fell with the groſſer parts to the bottom. Three grains of opium, diſſolved in water, did not ſubſide, and reſiſted putrefaction better than the ſtandard. But I obſerved, that more air than uſual was generated here, and that the fleſh became more tender than with any of the ſtronger antiſeptics.

3. Of all the reſinous ſubſtances, I found camphire the ſtrongeſt reſiſter of putrefaction. Two grains diſſolved in one drop of ſpirit of wine, five grains of ſugar and two ounces of water, exceeded the ſtandard; though during the infuſion moſt of the camphire flew off, ſwam at the top, or ſtuck to the phial. If we ſuppoſe only the half loſt, the remainder was at leaſt ſixty times ſtronger than ſea-ſalt; but if, as I imagine, the water ſuſpended not above a tenth part, then camphire will be three hundred times more antiſeptic than ſea-ſalt. That nothing might be aſcribed to the minute portion of the ſpirit uſed in this experiment, I made another ſolution of camphire in a drop or

two of oil, and found that mixture leſs perfect, but ſtill beyond the ſtandard.

EXPERIMENT XI.

1. I MADE ſtrong infuſions of camomile-flowers, and of *Virginian* ſnake-root; and finding them both much beyond the ſtandard, I gradually leſſened the quantity of theſe materials, till I found five grains of either impart a virtue to boiling water ſuperior to the ſtandard. Now, as we cannot ſuppoſe that theſe infuſions contained half a grain of the embalming part of theſe vegetables, it follows, that this ſubſtance muſt be at leaſt an hundred and twenty times more antiſeptic than common ſalt.

2. I alſo made a ſtrong decoction of the *Peruvian* bark, and infuſed a thin bit of fleſh in two ounces of it ſtrained; which fleſh did not corrupt, though it remained two or three days in the furnace after the ſtandard was putrid. During this time, the decoction become gradually limpid, whilſt the groſſer parts ſubſided: by which it appears, that a moſt minute portion of the Bark (perhaps leſs than of the ſnake-root or camomile-flowers) intimately mixed with water is poſſeſſed of a conſiderable antiſeptic virtue.

3. Beſides theſe, pepper, ginger, ſaffron, contrayerva-root, and galls, in the quantity of five grains each, as alſo ten

ten grains of dried ſage, of rhubarb, and of the root of wild valerian *, ſeparately infuſed, exceeded ſixty grains of ſalt. The leaves of mint, angelica, groundivy, ſena, green tea and red roſes; as alſo the tops of common wormwood, muſtard-ſeed, and horſeradiſh-root were likewiſe ſeverally infuſed, but in larger quantities, and proved more antiſeptic than the ſtandard. And as none of theſe can be ſuppoſed to yield in the water above a grain or two of the embalming principle, we may look upon them all as powerful reſiſters of putrefaction. Further, I made a trial with the decoction of white poppy-heads and another with the expreſſed juice of lettuce, and found them both above the ſtandard.

By theſe ſpecimens we may now ſee how extenſive antiſeptics are; ſince, beſides ſalts, vinous ſpirits, ſpices and acids commonly known to have this property, many reſins, aſtringents and refrigerants are of the number; and even thoſe plants called alkaleſcent, and ſuppoſed promoters of putrefaction; of which claſs horſeradiſh is particularly antiſeptic. And indeed after theſe trials, I expected to find almoſt all ſubſtances endowed with ſome degree of this quality, till, upon further experiments, I perceived that ſome made no reſiſtance, and others promoted corruption. But before I enter upon that part of my ſubject, it will be

* Although the experiment was made with ten grains of the powder of this root only, yet, conſidering how long that quantity reſiſted putrefaction, we may reckon the valerian among the ſtrongeſt antiſeptics.

proper

proper to relate ſome other experiments more nearly connected with the preceding.

EXPERIMENT XII.

HAVING ſeen how much more antiſeptic theſe infuſions were than ſea-ſalt, I then tried whether plants would part with this virtue without infuſion. For this purpoſe, taking three ſmall ſlices of the lean of beef, each not exceeding the thickneſs of half a crown, into one I rubbed the powder of the *Peruvian* bark, into another that of ſnake-root, and into a third that of camomile-flowers. It was in the heat of ſummer, yet after keeping theſe pieces for ſeveral days, I found the fleſh with the Bark but little tainted, and the other two quite ſweet. The ſubſtance of all the three was firm; in particular that piece with the camomile was ſo hard and dry that it ſeemed incorruptible. The reaſon why the Bark had not altogether the ſame effect, probably depended on its cloſer texture.

EXPERIMENT XIII.

I HAVE alſo made ſome attempts towards the ſweetening of corrupted fleſh, by means of mild ſubſtances; becauſe diſtilled ſpirits, or ſtrong acids, the ſubſtances which might be ſuppoſed the moſt likely to anſwer this intention, are of too acrid and irritating a nature to be thoroughly uſeful

uſeful when this correction is moſt wanted. As to ſalts, beſides their acrimony, it is well known that meat once tainted will not take ſalt.

A piece of fleſh weighing two drachms, which in a former experiment had become putrid (and was therefore very tender, ſpongy and floated in water) was thrown into a few ounces of a ſtrong infuſion of camomile-flowers, after expreſſing the air, in order to make it ſink in the fluid. The infuſion was renewed twice or thrice in as many days; when perceiving the *fœtor* gone, I put the fleſh into a clean bottle, with a freſh infuſion: this I have kept all the ſummer, and have it ſtill by me, quite ſweet, and of a firm texture *. In the like manner, I have ſucceeded in ſweetening ſeveral thin pieces of corrupted fleſh, by repeated affuſions of a ſtrong decoction of the *Peruvian* bark; and I have conſtantly obſerved, that not only the offenſive ſmell has been removed, but a firmneſs reſtored to the fibres.

Now, ſince the Bark parts with ſo much of its virtue in water, it is natural to think that it may yield ſtill more in the body, when opened by the *ſaliva* and the bile, and therefore that in ſome meaſure it operates by this antiſeptic virtue. From this principle we may perhaps account for its ſucceſs in gangrenes, and in the low ſtate

* This piece I kept a twelvemonth after this paper was read before the Society, and I found it then ſtill firm and uncorrupted.

of malignant fevers, when the humours are evidently putrid. And as to intermitting fevers, in which the Bark is moſt ſpecific, were we to judge of their nature from circumſtances attending them in climates and in ſeaſons moſt liable to the diſtemper, we ſhould aſſign putrefaction as one of the principal cauſes. They are the great endemic of marſhy countries, and prevail moſt after hot ſummers, with a cloſe and moiſt ſtate of the air. They begin about the end of ſummer, and continue throughout autumn, being at the worſt when the atmoſphere is moſt loaded with the *effluvia* of ſtagnating water, rendered more putrid by vegetables and animals dying and rotting in it. At ſuch times all meats are quickly tainted, and dyſenteries, with other putrid diſorders, coincide with theſe fevers. The heats diſpoſe the blood to acrimony; the putrid *effluvia* are a ferment*; and the fogs and dews, ſo common in ſuch ſituations, ſtop perſpiration, ſhut up the corrupted humours, and bring on a fever. The more theſe cauſes prevail, the eaſier it is to trace this putrefaction. The *nauſea*, thirſt, bitter taſte of the mouth, and frequent evacuations of corrupted bile are

* It will be proper to remark, that when I uſe here (as in the preceding Obſervations) the word *ferment* to denote the cauſe that changes the humours, I mean only to expreſs the aſſimilating power of all putrid animal ſubſtances over the freſh, as ſhall be explained more fully in the next paper, under experiment xviii. There ſeemed to be the more need for this caution, as in one of the ſubſequent papers I am to ſhew, that putrid animal ſubſtances become ferments in the ſtricteſt ſenſe, that is, act like yeaſt, when joined to any vegetable ſubſtance capable of a vinous fermentation: ſee exper. xxviii. and the following.

common

common ſymptoms, and arguments for what is advanced. We ſhall add, that in moiſt countries, and in bad ſeaſons, the intermittents not only begin with ſymptoms of a putrid fever, but, if unduly treated, are eaſily changed into a malignant form, with livid ſpots or blotches of the ſkin, or a mortification of the bowels. But at the ſame time we muſt acknowledge, that ſuch is the quick action of the Bark in removing theſe fevers, that its febrifuge quality muſt be ſomething different from its antiſeptic. I ſhall only remark, that whatever medicines (beſides evacuations and the Bark) have been found uſeful in the cure of intermittents, they are, ſo far as I know, moſtly powerful correctors of putrefaction, ſuch as myrrh, camomile-flowers, wormwood, tincture of roſes, alum with nutmeg, vitriolic or ſtrong vegetable acids with aromatics.

Thus far having recited my experiments upon fleſh or the fibrous parts of animals, I ſhall proceed to ſhew what effects the antiſeptics have upon the humours. For, though from analogy we might conclude, that whatever retards the corruption of the ſolids, or recovers them after they are tainted, will act ſimilarly upon the fluids, yet, as this does not certainly follow, I judged it neceſſary to make ſome new trials, which, with ſome experiments on the promoters of putrefaction, the reverſe of the former, ſhall be offered to the ſociety at a future meeting.

PAPER III.

Experiments on ſubſtances reſiſting the putrefaction of animal humours, with their uſe in medicine. Aſtringents always antiſeptics, but antiſeptics have not always a manifeſt aſtriction. Of the uſe of putrefaction in general, and particularly in the animal œconomy. Of the different means of inducing putrefaction. Some ſubſtances reputed ſeptics have a contrary quality. And the real ſeptics are ſome of thoſe very ſubſtances which have been the leaſt ſuſpected to be of that nature, viz. *chalk, the* teſtacea, *and common ſea-ſalt.*

Read Nov. 15, 1750. HAVING given an account of the manner in which I tried the power of antiſeptics on the fibrous parts of animals, I ſhall but juſt mention the reſult of ſome experiments made with them upon the humours *.

EXPERIMENT XIV.

DECOCTIONS of wormwood, and of the *Peruvian* bark, alſo infuſions of camomile-flowers, and of ſnake-root, preſerved yolks of eggs ſeveral days longer not only than water

* All the following experiments, whether made in the lamp-furnace, or by the fire, were made in a degree of heat equal to that of the human blood, *viz.* about 100 degrees of FAHRENHEIT's ſcale.

water did alone, but alſo when ſome ſea-ſalt was added to it. I likewiſe found that ſalt of hartſhorn preſerved this ſubſtance better than four times its weight of ſea-ſalt.

EXPERIMENT XV.

Ox's gall was kept ſome time from putrefaction by ſmall quantities of the ley of tartar, ſpirit of hartſhorn, *ſal Ammoniacus*, and the ſaline mixture; and ſtill longer by a decoction of wormwood, infuſions of camomile-flowers, and of ſnake-root; by ſolutions of myrrh, camphire, and ſalt of amber: all theſe were ſeparately mixed with gall, and found more antiſeptic than ſea-ſalt, and ſeemingly in proportion to their effects upon fleſh. Only nitre failed, which though four times ſtronger than ſea-ſalt in preſerving fleſh, is inferior to it in preſerving gall, and much weaker than *ſal Ammoniacus*; which, again, is ſomewhat leſs powerful than nitre in keeping fleſh ſweet. The nitre was ſoon opened by the gall, and emitted much air, which roſe as from a fermenting liquor; and when this happened the gall began to putrefy *. But the ſaline mixture generated no air, and oppoſed the putrefaction of the gall more than it did that of the fleſh.

EXPERIMENT XVI.

THE laſt trial was with the *ſerum* of human blood, which was preſerved by a decoction of the Bark, and by

* Perhaps this may be the reaſon why, as far as I have obſerved, nitre diſagrees with the ſtomach in putrid bilious caſes.

an

an infuſion of ſnake-root. But ſaffron and camphire were not here above a fourth part ſo antiſeptic as before: whether it be that they are leſs preſervative of this humour, or, as I ſuſpect, that they were not well mixed with it. Nitre acted nearly with its full force, being about four times ſtronger than ſea-ſalt; and it generated ſome air, but much leſs than it did with the gall. No other humour was tried: but from theſe ſpecimens added to the former experiments we may conclude, that whatever is a preſervative of fleſh, will be univerſally antiſeptic, though perhaps not always with the ſame force.

EXPERIMENT XVII.

HAVING already ſhewn how putrid fleſh may be ſweetened, I ſhall conclude this part of my ſubject with a like trial upon the yolk of an egg. A portion of this being diluted with a little water, ſtood till it was corrupted, when a few drops were put into a phial with two ounces of pure water, and about twice as many drops were mixed with a ſtrong infuſion of camomile-flowers. At firſt both phials had ſome degree of a putrid ſmell; but being corked, and kept a few days near a fire, in about the degree of animal heat, the mixture with plain water contracted a ſtrong *fœtor*, whilſt the other ſmelled only of the flowers.

Thus far I have related the experiments made upon antiſeptics; by which it appears, that beſides ſpirits, acids, and ſalts, we are poſſeſſed of many powerful reſiſters of putre-

putrefaction, endowed with qualities of heating, and cooling, of volatility, aſtriction, and the like; which make ſome more adapted than others to particular indications. In ſome putrid caſes many correctors are already known, in others they are wanting. We are yet at a loſs how to correct the *fanies* of a cancerous ulcer; but in ſuch a multitude of antiſeptics, it is to be hoped that ſome will be found at laſt adequate to that intention.

It may be further remarked, that as different diſtempers, of the putrid kind, require different antiſeptics, ſo the ſame diſeaſe will not always yield to the ſame medicine. Thus the Bark will fail in a gangrene if the veſſels are too full, or the blood is too thick. But if the veſſels are relaxed, and the blood reſolved, or diſpoſed to putrefaction, either from a bad habit, or from the abſorption of putrid matter, then is the Bark ſpecific. With the ſame caution are we to uſe it in wounds, *viz.* chiefly in the caſes of abſorbed matter, when it infects the humours and brings on a hectic fever. But when inflammatory ſymptoms prevail, the ſame medicine by increaſing the tenſion of the fibres (a ſtate very different from the other) has ſuch conſequences as may well be expected.

By the ſucceſs of the Bark in ſo many putrid diſorders, it ſhould ſeem that aſtriction had no ſmall ſhare in the cure*; and indeed the very nature of putrefaction con-

* All aſtringents ſeem to be ſtrong antiſeptics; and all antiſeptics probably have ſome aſtringent quality, though not always manifeſt.

ſiſts

ſiſts in a ſeparation and diſunion of parts. But as there are other caſes in which aſtringency is leſs wanted, we may find in the contrayerva-root, ſnake-root, camphire, and other ſubſtances, a ſtrong antiſeptic power, with little or no appearance of aſtriction. And as ſeveral of theſe medicines are alſo diaphoretic, their operation, in this reſpect, may for that reaſon be the more ſucceſsful.

I come now to the ſecond thing propoſed, which was to give an account of ſome obſervations that I have made on ſubſtances haſtening or promoting putrefaction; an inquiry not leſs uſeful than the former. For, ſetting aſide the offenſive idea commonly annexed to the word putrefaction, we muſt acknowledge it to be one of the inſtruments of Nature, by which ſome great and ſalutary changes are brought about. With regard to medicine, we know that neither animal nor vegetable ſubſtances can become aliment without undergoing ſome degree of putrefaction. Some diſtempers may proceed from a want of it *; the *criſis* of fevers ſeems to depend upon it †; and perhaps

* Some learned authors mean the ſame thing, when they expreſs this by a defect of a due degree of *alkaleſcence* in the humours; but I have ſhewn in my firſt paper how liable that term is to objections.

† It is obſervable, that HIPPOCRATES entertained the ſame idea, ſince he oftener than once uſes the word ſignifying *to putrefy*, as ſynonymous to that which ſignifies *to concoct*. Thus FOËSIUS remarks, Σήπειν, *quod eſt putrefacere*, HIPPOCRATI *concoquere ſignificat; ut et* σῆψις, *concoctionem. Vid. Oecon.* HIPPOCRAT. *in voce* Σήπειν. In the

perhaps even animal heat, according to the late Dr. *Steveſon*'s theory *.

But in the proſecution of this ſubject I have met with few real ſeptics, and found many ſubſtances, commonly accounted ſuch, to be of an oppoſite nature. The moſt general means of accelerating putrefaction are by heat, moiſture, and ſtagnating air, which being ſufficiently known and aſcertained, I paſſed over without making any new experiments about them. But Lord *Bacon* †, as

the former editions, by miſtake, I quoted GORRÆUS for FOËSIUS; though indeed GORRÆUS, the younger, in his edition of the *Definitiones Medicæ* makes much the ſame remark under the article Σηπτικὴ κοιλία, when to that expreſſion he adds "HIPPOCRATI *libello* περὶ ἀνατομῆς *de ventriculo dicitur ubi fit concoctio, velut cibos concoquens aut putrefaciens.*" Now, that the concoction of the humours is a kind of putrefaction, ſeems probable from hence, that whenever they are in that ſtate, they are generally more fluid, and fitter to paſs through the ſmaller veſſels, where they ſtagnated before. But reſolution or tenuity is one inſeparable character of putrefaction. And we often find in the offenſiveneſs of the ſweats, or in other excretions conſequent on a *criſis*, indiſputable marks of corruption. The time of reſolution or putrefaction depends on the degree of heat, the habit of the patient, and on the part obſtructed: hence may ariſe the variety in the duration of fevers of different kinds, and the uniformity among others that are of a like nature. Reſolution is the putrefaction of the impacted humour only, but ſuppuration implies a corruption of the veſſels alſo. This manner of ſpeaking has been diſuſed, from the prejudice that nothing is putrid but what is offenſively ſo; whereas, in fact, every fibre becoming more tender, and every humour becoming thinner, may be conſidered as reſolved or putrid in ſome degree; whether the change tends to the better health, or to the deſtruction of the perſon; or whether it becomes grateful, or offenſive to the ſenſes.

* See his Eſſay on the Cauſe of Animal Heat, inſerted in the Medical Eſſays, vol. v. In that treatiſe, the reader will find ſome curious obſervations relating to animal putrefaction.

† Nat. Hiſt. cent. iv. exper. 330.

well as ſome of the chemiſts, having hinted at a putrid fermentation, analogous to what is found in vegetables, and this having ſo near a connexion with contagion, I made the following experiments for a further illuſtration of that doctrine.

EXPERIMENT XVIII.

A THREAD being dipped in the yolk of an egg already putrid, a ſmall portion of it was cut off and put into a phial, with half of the yolk of a new-laid egg diluted with a little water. The other half, with as much water, was put into another phial; and both being corked were ſet by the fire to putrefy. The reſult was, that the thread infected the freſh yolk; for the putrefaction was ſooner perceived in the phial that contained the thread, than in the other. But this experiment was not repeated.

In this manner the putrefaction of meat advances quicker in a confined than in a free air; for as the moſt putrid parts are alſo the moſt volatile, they inceſſantly iſſue from a corrupting ſubſtance, and are diſperſed with the wind; but in a ſtagnation of the air they remain about the body, and by way of ferment excite it to corruption *.

EXPE-

* *Corpus in putredine exiſtens, alii (corpori) a putredine libero facillimè corruptionem conciliat; quia illud ipſum (corpus) quod in motu inteſtino jam poſitum eſt, alterum quieſcens,*

EXPERIMENT XIX.

As to other ſeptics received by authors, I found none of them anſwer the character. The alkaline ſalts have been conſidered as the chief putrefiers; but this is diſproved by experiments. Of the volatiles it may indeed be obſerved, that though they preſerve animal ſubſtances from the common marks of putrefaction, with a force four times greater than that of ſea-ſalt, yet, in warm infuſions, a ſmall quantity of theſe ſalts will ſoften and

quieſcens, ad talem motum tamen proclive, in eundem motum inteſtinum facilè abripere poteſt. STAHLII *Fundam. Chymiæ, par.* ii. *tract.* i. *ſect.* i. *cap.* v. In this light STAHL and other celebrated chemiſts have conſidered a *putrid ferment*, and generally uſed the ſame expreſſion for it. BECCHER *(in Phyſic. Subterran. lib.* i. *ſect.* v. *cap.* i. *n.* 34.) treating of a corroſive putrid ſubſtance taken in aliment, ſays of it, *fermentum univerſo ſanguini imprimit.* And Mr. BOYLE has uſed the words *fermentation* and *putrefaction* of the blood promiſcuouſly in his piece called Obſervations and Experiments on the Human Blood. But theſe authors are nevertheleſs very careful not to confound putrefaction with vegetable fermentation, accounting them only analogous proceſſes; and therefore uſe the ſame term to expreſs both the putrefying and fermenting agent, from the want of more expreſſive words in the languages in which they wrote. It were to be wiſhed, that to avoid ambiguity we had two different words to denote the exciting cauſe of theſe two inteſtine motions; but this is the leſs to be expected, on account of the diſpoſition of all putrid animal ſubſtances to promote both animal putrefaction, and a vinous fermentation in vegetables, as will appear by the ſequel of theſe experiments.

I have inſiſted the longer on this point, as I apprehended my uſe of the term *ferment* in the preceding Obſervations might induce ſome readers to think, that I had endeavoured to revive the exploded doctrine of a fermentation of the blood, like that which takes place among vegetable ſubſtances, than which nothing could be more contrary to my ſentiments.

relax the fibres more than water does by itſelf. They alſo prevent the coagulation of blood; and when taken by way of medicine, perhaps thin and reſolve it; but they are not therefore ſeptics. For, ſo little do theſe ſalts putrefy, or even reſolve the fibres, when applied dry, that I have kept in a phial a ſmall piece of fleſh, preſerved with ſalt of hartſhorn only, ſince the beginning of June laſt (about five months ago;) during which time, though the ſummer was hotter than uſual, it has remained not only ſound, but firmer than when it was firſt ſalted *.

EXPERIMENT XX.

FROM the ſpecimens we had of the antiſcorbutic plants, it is likewiſe probable that none of that claſs will prove ſeptic. Horſeradiſh, one of the moſt acrid, is a powerful antiſeptic. And though carrots, turnips, garlic, onions, celery, cabbage, and colewort were tried, as alkaleſcents, they did not haſten, but retard the putrefaction.

EXPERIMENT XXI.

THE caſe was ſomewhat different with ſuch farinaceous vegetables as I examined, *viz.* white bread in water, decoctions of flour, barley, and oatmeal; for theſe infuſed with fleſh did not retard its putrefaction, but

* This piece of fleſh continued uncorrupted above a year after this paper was preſented to the Society, and then I inſpected it no longer.

after

after that proceſs was ſomewhat advanced, they checked it by turning ſour. And by a long digeſtion, the acidity became ſo conſiderable that it conquered the putreſcency of the fleſh, and generated much air. Theſe phials did not then ill repreſent the ſtate of weak bowels, in which bread and the mildeſt grains are converted to ſuch an acid, as prevents the due reſolution and digeſtion of animal food *.

EXPERIMENT XXII.

I EXAMINED the powder of *cantharides*, of vipers, and of *Ruſſian* caſtor, all animal ſubſtances, and therefore moſt likely to prove ſeptic. The flies were tried both with freſh beef, and with the *ſerum* of human blood; the vipers, with the former only; but neither of them haſtened putrefaction. And as to the caſtor, it was ſo far from promoting that proceſs, that an infuſion of twelve grains oppoſed putrefaction more than the ſtandard.

EXPERIMENT XXIII.

AFTER finding no ſeptics where they were moſt expected, I diſcovered ſome which ſeemed the leaſt likely, *viz.* chalk, the *teſtacea*, and common ſalt.

* It is to be remarked, that in making this experiment, I did not then attend to a fermentation that enſued, and which was the cauſe of the acidity. This kind of fermentation between animal and vegetable ſubſtances, having been hitherto overlooked, ſhall be ſet forth in my next paper.

Twenty

Twenty grains of prepared crabs-eyes were mixed with ſix drachms of ox's gall and as much water; into another phial I put nothing but gall and water, in the ſame quantity with the former; and both being placed in the furnace, the putrefaction began much ſooner where the abſorbent powder was, than in the other phial. I alſo infuſed, in the ſame furnace, thirty grains of levigated chalk, with the uſual quantity of fleſh and water *; and having ſhaken the phial from time to time, I found that the corruption not only began ſooner, but roſe higher by this mixture; nay, which had never happened before, that in a few days the fleſh was reſolved into a perfect *mucus*. The experiment was repeated with the ſame reſult, which being ſo extraordinary, I ſuſpected that ſome corroſive ſubſtance had been mixed with the powder; but for a proof, a lump of common chalk being pounded, thirty grains thereof proved fully as ſeptic as the former. The ſame powder was compared with an equal quantity of ſalt of wormwood, and care was taken to ſhake both the mixtures equally; but after three days warm digeſtion, the ſalt had neither tainted nor ſoftened the fleſh, whilſt the chalk had rotted and conſumed that piece which was infuſed with it. Nor was the ſeptic power of the teſtaceous powders of the Diſpenſatory leſs. But egg-ſhells in water ſeemed to reſiſt putrefaction, and to preſerve the meat longer than water did without them †.

* *Viz.* of fleſh two drachms, and of water two ounces.

† The trial was made only with a coarſe powder of egg-ſhells, and not repeated.

EXPERIMENT XXIV.

To try whether the *teſtacea* would alſo diſſolve vegetable ſubſtances, I mixed them with barley and water, and compared this mixture with another of barley and water only. After a long maceration by a fire, the plain water ſwelled the barley, became mucilaginous and ſour; but that with the powder kept the grain to its natural ſize, and though it ſoftened it, yet produced no mucilage, and did not become acid.

EXPERIMENT XXV.

NOTHING could be more unexpected than to find ſea-ſalt a haſtener of putrefaction; but the fact is thus. One drachm of ſalt preſerves two drachms of freſh beef, in two ounces of water, about thirty hours uncorrupted, in a heat equal to that of the human body; or, what amounts to the ſame, this quantity of ſalt keeps fleſh ſweet twenty hours longer than pure water; but half a drachm of ſalt does not preſerve it above two hours longer than pure water. This experiment has been already mentioned. Now, I have ſince found that twenty-five grains have little or no antiſeptic virtue, and that ten grains both haſten and heighten the corruption *. It is

* I found the moſt putrefying quantity of ſalt, with this proportion of fleſh and water, to be about eight or ten grains.

further to be remarked, that in warm infuſions with theſe ſmaller quantities, the ſalt, inſtead of hardening the fleſh (as it does in a dry form, in brine, or even in ſtrong ſolutions, ſuch as our ſtandard) ſoftens and relaxes its texture more than plain water does, though much leſs than water with chalk, or water with the teſtaceous powders.

Several inferences might be drawn from this experiment, but I ſhall only mention one at preſent. Salt, the indiſpenſible ſeaſoner of animal food, has been ſuppoſed to act by an antiſeptic quality, correcting the too great tendency of meats to putrefaction: but ſince it is never taken in aliment beyond the proportion of the corrupting quantities in our experiment, it would ſeem that ſalt is ſubſervient to digeſtion chiefly by its ſeptic virtue, that is, by ſoftening and reſolving meats, an action very different from what is commonly imagined *.

* BECCHER is the only author, I know of, who hints at the reſolving quality of ſea-ſalt, and alſo at its corroſive and putrefying nature when taken too freely in aliment. *Vid. Phyſic. Subterran. lib.* i. *ſect.* v. *cap.* i. *n.* 34.

It is to be obſerved, that all theſe experiments were made with the ſalt kept here for domeſtic uſes.

PAPER

PAPER IV.

A continuation of the experiments upon ſeptics. Conjectures about the cauſes of the decline of putrid diſeaſes. Of the difference between the effects of the teſtacea *and lime-water. An account of a power diſcovered in putrid animal ſubſtances of exciting a vinous fermentation in vegetables; and of what uſe the* ſaliva *is in that proceſs: with an application of theſe experiments to the theory of digeſtion.*

Read April 25, 1751. IT being ſo eſtabliſhed an opinion, that ſalt reſiſts putrefaction with a power proportioned to its quantity, I did not therefore rely on my firſt trials, but often repeated that experiment which contradicted this maxim; and I ſtill found, that two drachms of freſh beef, with five, ten, or even fifteen grains of ſea-ſalt and two ounces of water, putrefied ſooner than the ſame quantity of fleſh infuſed with water only.

EXPERIMENT XXVI.

1. I NEXT inquired, whether ſmall portions of other neutral, or alkaline ſalts, were in like manner ſeptic; but upon examining *tartarus vitriolatus*, *ſal Ammoniacus*, nitre, *ſal diureticus*, as alſo ſalt of hartſhorn, and ſalt of

wormwood, I could not perceive that they were; though all of them, in weak ſolutions, were found to ſoften or reſolve the fleſh; ſalt of hartſhorn moſt, and nitre leaſt of any.

2. Nor does ſugar at all promote putrefaction. A plain ſyrup has been ſaid to preſerve meat better than any brine; and the trials which I have made induce me to think that this is true: as alſo, that weak ſolutions of ſugar are proportionally antiſeptic. But, what is remarkable here, though weak ſolutions of ſugar ſoon yield to the putrefaction of fleſh, yet as ſoon as an acidity is produced from the ſugar's fermenting, that putrid tendency is either retarded, or intirely overcome. Therefore in ſugar, the effects both of the *farinacea* and ſalts ſeem to be combined; for, as a ſalt, it oppoſes putrefaction at firſt, which the *farinacea* do not; and like the *farinacea*, it checks putrefaction after the fermentation begins.

To this antiſeptic quality in ſugar (which, for theſe hundred years paſt, has been daily joined in large quantities to other aceſcent food) we may perhaps attribute ſome ſhare of the general decline of putrid diſeaſes. For now, we ſeldom hear of leproſies *, putrid ſcurvies, dyſenteries, peſtilential fevers, and the like diſtempers, formerly ſo frequent, and to which thoſe were moſt ſubject who

* *Viz.* the *lepra Arabum*.

uſed animal food in exceſs, eſpecially ſalted meats *. No doubt other cauſes concur, but to enumerate them would be foreign to our preſent purpoſe, as well as to mention the inconveniences that, on the other hand, may ariſe from the immoderate uſe of ſuch things as too much oppoſe putrefaction.

3. I have alſo repeated the experiments with the *teſtacea*, and in particular on human blood, and have found that crabs-eyes promoted the putrefaction of the *craſſamentum*, and likewiſe that of the *ſerum*, but the latter not ſo ſpeedily.

EXPERIMENT XXVII.

1. HAVING a mind to ſee the action of the *teſtacea* combined with the antiſeptics, I infuſed half a drachm of the compound powder of contrayerva-root with the uſual quantity of fleſh and water, and obſerved that the teſtaceous part of this compoſition did ſenſibly weaken the vegetable, which is one of the ſtrongeſt antiſeptics. For, though upon the whole the powder did indeed reſiſt putrefaction, it was with leſs efficacy than if the ſmall portion of the root, which enters the compoſition, had been uſed alone †.

2. To

* Add what is ſaid in the Obſervat. part iii. ch. vi. § 6.

† The high opinion which ſome phyſicians of the laſt century entertained of the *teſtacea* was founded on the *hypotheſis*, that moſt diſeaſes proceeded from an acid,

2. To this examination of chalk and the *teſtacea*, were added ſome experiments upon lime-water, made both of chalk-lime and oyſter-ſhell-lime (for ſtone-lime is not in uſe here) and I found, that though fleſh infuſed in either immediately ſent forth a diſagreeable ſmell, as in a common ley, yet it did not become putrid ſo ſoon as the ſtandard. So that in this trial, lime-water made ſome reſiſtance to putrefaction, though the materials of which it was made, namely chalk and ſhells, are both ſeptics. Nevertheleſs, I obſerved that when the putrefaction began, it became little leſs offenſive in this than in common water*. And though it has been often found by

not even fevers excepted. Now, though this theory is at preſent much limited, yet the practice is ſtill common, at leaſt in acute diſorders; ſome uſing theſe powders from cuſtom, and others with a view to neutralize the acids then given, to fit them for entering the lacteals, and promoting a *diaphoreſis*. Otherwiſe it does not appear how theſe abſorbents ſhould correct any acrimony, either in the *primæ viæ*, or in the blood. But whatever diſputes have ariſen about their manner of operating, almoſt all have agreed in believing them harmleſs; though from theſe experiments we may perhaps be led to doubt whether they are ſo always. However, I would not from hence infer, that the *teſtacea* are only to be given when an acid is to be deſtroyed; ſince to cure ſome diſeaſes, it may be requiſite to attenuate the humours, and relax the fibres by ſome degree of putrefaction. HIPPOCRATES obſerves, that a fever is the beſt remedy for ſome diſorders. And the primary effects of mercurials conſiſt in a ſeptic reſolution both of the fibres and humours. Poſſibly therefore the *criſis* of ſome fevers may be haſtened, or perfected by the *teſtacea*, which we have ſhewn to be ſubſtances endowed with a conſiderable putrefying quality.

* The Rev. Dr. HALES having ſince made ſome experiments upon lime-water, confirms what is here ſaid about the little antiſeptic quality of ſhell or chalk-lime. And though he does not mention his having ever found them act as ſeptics, yet he lays before the Royal Society my account how that may happen, *viz.* whenever the chalk or ſhells are not ſufficiently calcined. Phil. Tranſact. vol. xlviii. n. 103.

others,

others, that the water of ſtone-lime is in ſome degree conſtantly antiſeptic, yet I think it probable that the virtues of this medicine do not ſo much conſiſt in correcting putrefaction, as in checking immoderate acidities and concretions, the cauſe of ſeveral chronic diſeaſes.

Thus far I have related my experiments upon ſubſtances reſiſting, and promoting putrefaction; by which it ſeems probable, that there are a great number of the former, and but few of the latter, though perhaps more than we have yet diſcovered. In this laſt part, I have confined my inquiries to ſuch things only as induce putrefaction out of the body; for, as to mercury, and certain poiſons, which taken into the ſtomach, or abſorbed by the veins, have the effect of ſeptics, I purpoſely omitted them, as not being able to take in ſo large a field. But I ſhall add, to what I have already laid before the Society, ſome other obſervations upon the corruption of animal ſubſtances, which have a near relation to the former, and may not be without their uſe in medicine.

EXPERIMENT XXVIII.

I MADE ſeveral mixtures, each conſiſting of two drachms of raw beef, as much bread, and an ounce of water; theſe being beaten to the conſiſtence of a pulp were put into cloſe phials, of three or four ounces meaſure each, and placed in

the

the uſual heat of 100 degrees. But in this, and in ſeveral of the ſubſequent experiments, the furnace was allowed to cool for ſome hours every night.

1. In a few hours, all theſe mixtures began to ferment, and continued in that action about two days *. For the moſt part the fermentation was ſo ſtrong, eſpecially when the heat was a few degrees above the ſtandard, that if the corks had not ſometimes given way, the phials muſt have been burſt. The bread and fleſh, which at firſt lay at the bottom, ſoon roſe to the top, and conſtantly, as the air eſcaped, let fall ſome particles that had been buoyed up by that fluid. Thus a ſediment was formed reſembling lees, whilſt the lighteſt parts or *flowers* remained on the ſurface; but the fermentation continuing, theſe alſo ſubſided; and the acid taſte and ſmell of the liquors, after the action ceaſed, was a further proof of the preceding fermentation. This change was the more extraordinary, as theſe mixtures, when the motion began, were tending to corruption, and in fact in a few hours after, became offenſive: but the next day, the putrid ſmell abated, and went quite off before the fermentation had ceaſed.

2. I repeated theſe experiments often, and with the ſame ſucceſs. And to aſcertain the part which the animal ſubſtance had in producing ſuch effects, I made mixtures of

* I found afterwards, that when the phials were left quite open, or ſo that the air could eaſily eſcape, the fermentation was completed in leſs than half that time.

bread

bread and water only; but theſe ſtood ſeveral days in the furnace without any ſign of fermentation.

3. I added to two drachms of freſh meat double the quantity of bread, and water in proportion; and having placed this mixture in the furnace, I found the fermentation proceed as before, and with no other difference than that of producing a purer acid.

4. To the ſame quantity of fleſh and an ounce of water, was added only half a drachm of bread; but a fermentation nevertheleſs enſued, and the liquor became acid to the taſte, but with the ſmell of rank cheeſe.

5. Another variation was made with fleſh and oatmeal, inſtead of bread; but the effects were only different in a higher degree of fermentation, as the oatmeal had not undergone that proceſs before.

6. I tried whether oatmeal and water would ferment alone; but though they did, the action was not nearly ſo ſtrong as when an animal ſubſtance was added.

7. Experiments were alſo made with bread and roaſted meat, with ſimilar effects; for, though the putrefaction was but juſt diſcernible, and the generation of air was much leſs than in the firſt experiment, yet the fermentation was complete, and the mixtures became acid.

8. I

8. I varied the quantity, taking of roaſted meat and bread each an ounce, with about two ounces of water. This mixture being poured into a phial and corked was left in a room with a fire, where the thermometer roſe no higher than about 65 degrees. Here the fermentation began late, and proceeded ſlowly; but, what was remarkable, it no ſooner commenced, than the mixture, without ever becoming putrid, acquired a vinous ſmell like that of other fermenting liquors, and towards the end, the uſual acid taſte and ſmell ſucceeded.

9. I mixed half an ounce of bread with an ounce and a half of water, and a ſmall portion of the *craſſamentum* of human blood already putrid; and ſetting this mixture in the furnace, in a cloſe phial, I obſerved a ſtrong fermentation ſome hours after.

10. I diſcovered the ſame quality in ſheep's gall. For, having put two drachms of bread, with half an ounce of that liquor, in a phial, and placed it in the furnace, I perceived that this mixture, the next day, generated air as in the former experiments. The fermentation continued for two days; in which time the gall began to putrefy, but recovered afterwards; ſo that on the ſixth day it ſeemed to be as uncorrupted as on the firſt, without becoming acid.

From all theſe experiments it ſeems probable, that all animal ſubſtances putrid or tending to putrefaction are endowed

dowed with a power of raiſing a fermentation in the *farinacea*, and even of renewing that action in ſuch as have undergone ſome degree of it before.

11. After ſuch mixtures become ſour they never return to a putrid ſtate, but, on the contrary, grow more and more acid, and to ſuch a degree, that I compared one of them (which conſiſted of raw meat and bread, of each two drachms, and of an ounce of water) with a like mixture, to which was added in the beginning ten drops of the ſpirit of vitriol, and after both had ſtood ſome days in the furnace, I found them equally acid. To account for this, it will be proper to obſerve, that the addition of the ſpirit preventing fermentation, the laſt mixture had no more acidity than what was given to it at firſt by the ſpirit of vitriol.

12. I have alſo remarked, that the acid ariſing from theſe proceſſes has ſomething of an auſtere and ſaltiſh taſte, but without any offenſive ſmell, unleſs the phials are kept cloſe during the fermentation; in which caſe the ſmell is like that of ſour milk, or lean cheeſe.

Now, conſidering how much air is generated, and how ſour theſe mixtures are made by fermentation, it may ſeem ſtrange that the ſame materials, uſed as food, ſhould make ſo little diſturbance in the body. And the difficulty

would be the greater, did the *ſaliva*, as ſome ſuppoſe, promote both fermentation and putrefaction *.

EXPERIMENT XXIX.

To aſcertain the effects of the *ſaliva* in digeſtion, I added a ſmall portion of it to ſome raw beef, and obſerved that this mixture, in the uſual heat, putrefied ſlower than another which had no *ſaliva* joined to it.

EXPERIMENT XXX.

1. I TOOK two drachms of freſh meat, the ſame quantity of bread, and an ounce of water, and to theſe added as much *ſaliva* as I ſuppoſed neceſſary for digeſtion. This mixture being beaten in a mortar was put into a cloſe phial, and ſet in the furnace, where it remained about two days with ſcarce any viſible fermentation; but on the third day that action became manifeſt. At that time I found the bread and

* The *ſaliva* is reckoned by the celebrated STAHL among thoſe ſubſtances which are proper to excite a vegetable fermentation. *Vide Fundam. Chym. part.* ii. *tract.* i. *ſect.* i. *cap.* v. And the ſame opinion has generally prevailed, as I imagine from this circumſtance. A traveller gives an account of a ſtrange method of making a vinous liquor, in uſe among one of the *Indian* nations; that is, by firſt chewing the fruit, or grain, before they put them to ferment. But all that can be inferred from hence, is that the *ſaliva*, without bringing on the fermentation ſooner, may make it more equable and moderate after it begins, as in our experiments; and this may be a neceſſary circumſtance for conducting that proceſs in a hot climate.

fleſh riſen in the water, a ſediment nevertheleſs forming itſelf, and bubbles of air continually mounting: in a word, the fermentation was complete, being alſo diſtinguiſhed by a vinous ſmell, as in ordinary *working* liquors. The action continued above twice as long as when no *ſaliva* was uſed, and it was more moderate, and generated air with leſs tumult. When the fermentation intirely ceaſed, the mixture had a pure acid taſte, though weaker than what was produced in the former experiments; and I took notice, that it was without any putrid ſmell from the beginning.

2. I likewiſe varied this experiment as I had done the firſt, by uſing roaſted inſtead of raw meat, and ſometimes oatmeal inſtead of bread; but the reſult was ſtill the ſame. One circumſtance may deſerve particular notice. An ounce of bread, as much roaſted meat, about two ounces of water, and a ſmall quantity of the *ſaliva*, being beaten together, were allowed to ferment in a heat of ſixty five degrees; and having examined the phial with a thermometer, I found it about three degrees warmer than the external air *.

* It is probable, that in a fermentation of this kind the heat increaſes in proportion to the quantity of the mixture. In ſo ſmall a quantity, I doubt that neither vegetable ſubſtances fermenting, nor animal corrupting, ſeparately, would raiſe any perceptible degree of heat; though vegetables alone are capable of acquiring an intenſe heat (ſo indeed as to break out into a flame) if laid in a great heap, compreſſed and kept moiſt. But in that caſe, a putrefaction beginning, the fermentation is carried on between the ſeptic and the aceſcent parts, exactly as in the experiment above.

From theſe laſt experiments it appears, that if the *ſaliva* is found, in a ſufficient quantity, and well mixed with the aliment, it is qualified for retarding putrefaction, preventing immoderate fermentation, flatulence, and acidity in the *primæ viæ*. But if that humour is deficient, unſound, or not well mixed with what is ſwallowed, that the aliment may firſt putrefy, then grow acid, and in that action ferment ſtrongly, and generate much air in the ſtomach and bowels.

PAPER V.

Experiments and remarks on the fermentation of vegetables, by means of putrid animal ſubſtances, continued. An auſtere acid produced by ſuch fermentations. The probability that moſt vegetables are fermentable; not excepting the acrid, antiſcorbutic or alkaleſcent claſs. Of the fermentation of milk. How far the aliment ferments in the ſtomach. Of the uſe of the ſaliva *in alimentary fermentation. Of various cauſes of indigeſtion. Of the cauſe and cure of the heart-burn. And from what cauſe a ſourneſs of the ſtomach proceeds.*

Read June 20, 1751, IN my laſt paper, I gave an account of ſome obſervations which I had made upon the fermentation of the *farinacea*, excited by animal ſubſtances, but not having then finiſhed that ſubject, I ſhall now lay before the Society a few more experiments relating to it.

EXPERIMENT XXXI.

AFTER having ſeen the effects of the freſh *ſaliva*, both in keeping up and moderating fermentation, I was deſirous of knowing its qualities when putrid. For this purpoſe having collected a ſufficient quantity, I kept it about

about three days in the furnace *, and then added the uſual proportion thereof to the common mixtures of bread, fleſh, and water; which not only brought on the fermentation ſooner, but made it ſtronger and more productive of air, than would have happened without the *ſaliva*. The fleſh became alſo more than uſually putrid; but it was at laſt ſweetened by means of the fermentation, ſo that by the time the action ceaſed the contents of the phial ſmelled and taſted ſour, without any remains of putrefaction.

From this experiment we find it ſtill more probable, that all animal ſubſtances have a power (in proportion to their degree of corruption) of exciting a fermentation in the common *farinacea*.

EXPERIMENT XXXII.

I TOOK two drachms of a freſh mackarel ſkinned, with an equal quantity of bread, and having reduced them to

* *Viz.* Blood-warm, or about 100 degrees of FAHRENHEIT's thermometer; and the ſame degree of heat is to be underſtood as uſed in the reſt of theſe experiments, unleſs when it is otherwiſe expreſſed.

The late Dr. ALSTON not attending to the note above (which ſtands in all the editions of this work) in his firſt Diſſertation on Quick-lime, contradicts the reſult of one of my experiments, from one that he himſelf had made in a heat no greater than that of the common air, at *Edinburgh*, in the end of April and beginning of May, alledging that I had not ſpecified the degree which I had uſed in my experiments upon the ſame ſubſtance.

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the uſual conſiſtence with an ounce of water, I placed them in the furnace, together with another phial containing the like mixture, but with the addition of freſh *ſaliva*; and a third, with the ſame quantities of freſh beef, bread and water only, with which the two former were to be compared. In leſs than five hours after infuſion, the materials in all the phials began to riſe, to float in the water, and to ferment; and during the whole proceſs I perceived no difference between the fermentation occaſioned by the fiſh, and that by the fleſh, except that the phials with the fiſh retained the corrupted ſmell the longeſt. But next day, the fermentation ſtill ſubſiſting, the acid ſmell was to be diſtinguiſhed in all the phials; and on the fourth day (the corks having been drawn the night before) I was ſcarce ſenſible of any difference between the firſt and the third or ſtandard phial, either as to taſte, or ſmell; and both were very acid. But the liquor in the ſecond phial was not ſo ſour, and it yielded ſuch a vinous ſmell as was taken notice of before, when the freſh *ſaliva* was added to the common mixture with the beef *.

Having therefore obſerved, in this inſtance, ſuch an exact agreement between the effects of fiſh and of fleſh in cauſing fermentation, and preſuming that all fiſh poſſeſſed more or leſs of the ſame quality, I did not repeat the experiment with any other ſort. For, though I was ſenſible that for the better regulation of diet, and rightly

* Exper. xxx.

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underſtanding the different effects of different animals, in food, it might be of uſe to examine in this manner many of the individuals, and to obſerve which of them were more or leſs apt to cauſe fermentation, and to produce more or leſs of an acid; yet, as ſuch inquiries would have taken up too much time, I omitted them for the preſent, and purſued the general point, of inquiring how extenſive this principle, of exciting fermentation, was among other animal ſubſtances.

EXPERIMENT XXXIII.

I MADE therefore a trial with the yolks of new-laid eggs. One of theſe I mixed with two drachms of white bread and an ounce of water; and another, with the ſame proportion of bread and water, to which I added ſome *ſaliva*. But though both phials were kept four days in the furnace, I could perceive no marks of fermentation, or any tendency to putrefaction in either. Whereupon recollecting M. *de Rëaumur*'s obſervation about the ſlow putrefaction of un-impregnated eggs, I concluded that either theſe two happened to be ſo, and therefore reſiſted putrefaction ſo much the longer, or, which was moſt likely, that by a ſmall degree of acidity in the bread, they had been wholly preſerved from corrupting, and of courſe from fermenting too. So that this experiment ought to make no exception to the general principle, that all animal ſubſtances, upon putrefying, become ferments to the *farinacea*.

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EXPERIMENT XXXIV.

HAVING remarked, that the liquor produced by all the fermentations had not only a ſour but an auſtere taſte, that I might be ſure this did not proceed from alum (which the bakers have been accuſed of mixing with their loaf-bread) I made a like trial with ſea-biſcuit; which yielded the ſame kind of aſtringent acid as the other; and, as I remember, oatmeal afforded an acid little different from the reſt.

Having ſeen how fermentable ſome of the *farinacea* are by means of corrupted animal ſubſtances, and how probable it is, that the reſt of this claſs agree in the ſame quality with the ſpecimens, I ſhall next relate ſome experiments made upon vegetables of a different kind.

EXPERIMENT XXXV.

IN one phial I put two drachms of freſh beef, with a handful of new-cut ſpinage, and two ounces of water. In a ſecond, the ſame quantity of fleſh, half an ounce of boiled ſpinage, and between two or three ounces of water. In a third phial, was the ſame weight of the meat, with half an ounce of freſh aſparagus, and two ounces of water. In a fourth, was the like mixture, but with the aſparagus boiled. The fifth contained the ſame quantity of beef, with a handful of garden ſcurvygraſs, and two

ounces of water. The ſixth and laſt phial ſerved for a ſtandard, with a mixture of beef, bread and water only. All theſe were reduced to a pulp as uſual.

In leſs than five hours after ſetting them in the furnace, I found, not only the ſtandard, but the contents of the two phials with the aſparagus in a fermenting ſtate. The motion was particularly briſk in that with the raw plant; but in both, the fermentation went higher, and generated more air than the ſtandard. In other reſpects the action was the ſame; for the fleſh acquired at firſt a putrid ſmell, and afterwards loſt it; and the next day, or about thirty hours after infuſion, the acid prevailed; which, though conſiderably leſs than that of the ſtandard, yet was ſufficient for curdling milk. But the greateſt difference between the fermentation of the aſparagus, and that of the bread, lay in this, that after the bread-mixture became ſour, it remained ſo; whereas the acidity in the aſparagus-mixture was ſo weak, that in two or three days afterwards, it was intirely overcome by the corruption of the meat.

The proceſs with the ſpinage was little different: it fermented about an hour later than the ſtandard; and the raw plant ſomewhat later than the boiled. The fermentation of both was more moderate than either that with the aſparagus, or bread; leſs air being generated, and in a leſs tumultuous manner. At the ſame time that the ſtandard became acid, this change was alſo diſtinguiſhable in

in the phials with the ſpinage, by its curdling of milk: but after this period, as was remarked of the aſparagus, both the ſpinage-mixtures became putrid.

The ſcurvygraſs alſo fermented, and as early as the ſtandard, but more moderately and with leſs flatulence. Its acid was aſcertained by the ſame teſt with the former, *viz.* by curdling milk; but herein it differed, that after this change it continued to preſerve the meat longer from corruption. By which it appears, that though this plant is without any manifeſt acid, it is nevertheleſs a pretty ſtrong reſiſter of putrefaction.

I took the more notice of the fermentation of the ſcurvygraſs, as being of a claſs ſuppoſed unfermentable; and therefore I repeated the experiment, but with the ſame reſult. And ſince theſe trials agree with the conſtant obſervations upon the virtues of this plant in the marine or marſh-ſcurvy, it may therefore ſeem improperly claſſed with ſuch medicines as correct acidities, and promote putrefaction *. As for the aſparagus and ſpinage, though they contain but a weak acid, yet being fermentable, and in ſome degree reſiſters of putrefaction, neither can they be deemed ſeptics, but, at moſt, vegetables of eaſy corruption. The readineſs with which

* The ſea or marſh-ſcurvy appears to proceed from a putrid acrimony, as the livid blotches, offenſive breath, and reſolution both of the blood and fibres teſtify.

the aſparagus ferments, ſeems to correſpond with the quickneſs of its digeſtion in the ſtomach. For, from all the experiments which I have made, I am induced to think, that ſuch vegetables as are of the eaſieſt digeſtion will fall into the ſpeedieſt fermentation in a blood-warm furnace. Yet excepting theſe mentioned, I have made trial of no other eſculent plants, ſince I diſcovered their property of fermenting with corrupted fleſh. But I remember, when, for ſome other intention, I had once made a mixture of fleſh, water, and turnip, and left it in the furnace, without regarding it for two or three days, that the liquor then taſted ſour; which I preſume would not have happened without a previous fermentation. Hence I conjecture, that all the alimentary plants, which are not too bitter, or ſpicy, will ferment much in the ſame manner with thoſe mentioned: and I am almoſt confirmed in this opinion by the following experiment.

EXPERIMENT XXXVI.

1. To an ounce of new-milk were added ſome drops of the *craſſamentum* of human blood reſolved by putrefaction, and the phial with this mixture being expoſed to the uſual heat of an hundred degrees, in a few hours the contents fermented. The inteſtine motion was conſiderable, much air was ſeparated, and an acid was produced, which curdled the milk, and corrected the putrid ſmell.

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2. The experiment was repeated with four ounces of milk, and about two drachms of the corrupted blood; and after ſix or ſeven hours quiet infuſion, a ſtrong fermentation enſued, by which the glaſs ſtopper was forced out, and the froth came over, though the bottle was little more than half full. Now, ſince milk may be conſidered as the juice of graſs and various other vegetables, but little aſſimilated into an animal nature, we may from hence judge how prone all vegetables are to ferment with any thing putrid.

There being ſo near a conformity between the contents of the phials, in moſt of theſe experiments, and the aliment in digeſtion, it is ſcarce to be doubted, but that a fermentation is begun in the ſtomach, as often as there is any animal ſubſtance to ſerve for a ferment, and vegetables to be fermented.

That the aliment ferments in the ſtomach, was believed by ſome of the chemiſts; but as they did not explain the manner how, and applied the term *fermentation* to divers operations in nature ſcarcely analogous to that proceſs, it was no wonder that their theory was wholly rejected by ſome, and admitted by others with many reſtrictions. Nor will I infer from any experiment whichI have made, that this fermentation is either univerſal or indiſpenſible; ſince many live better on a vegetable than on an animal diet. And though in ſuch caſes the vegetables may be ſaid

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to ferment with the *ſaliva*, it is plain that the action muſt be inconſiderable, and come far ſhort of what reſults from a mixture of animal food. But then we may obſerve, that without milk vegetables alone afford but a poor and unwholeſome nouriſhment; and that ſuch as join milk to their vegetables, have therein an animal fluid already ſomewhat prepared. Again, that thoſe who require a vegetable diet moſt, are either of a hectic, or ſcorbutic habit: in which condition the *ſaliva*, being in a putrid ſtate, may induce that change upon the aliment, which, in better health, would be effected by the corruption of animal food in the ſtomach. Without theſe circumſtances, a vegetable diet ſuits thoſe beſt, who by great exerciſe or hard labour are able to ſubdue the viſcidity of unfermented chyle. This is the caſe of the common people in poorer countries, who ſubſiſt chiefly on the *farinacea*, and eat no fleſh. But whenever ſuch, by age or infirmity, are obliged to leave off work, they become ſubject to indigeſtions; and, upon the whole, ſeem to be leſs healthy and ſhorter lived than thoſe who are nouriſhed by a mixture of animal and vegetable ſubſtances.

It has been remarked, that the fermentation begins in the phials between four and five hours after infuſion; but this we are to underſtand of the manifeſt fermentation only; for as to the inſenſible working of thoſe mixtures, it muſt be allowed to begin much ſooner, and probably from the time they are firſt ſet in the furnace. Conformably

ably to which notion, we preſume, that after every meal a fermentation is begun, and ſo far carried on in the *primæ viæ*, that before the chyle enters the lacteals, its particles become as diſunited, and the air as much looſened, as in the phials, when the bread and fleſh firſt change their ſpecific gravity and float in the water. But we do not pretend, that in a natural ſtate this ever riſes to a vinous or an acetous fermentation, being aſſured that the chyle is admitted into the blood before it undergoes ſo conſiderable an alteration.

We have ſeen the uſe of the *ſaliva* in moderating fermentation, and making it ſlow; and alſo in checking the too great propenſity of animal ſubſtances to putrefaction, and of vegetables to acidity. Now, when the *ſaliva* is found, and in ſufficient quantity, and the aliment well prepared, and not too much of it, the fermentation paſſes without any tumult, and generates but little air. But in ſurfeits, or upon ſwallowing without due maſtication; when meats are tough, and fat, or eaten with farinaceous ſubſtances unfermented; or when by any accident the *ſaliva* is vitiated, too ſmall in quantity, or not intimately mixed with the food, the fermentation becomes tumultuous, the ſtomach ſwells with air; and this extraordinary commotion being attended with an unuſual heat, brings on that uneaſineſs called the *heart-burn*. And as in the experiments, a certain quantity of the *ſaliva* was found requiſite for keeping the fermentation within

bounds

bounds, ſo in practice we find, that whatever promotes a greater ſecretion of that humour, or helps to mix it with what we eat, is the beſt remedy for ſuch indigeſtions.

3. If an oily ſubſtance is added to the common mixture, a ſtronger fermentation enſues, which cannot be moderated by the uſual proportion of the *ſaliva*, till ſome fixed alkaline ſalt be added, as I found upon trial. And as I have alſo obſerved, that theſe ſalts will, without the *ſaliva*, not only ſuddenly ſtop very high fermentations in the phials, but likewiſe ſuppreſs them for ſome time, it is no wonder they ſhould be ſo ſure and ſpeedy a remedy in the heart-burn; as they not only render the *ſaliva* more ſaponaceous, but ſuſpend the fermentation till more of that humour can be ſecreted, and mixed with the aliment.

The theory reſulting from theſe experiments may help to account for other diſorders of the ſtomach; but I ſhall attempt to explain only one more at this time. This is the *fourneſs* of the ſtomach, occaſioned by a liquor ſo very acrid as to excoriate the throat, and to ſet the teeth on edge. In order to learn the cauſe of this extraordinary acidity, I made various experiments upon our common food; and among others, I made ſeveral infuſions of bread in water, in different proportions, which after keeping ſome days blood-warm, in the furnace, became but little acid, and ſtill leſs when the *ſaliva* was added.

And as to fleſh, ſo far is it from turning ſour, that its corruption ſeems directly oppoſed to acidity. Nevertheleſs it is certain, that many ſuffer greatly from an acid, though living on fleſh, bread and water only. Now, from the common theory of digeſtion we ſhall hardly be able to account for this matter; but eaſily from the principle of fermentation, by which we find that not only a ſtrong, but an auſtere acid, may be produced from theſe very materials, as often as the ſtomach is relaxed, or any way diſabled from conveying the whole aliment into the inteſtines. For, what is left having time to undergo too long a fermentation, it is thereby changed into a harſh ſort of vinegar.

PAPER VI.

Experiments upon ſubſtances haſtening, retarding, increaſing, and diminiſhing alimentary fermentation, with remarks upon their uſe in explaining the action of digeſtion, and ſhewing how that may be occaſionally aſſiſted by acids, bitters, aromatics, wine, &c. *What ſubſtances come neareſt to the* ſaliva *in its digeſtive quality, and how theſe are to be varied according to the habit. Of the difference between the action of the bile and that of common bitters. Sea-ſalt, in different quantities, either promotes, or retards alimentary fermentation; but the other ſeptics always haſten that proceſs. In what properties the* teſtacea, *lime-water, and the fixed alkaline ſalts agree, and differ. What aliments are the eaſieſt, and what the hardeſt of digeſtion.*

Read October 31, 1751. HAVING in the two preceding papers laid before the Society ſome experiments ſetting forth the general fermentation of alimentary vegetables, by means of animal ſuſtances tending to putrefaction, or already putrid, I ſhall now finiſh that part of my ſubject by reciting ſome experiments made upon bodies, which either haſten, or retard, increaſe, or diminiſh that proceſs; and I ſhall endeavour, as before, to apply them to uſe.

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EXPERIMENT XXXVII.

1. To two drachms of freſh beef, and as much bread, were added red port-wine, and water, of each half an ounce. To the ſame quantity of bread and fleſh, in another phial, was put an ounce of common ſmall-beer. In a third phial the bread and fleſh were diluted with an ounce of water acidulated with a few drops of the ſpirit of vitriol. And in a fourth phial were the ſame materials; only, inſtead of the ſpirit of vitriol, I put two drachms of the acid liquor ariſing from a fermentation of bread, fleſh and water. All theſe mixtures being reduced to the uſual conſiſtence, were ſet in the furnace, where they remained three days, without generating air, or affording any ſigns of fermentation. But two tea ſpoonfuls of rum being added to the common mixture, retarded fermentation for ſome hours only: perhaps a double or triple quantity would have wholly ſuppreſſed it.

2. In one of the common mixtures were infuſed five grains of the *ſpecies aromaticæ;* in another, ten grains of cummin-ſeed; a third, had half a drachm of the filings of the wood of ſaſſafras; a fourth, five grains of ſaffron; a fifth, five grains of myrrh; and a ſixth, five grains of aloes. In the two laſt the ſubſtances were diſſolved; but in all the reſt, the infuſions were made in boiling water, and when cool, added to the bread and fleſh beaten

to a pulp, as in the former experiments. Beſides theſe, another phial with the common mixture was prepared for a ſtandard, with which the reſt were to be compared, in relation to the manner, time, and degree of their fermentation. Things being thus diſpoſed, and the phials placed in the furnace, I obſerved the fermentation to begin in them all much later than in the ſtandard, that with the ſaſſafras excepted; but with this difference among them, that the mixtures with the aromatics, eſpecially that with the ſaſſafras, fermented ſtrongly and generated more air than the ſtandard, whilſt thoſe with the ſaffron, myrrh, and aloes, fermented ſlower, and were leſs flatulent.

3. In the ſame manner I examined the tops of wormwood and the leſſer centaury, camomile-flowers, gentian-root, and green tea; making moderate infuſions of all except the laſt, which was ſtrong; and I perceived that theſe alſo retarded fermentation conſiderably; the camomile and wormwood moſt; and that all of them, like the former bitters, moderated the fermentation; though none of them nearly ſo much as the *ſaliva*.

4. I found the ſame effect in ſtrained decoctions of the wild valerian-root, and of the *Peruvian* bark. But when the decoction of the laſt was left unſtrained (*i. e.* with more of the ſubſtance in it) the fermentation became then much greater than in the ſtandard. Whereupon recollecting

lecting the like high fermentation of ſaſſafras, and what is ſaid of the fermentation of the *Thames*-water, in oaken caſks *, I imputed theſe greater commotions to the aptneſs which all wood has to increaſe fermentation, when infuſed with any thing putrid. But however that may be, it is likely that this fermenting quality of the Bark is the cauſe of its diſagreeing with weak ſtomachs, when taken in ſubſtance, and in large doſes.

5. In like manner I examined horſeradiſh, muſtard-ſeed, and garden ſcurvygraſs, as ſpecimens of the hot alkaleſcent plants, and obſerved that the firſt, like the bitters, ſuſpended the fermentation long; the muſtard, a little while; but the ſcurvygraſs, not at all. And I took notice, that theſe mixtures not only fermented more moderately than the ſtandard, but alſo leſs than any of the ſubſtances before mentioned; and therein approached nearer to the nature of the *ſaliva* than any thing yet tried. Laſtly, I obſerved both of the bitter and acrid plants, that after a complete fermentation, the acid thereby produced was ſenſibly milder than that in the ſtandard.

* The great tendency in the *Thames*-water firſt to ferment, and then to become pure, in long voyages, is well known; and it is probable that this quality is owing to the extraordinary quantity of putrid matter with which it is impregnated at the place where it is taken up, *viz.* a little below *London*-bridge. As I have never heard of this, or of any other water, fermenting but in wooden veſſels, we may conclude that a vegetable juice is a neceſſary ingredient. Oaken caſks are particularly noted for promoting the fermentation of common vinous liquors.

From

From theſe experiments it ſeems probable, that ſpirits, acids, bitters, aromatics, and the hotter antiſcorbutic plants retard fermentation by their power of correcting putrefaction; and that ſince putrefaction and fermentation are ſuch requiſites in digeſtion, whatever oppoſes thoſe proceſſes muſt be contrary to that action. But as by means either of putrid *ſaliva*, or from a defect of that humour, the aliment may ferment too ſtrongly; or by a debility of the ſtomach, the food may be detained too long in it, and ferment too much, acids, bitters, aromatics, wines, *&c.* may have their ſeveral uſes; ſome for checking immoderate fermentation, and others for bracing the ſtomach, and enabling it to expel its contents in due time.

Fermentation being wholly ſuppreſſed in the phials by ſmall-beer, wine, and acids, may ſeem to prove that this proceſs would not take place in the ſtomach during the free uſe of ſuch liquors. But here we muſt obſerve, that the experiments mentioned were made without any *ſaliva*; for, when new trials were made with a ſufficient quantity of that humour, the ſame materials then fermented well, and only ſomewhat later than in the ſtandard. Again, when the putrid *ſaliva* was uſed, ſo far were the acids from being of diſſervice, that they were evidently uſeful in preventing the more violent fermentations which ſuch mixtures would have produced.

But

But whenever the recent *ſaliva* was overpowered by the acid, the fermentation was then to be promoted by correcting that acid, either by an alkaline ſalt, or by the teſtaceous powders.

All theſe facts correſpond with digeſtion. For, the moſt nouriſhing and digeſtible food, to people in health, conſiſts of a due mixture of animal and vegetable ſubſtances with water. Scorbutic or putrid habits require acids, wine, or other antiſeptics. An acid abounding in the ſtomach is corrected by abſorbents; and in a want of natural heat, or in a debility of the ſtomach, wines, bitters, warm and acrid ſubſtances become neceſſary for bracing and ſtimulating the fibres.

Since one great uſe of the *ſaliva* is to moderate fermentation, it is probable that ſuch ſubſtances as reſemble it moſt in this quality will prove the beſt ſtomachics, upon the failure of that humour. Of this claſs are acids, ſpirits, and bitters; but ſeeing that all theſe much retard, as well as moderate fermentation, they may be frequently leſs proper than ſome of the antiſcorbutics, which, as we obſerved, ſtopped fermentation little, and yet kept it moſt within bounds *. And as to the aromatics, however aſſiſting they may be in digeſtion by their heat and *ſtimulus*, they promiſe leſs of a carminative quality than either the bitters, or antiſcorbutics, in as much as they

* Such as muſtard, and garden ſcurvy-graſs: ſee page lxviii.

are

are more diſpoſed to increaſe than to moderate fermentation, and conſequently to produce air, inſtead of ſuppreſſing it.

EXPERIMENT XXXVIII.

BEING deſirous of comparing the effects of bile with thoſe of bitter plants, I made trials with freſh ſheep's gall; but found the reſult very different from the common opinion, about the agreement between an animal and vegetable bitter. For, having added a portion of the gall to a mixture of fleſh, bread and water, and made a ſtandard of a like mixture without the gall, I perceived the fermentation begin in both about the ſame time, but to be much ſtronger, and more tumultuous in the former than in the latter. Nay, ſo little was the gall diſpoſed to reſtrain fermentation, that without any other animal ſubſtance it fermented with bread and water only, as mentioned in a former paper. Now, ſince vegetable bitters are antiſeptic, retarders, and moderators of fermentation, they muſt therefore influence digeſtion very differently from the bile, which is poſſeſſed of all the oppoſite qualities. This being the caſe, we cannot be ſurpriſed at finding digeſtion ſo little mended in the jaundice by bitters, which are commonly given to ſupply the defect of the gall. There is nevertheleſs one quality in which the animal and vegetable bitters may agree, *viz.* in correcting

acidity; for, I took notice, that though the bilious mixtures loſt their uſual rankneſs acquired in the beginning of the fermentation, yet they never ſmelled nor taſted ſour after it had ceaſed.

EXPERIMENT XXXIX.

UPON adding ſea-ſalt to the common mixture, I obſerved that the ſame quantity, which proved ſeptic in the former experiments, made the fermentation begin ſooner here than in the ſtandard; but that a larger quantity retarded it. Thus two drachms of bread, with as much fleſh, two ounces of water, and ten grains of ſea-ſalt, fermented ſomewhat ſooner than a like mixture without ſalt; but when the ſalt was increaſed to half a drachm, the fermentation came on later than uſual.

But ſalt of wormwood, and ley of tartar, always retarded fermentation, and that in proportion to their quantity. I tried no other ſalt, being perſuaded that all the reſt (in any proportion) would reſiſt fermentation, as being all thoroughly antiſeptic.

EXPERIMENT XL.

A FEW grains of prepared crabs-eyes, added to the common mixture, brought on the fermentation above half an hour before the ſtandard, and made it greater. The fleſh

alſo became ranker than uſual; yet it was at laſt ſweetened by the acid produced in this proceſs. But when twenty or thirty grains of the powder were uſed, the fermentation came on ſtill earlier, and was more violent; and the fleſh becoming once putrid, never recovered its ſweetneſs.

The effects of lime-water were different; as it neither haſtened the fermentation, nor made it ſo ſtrong as above; the motion however was briſk, and when it ceaſed, the liquor was neither acid nor putrid, but had an agreeable ſmell like that of new bread.

Thus the *teſtacea*, lime-water, and fixed alkaline ſalts agree in ſome things, but differ in others. For, both putrefaction and fermentation are reſiſted by the ſalts, but promoted by the *teſtacea*; whereas lime-water neither retards fermentation, like the lixivial ſalts, nor haſtens it, nor makes it ſo violent as the *teſtacea* do; and being moreover ſomewhat aſtringent, it becomes a good medicine for weak ſtomachs with a predominating acid; as ſeveral have experienced who have been ſubject to the gout, gravel, and other chronic diſeaſes ſeemingly depending on that cauſe.

EXPERIMENT XLI.

ALIMENTARY animal ſubſtances, tending to putrefaction, are all of them likewiſe promoters of fermentation, ſo

ſo far as I have inquired. Thus, meat kept till it is become tender, though ſtill ſweet, is a readier ferment than the ſame kind uſed quite freſh. But though the fermentation is by the keeping ſooner excited, it is not made thereby the ſtronger. Fleſh pounded in a mortar ferments much ſooner, and with leſs tumult, than the ſame does in a lump, or not ſufficiently bruiſed; and raw meat ferments more violently than roaſted. All which are circumſtances agreeable to common obſervation, *viz.* that meats are better digeſted when kept till they are tender, when well dreſſed, and ſufficiently chewed; and ſeem to prove, that whatever is ſlow to corrupt, will *cæteris paribus* alſo ſit heavy on the ſtomach.

Among animal ſubſtances eggs corrupt the moſt ſlowly, and of courſe are among the ſloweſt to excite fermentation. Hence a new-laid egg, for its bulk, ſhould be of all tender animal food the heavieſt; and yet the ſame ſubſtance, by another theory reſpecting the nutrition of the chick only, has been thought the lighteſt of any.

PAPER VII.

Experiments and remarks upon the putrefaction of blood, and other animal ſubſtances. Of the nature of the inflammatory cruſt or the ſizy part of the blood. Of the fœcal acid. Uſes drawn from obſerving the colours of corrupted blood. Of the nature of purulent matter. The reſolution of the blood, the relaxation of the fibres, and the emiſſion of air, are the conſequences of putrefaction: hence ſeveral ſymptoms of putrid diſeaſes accounted for. The marrow not ſoon corruptible. The blood may become really putrid whilſt the animal lives. The different effects of alkaline ſalts, and of putrid ſubſtances, upon the nerves. That there is properly but one ſpecies of the true ſcurvy; and that this ariſes from putrefaction.

Read Feb. 13, 1752. HAVING in my laſt paper finiſhed that part of my ſubject which relates to the vinous fermentation of vegetables, excited by a putrid ferment, I ſhall conclude the whole with ſubjoining a few experiments made upon the putrefaction both of blood and of the more ſolid parts of the body, with a view to clear up ſome other points in the theory of medicine.

EXPERIMENT XLII.

A PORTION of blood, taken from a man ill of a pleuriſy, was divided into the inflammatory cruſt *, the

* *Viz.* that part of the blood, which M. DE SENAC calls *la matiere blanche, qui ſe coagule d'elle même. Structure du Cœur, tome* ii. *p.* 91.

craſſamentum,

craſſamentum, and the *ſerum*. Theſe were put into different phials of a larger ſize (ſo as to contain a good deal of air) and being corked, were placed in the furnace, heated to the common ſtandard, *viz.* 100 degrees of *Fahrenheit*'s thermometer. In twelve or fourteen hours the cruſt began to corrupt, the *craſſamentum* held out a few hours longer, but the *ſerum* continued near four times longer than this laſt without any offenſive mark of putrefaction. This experiment was repeated with ſome freſh pleuritic blood, taken from another perſon, and with the like ſucceſs.

2. Another time, having procured blood with a thick inflammatory cruſt, I ſeparated that part of it from the reſt, and dividing it into two, I expoſed one piece to the air, in a room; and the other I kept in a ſaucer, and covered it with a cup. The experiment was made in ſummer; and I obſerved that the former piece (which at firſt weighed two drachms) loſt half of its weight in twenty-four hours, by evaporation only; and that in two days more, the whole was reduced to a thin pellicle; but that the covered portion, in a few days, ran *per deliquium*; whilſt one part of the *craſſamentum* (that had likewiſe been left to evaporate, but upon the outſide of a window) formed itſelf into a thick cake; and the reſt of that ſubſtance, which was kept in a cloſe phial, retained for ſome weeks a conſiderable degree of coheſion.

The

The inflammatory cruſt being therefore ſo ſoluble, volatile, and corruptible, we may conclude that it contains a greater quantity of ſeptic particles, than any other part of the blood. How this comes to paſs, I ſhall now endeavour to explain.

Whether thoſe inflammatory fevers are firſt brought on by the ſhutting up of the pores, or by ſome other cauſe, has been a queſtion; though it has never been doubted, that a ſtoppage of perſpiration is, at leaſt, the conſequence of ſuch fevers; and therefore it follows, that in either caſe, the moſt corrupted particles muſt be retained, at a time when, from a greater degree of heat, the humours are moſt diſpoſed to putrefaction. But when after bleeding, the blood is allowed to ſtand till the homogeneous parts have time to unite, the perſpirable and ſeptic matter immediately flies off from the *ſerum*, as leaſt viſcous; but adheres to the *craſſamentum;* and is ſtill more entangled in the ſizy or glutinous portion of the blood that riſes to the ſurface.

EXPERIMENT XLIII.

MINERAL acids being ſuch powerful antiſeptics, I was deſirous to ſee their effects upon ſubſtances already putrid. For this purpoſe I dropped ſpirit of vitriol both upon a piece of corrupted beef, and upon the *craſſamentum* of human blood, alſo putrid; and obſerved that this acid, inſtead of allaying the *fœtor*, rather increaſed it; ſo that by this

this addition it became ſtercoraceous, or acquired ſuch a ſmell as ariſes during the precipitation of ſulphur (by an acid) in a lixivial *menſtruum* *.

Having repeated the experiment both with the ſpirit of ſea-ſalt, and vinegar, with the ſame reſult, we may from thence conjecture, that the *effluvia* iſſuing from corrupted ſubſtances conſiſt chiefly of the *phlogiſton* † or *ſulphur-principle;* ſince theſe *effluvia* ſo readily unite with, and volatilize the acids, as appears by the increaſe and particular change of the ſmell. But it will be proper to remark, that from a ſimple putrid ſubſtance, the *phlogiſton* does not riſe alone, but combined with the ſaline parts of the body. For, the *phlogiſton*, when ſingle, is perhaps imperceptible to the ſmell; and when diveſted of theſe ſalts, is never, ſo far as we know, peſtilential. So that the deleterious particles of rotten ſubſtances ſeem to conſiſt of a certain combination of the ſulphureous with the ſaline principle, which united not only become the moſt irritating *ſtimuli* to the nerves, but act upon the humours as a putrid ferment, in promoting their corruption.

* Sciendum vero ſulphur ſolutum alcalicis, dein miſto acido, præcipitari, albeſcere, *fœtorem ingratiſſimum putrefactorum excrementorum* exhibere... Si tincturæ aureæ ſulphuris acetum inſtillas, mox *fœtor* prodit *ſtercoreus* ex præcipitato ſulphure. BOERHAAVE, Element. Chem. tom. ii. proc. clix.

† Materiam et principium ignis, non ipſum ignem, ego *phlogiſton* appellari cœpi; nempe primum igneſcibile, inflammabile, directè atque eminenter ad calorem ſuſcipiendum atque fovendum habile principium STAHLII Fundam Theor. BECCHERIAN.

From

From the ſame experiment it likewiſe ſeems probable that the *fæces humanæ*, to which this mixture (made between a putrid ſubſtance and an acid) has a near affinity, are compounded of ſome ſtrong acid and corrupted matter; and from thence, that, in a natural ſtate, the *fæces* are little, if at all, infectious: which could not happen, were they wholly putrid *.

EXPERIMENT XLIV.

AFTER the acid was added, in the manner deſcribed in the laſt experiment, I attempted to reſtore thoſe ſubſtances to their former putrid ſtate, by an alkaline ſalt. But upon inſtilling the ley of *tartar* (which was followed by the uſual effervеſcence) I perceived that the mixture became thereby much leſs offenſive, than when the putrid ſubſtance was either alone, or joined to the acid: a circumſtance which I did not expect. But from hence, perhaps, we may be able to account for the virtues of the ſaline draughts of *Riverius*, taken in the act of effervеſcence, and firſt recommended by that author in vomitings incident to putrid and malignant fevers †.

EXPERIMENT XLV.

IN order to examine the colour of the different parts of corrupted blood, I procured a freſh quantity without any

* See the preceding Obſervations, part iii. ch. vii.

† RIVER. cap. de Feb. Peſtilent.

inflam-

inflammatory cruſt, and divided it into the *craſſamentum*, the *ſerum*, with a few red globules that fell to the bottom, and the pure *ſerum*. The phials containing theſe ſeveral liquors were ſet in the furnace, where they ſtood ſome days till they became thoroughly putrid.

The *craſſamentum* changed from a deep crimſon to a dark livid colour; ſo that when any portion of this was diluted with water, it appeared of a tawny hue. Of the ſame colour was that *ſerum* in which the red globules had been diſſolved. But the pure *ſerum*, after becoming turbid, dropped a white purulent ſediment, and changed into a faint olive-green.

From this experiment it ſhould ſeem, that the *ichor* of ſores, and that of dyſenteric fluxes, conſiſts of the *ſerum* tinged with a ſmall quantity of red blood putrefied; and that when the ſerous veſſels are of a tawny caſt, we are not always to refer that colour to inflammation, but to a ſolution of ſome of the red globules mixed with the *ſerum*. An inſtance of which may be ſeen in the colour of the *white* of the eye in putrid ſcurvies, and in the advanced ſtate of malignant fevers. At ſuch times not only the *ſerum* of the blood drawn from a vein, and what oozes from a bliſter, but even the *ſaliva* and ſweat will be tinged in the like manner *.

* See the preceding Obſervations, page 197.

To the recent urine of a perſon in health were added a few drops of this putrid *craſſamentum*, which it immediately changed into a flame-coloured water, ſo common in fevers and in the ſea-ſcurvy. After ſtanding an hour or two it gathered a cloud, reſembling what is ſeen in the crude urine of acute diſtempers; and I took notice of a ſpeck or two of an oily ſubſtance on the ſurface, like that ſcum which is ſaid to appear in putrid ſcurvies.

As to a green *ſerum*, it is perhaps never to be ſeen in the veſſels of a living body; ſince in all putrid diſorders the red globules being reſolved, enter the ſerous veſſels, and when the *ſerum* is thus coloured, it never can become green. Beſides, as this humour is very late in acquiring that caſt when out of the body, it is not to be ſuppoſed that a perſon could ſurvive ſo great a change of the blood. But in dead bodies this *ſerum* is to be diſtinguiſhed by the greenneſs which the fleſh acquires in corrupting. In ſalted meats we commonly aſcribe the greenneſs to the brine, but erroneouſly; for ſalt has no power of giving this colour, but only of qualifying the taſte, and correcting the bad effects of corrupted aliments, in ſome degree. This colour in dead bodies begins firſt in the inteſtines, and in the parts adjoining, from the air in the *primæ viæ*, which haſtens the putrefaction.

In foul ulcers, and in other ſores where the *ſerum* is left to ſtagnate long, the matter is likewiſe found greeniſh, and

and it is then always acrimonious. But the effects of a green *ſerum* are no where ſo much to be dreaded as in the caſe of an *aſcites*, where it is often collected in a large quantity. Of this the Society had, ſome years ago, an inſtance, almoſt fatal, in Mr. *Cox*, ſurgeon at *Peterborough*; who upon tapping a woman, but a few hours after her death, was ſo affected with the poiſonous ſteams of a green *ſerum*, that he was preſently ſeized with a peſtilential fever, and narrowly eſcaped with his life *.

I have already obſerved that the *ſerum* of human blood, upon ſtanding but a little time in the furnace, becomes turbid before it grows offenſive, and then gradually drops a ſediment reſembling digeſted matter. This experiment was alſo frequently repeated with the ſame ſucceſs; and I likewiſe took notice, that this matter never changed its colour, or mixed again with the *ſerum*. From theſe circumſtances I conjecture, that this ſediment is a terreſtrial ſubſtance, intended for the nouriſhment or reparation of the ſolids. And I am the more inclined to this opinion, upon diſcovering a like ſediment in the urine of people in perfect health, after long ſtanding, as I conſider this laſt as either the redundance of the nutritious matter, or what has been actually applied, but ceaſes to be of any longer uſe.

We may therefore conclude, that the *ſerum* is perpetually oozing into all ulcers; but that from the heat of the

* Philoſ. Tranſact. n. 454. p. 168. Abridg. vol. ix. part iii. ch. v. art. viii.

part, and the natural volatility of animal fluids, it is all quickly evaporated, excepting this matter that remains in the ſore in the form of *pus*, which is ſo requiſite to the cure. For this reaſon all large ulcers are ſo weakening, from the great expence of blood in furniſhing as much *ſerum* as is neceſſary, upon evaporation, to leave a ſufficient quantity of this ſubſtance: and hence it is that iſſues are of more conſequence for making drains, than one would expect from the viſible diſcharge. As near as I could gueſs, an ounce of *ſerum*, upon ſtanding ſome days, did not furniſh more of this matter, than what might be produced by the daily running of a common pea-iſſue, or of a ſeton.

EXPERIMENT XLVI.

As all the humours become thinner by putrefaction, ſo the ſolid or fibrous parts of animal bodies are relaxed or rendered more tender by the ſame proceſs. This obſervation is ſo common and uncontroverted that it requires no new experiments to confirm it. I ſhall therefore only remark, that this ſtate ſeems to be one of the cleareſt caſes of diſeaſes depending on weak and lax fibres, as it appears in all malignant fevers, and in the true ſea or marſh-ſcurvies which ariſe from a putrid cauſe.

From this circumſtance we are enabled to account for the extraordinary bulk of the heart, liver, and ſpleen, the

the common effects of theſe diſeaſes. For, ſuppoſing the natural growth of the parts ſtopped by the rigidity of the fibres balancing the diſtending force of the blood, it will follow, that whenever the fibres are preternaturally ſoftened, the increaſe of the ſame parts will begin again *. Of this fact, we have ſome remarkable inſtances in thoſe who died of the laſt plague at *Marſeilles* (communicated to the Society by M. *Deidier*, one of the phyſicians to the King of *France* †) which, with others of the ſame ſort, have been ſince republiſhed in a large collection of papers relating to that fatal diſtemper ‡. It is obſervable, that in nine diſſections there referred to, the extraordinary growth of the heart is mentioned in all, and that of the liver in ſeven of them. Thus, in the firſt, the author takes notice: "That the heart was of an extraordinary bigneſs, and the liver was of double the "natural ſize....Caſe 2. The heart was of a prodigious "bigneſs, the liver much enlarged....Caſe 3. The heart "of double the natural bigneſs....Caſe 4. The heart was "very large, and the liver was bigger and harder than "ordinary....Caſe 5. We found the heart of a prodigious "bigneſs....Caſe 6. The heart was larger than in its natu-"ral ſtate, the liver alſo was very large....Caſe 7. The "heart was of a prodigious ſize, and the liver was very

* This conjecture I had from Dr. SIMSON, profeſſor of medicine in the univerſity of St. *Andrews*.

† Phil. Tranſact. n. 370. abridg. vol. vi. part iii. ch. ii.

‡ Traité de la Peſte.

" large....Caſe 8. We found the heart much larger than " natural, and the liver of a prodigious ſize....Caſe 9. The " heart was double the natural bigneſs, and the liver " alſo was larger than ordinary."

As to the ſcurvy, *Eugalenus*, a noted author on that diſeaſe, obſerves that the liver and ſpleen were often ſo much enlarged that the tumour could be ſeen outwardly *. And M. *Poupart*, who opened a great number of thoſe who died of that diſtemper, remarks, that in all thoſe who died ſuddenly, he found the auricles of the heart as large as a man's fiſt, and full of coagulated blood †.

With regard to the corruption of dead bodies, a ſkilful anatomiſt, who has made an uncommon number of diſſections, informed me: " That the *viſcera* and muſcles " of the *abdomen* corrupt ſooner than any other part of the " body after death; therefore it is a rule with anato- " miſts to begin their diſſections and demonſtrations with " thoſe parts which firſt become offenſive. That the quick " putrefaction here may be aſcribed to the air included in " the inteſtines, or to the putrid ſteams of the *fæces*, eſpe- " cially in a morbid ſtate: hence alſo the ſpeedy corrup- " tion of the muſcles *pſoas*, and *iliacus internus*, in compa- " riſon of the muſcles of the extremities. That next to

* Lib. de Morbo Scorbuto art. xxxi. Conf. MEAD Mon. & Præc. Med. cap. xvi.

† Mem. de l'Acad. R. des Sc. A. 1699.

" the abdominal *viſcera* and adjacent parts, the lungs are " commonly the ſooneſt tainted; whether from the air " ſtagnating in the *veſiculæ bronchiales*, or ſome remains of " the perſpirable matter, that may act as a ferment and " haſten the putrefaction. For, whoever tries the experi- " ment of compreſſing the *thorax*, in a body that has been " dead for ſome time, will be ſenſible of the putrid ſtate " of the lungs, by the offenſiveneſs of the air that is for- " ced out of them. That the brain ought to be diſſected " as ſoon as can be conveniently done after death; be- " cauſe in its firmeſt ſtate, it is but an indifferent ſubject " for the knife, and altogether unfit for diſſection when " reſolved by putrefaction; but that in ſeveral caſes it " had been found unexpectedly firm after being kept " ſome time, and as ſweet as any other part of the body. " Laſtly, that this difference is obſervable between the " brain and the other parts, that when the brain is kept " in the open air, its putrefaction ſeems thereby rather " retarded, and it acquires a dry gloſſy ſkin on its outſide; " whereas all the other parts corrupt manifeſtly the ſooner " for being expoſed to the air, and get a covering of a " putrid *mucus* all over their ſurface *."

EXPERIMENT XLVII.

THE marrow is commonly accounted a ſubſtance the moſt offenſive when corrupted; perhaps for this reaſon

* Dr. HUNTER, who favoured me with this account, added, that as he had never given a particular attention to this ſubject, he could only offer what is above as the reſult of his beſt recollection.

only,

only, that carious bones are more fetid than other ſores. But however that may be, I am apt to think, from the following experiment, that in general the marrow muſt putrefy very ſlowly. I put an equal, but a ſmall quantity of ox's marrow into two large phials; to one of which I added prepared crabs-eyes. Theſe phials being corked were ſet by a fire, kept up all the day to a heat ſufficient for liquefying the marrow (that is, above the hundredth degree of *Fahrenheit*'s ſcale) and continued there near five weeks. Yet at the end of this time I could perceive nothing offenſive in the phial with the pure marrow, and the other ſmelled only a little rancid.

From this experiment, one ſhould believe that the *fœtor* of a carious bone is not to be attributed to the marrow, ſince the corruption of that ſubſtance tends more to the rancid than to the cadaverous ſmell; and therefore I am inclined to refer that rankneſs to one of the two following cauſes, or to a combination of them. The firſt may be the porouſneſs of the bone, which retains the corrupted matter longer than any ordinary ſore. The ſecond, the more conſtant oozing of veſſels conveying the red blood; for, when theſe are broken in a boney ſubſtance, they do not contract ſo ſoon as in a common ulcer; and we have ſeen that the red part of the blood admits of a higher degree of corruption than the ſerous.

EXPE-

EXPERIMENT XLVIII.

IT is well known that as fleſh, ſo the blood is ſpecifically heavier than water; and that dead bodies float, after lying ſome time at the bottom, by means of the fixed air ſeparated in the bowels by putrefaction. But I have obſerved that a bit of meat beaten in a mortar to the conſiſtence of a pulp, put into a phial with water, and ſet in the furnace (as in the foregoing experiments) after remaining a few hours at the bottom, floated before it became offenſive; though after it roſe, the corruption was ſoon perceptible. Here it is probable, that the particles of air, incorporated with the animal ſubſtance *, begin to be diſengaged, and to be ſo collected together as to buoy up the fleſh, though at this time there are ſcarce any air-bubbles to be ſeen with the naked eye adhering to it.

Further, I have remarked that both the *craſſamentum* and the *ſerum* of human blood have yielded air, after ſtanding ſome time in the lamp-furnace, before they ſmelled offenſively. This was eaſily diſcovered by the accumulation of air in the phials; for in that heat, the incloſed air, where there is no animal ſubſtance, is ſcarce ſenſibly dilated.

But upon the thorough putrefaction of all animal ſubſtances a conſiderable quantity of air is generated;

* HALES Veget. Stat. ch. vi.

which being a fact sufficiently known, I need only add, that I have constantly observed a great deal more air produced from flesh than from blood, and that this too is a circumstance agreeable to the experiments of Dr. *Hales**.

Now, as I could be assured that the blood and other animal substances, at the time they began to emit air, were not so far advanced in the septic process, as they are often found in some putrid diseases, I was induced to think that several symptoms in a deep scurvy † might be owing to the action of the air, within the vessels, either wholly detached from the humours, or but imperfectly incorporated with them; though I was aware of an objection that might arise from the experiment of injecting air into the veins, by which animals are said to die immediately with convulsions. For, all that we can infer from thence is, that more air is thrown in than is consistent with the circulation; and that if there was less of it, the animals might survive, though perhaps not without some irregular motion of the blood, faintings, a palsy, or other affections of the nerves, according to the quantity of the air injected. In fact, we find some of the most accurate naturalists allowing, after trial, that air may be conveyed into the veins slowly, and in a small quantity,

* Vide loc. cit.

† By the *scurvy*, I always mean the disease of sailors, or of those who live in a moist air, eat salted provisions, have little milk or greens, and drink no fermented liquors.

without

without killing the animal *. And this is further confirmed by the experiments made upon animals inclosed in an exhausted receiver, which swell all over, and are thrown into convulsions, as soon as the air is withdrawn, yet recover upon the timely re-admission of it †.

Have not therefore the symptoms of a deep scurvy some similitude to what these animals suffer? For, we are told by those who have had opportunities of seeing the worst cases, that the sick are afflicted with vague and excruciating pains, coming on and going off suddenly, which are always rendered worse by bleeding ‡; that they have tumours appearing in several parts of the body, different from all others §; and that they are subject to sudden and momentary numbness of their limbs, to convulsions,

* Vena nempe jugularis vivi canis inflatur, protinus coagulatur sanguis, et cita mors sequitur liberum aëris per sanguinem iter. Sed et pauco aëre injecto, neque necatis animalibus, pulsus intermittens fit. (REDI vol. vi. p. 223.) Respondit dudum BERGERUS, posse bullas magnas aëris frigore suo coagulare sanguinem, et immeabilitate obstruere vias; neque ideo aëris minimas particulas, sensim et parcè admistas eadem mala facturas. HALLER. Not. in BOERH. Præiect. Physiolog. vol. ii. p. 208.

† BOYLE Physico-Mechan. Exp. *Mem. de l'Acad. R. des Sc. A.* 1700, 1707, MUSSCHENBROEK *Inst. Physic.* § 1388.

‡ EUGALEN. de Morb. Scorbut. art. xii. et seq. art. xxx.

§ *Id ibid. art.* xviii. M. POUPART also observes, that in one year a great number of sick being sent into the *Hotel-Dieu* with some alarming symptoms, he had inquired into the nature of their ailment, and found that it was only the scurvy, but in a more than ordinary degree. Among other appearances, he observes that several had such large swellings over their body and in their extremities, that they looked as if they had been blown up. *Mem. de l'Acad. R. des Sciences, A.* 1699.

and to palfies of an uncommon kind*. To all which let me add the effects of the quick changes of the weight of the atmoſphere, which being perhaps more remarkable upon conſtitutions of this kind than upon any other, ſeem to confirm what has been conjectured about the looſer connexion of the air with the blood, in ſcorbutic habits.

Laſtly, it may be proper to remove the difficulties of thoſe who maintain, that no animal can live whilſt the blood is really putrid, and therefore that the moſt that can be allowed, is only a tendency to putrefaction. But to this we reply, that beſides numberleſs obſervations of the corruption of all the ſecretions, as well as excretions, in diſeaſes, we have frequent inſtances of the tawny colour of the *ſerum*, the reſolution of the *craſſamentum*, and even of the offenſive ſmell of the blood recently drawn †.

* EUGALEN. art. xi. xxvi. xxvii.

† Vapor, ex ſanguine exhalans, eſt mitis, blandus, neque nares neque oculos afficiens; in ſtatu tamen præternaturali planè eodem modo, ut ſudor morbificus et vapor ex ulcere manans atque evaporans, acer nares atque oculos ferit. SCHWENCKE Hæmatolog. p. 90.

In morbis putridis, diſſolutio cruoris quoque advertitur, præſertim peſtis ſpecie, in quibus non coagulatur ſanguis (ſcil. e venâ emiſſus) ſed gangrænoſus et putridus reperitur; quod etiam in eo ſanguine obſervatur, qui poſt protractam inediam putridus et alcalinus factus eſt, &c. Id. ibid. p. 129.

Sanguis qui per febres putridas detrahitur ſæpe animadvertitur non ſolùm fœtidus & graveolens, ſed et putridus; adeò ut nec ſibi cohærere nec concreſcere queat, omnibus ſcilicet ejus fibris putredine conſumptis. FERNEL. de Febrib. cap. v.

Denique notatu digniſſimum eſt, quod mihi nuperrimè videre contigit, ſanguis fœminæ cujuſdam, febre malignâ laborantis, per phlebotomiam detractus adeò fœtebat, ut ex ejus tetro odore tam chirurgus quam adſtantes in animi planè deliquium inciderint. MORTON. Pyretolog. part. i.

And

And indeed if we reflect how putreſcent blood is in a heat equal to that of the human body, we may be convinced that the perſpiration by the lungs and ſkin (or whatever other outlet there may be for the more volatile and corrupted particles) is no ſooner impeded, than a *reſolution* begins in the whole maſs, which if not timely prevented brings on ſome putrid diſeaſe *.

If the acrimony be great, and the nerves thereby ſuddenly affected, a putrid fever, a vomiting, or a flux will enſue. But if the accumulation be ſo ſlow, that the nerves grow in ſome manner habituated to the putrefaction, a ſcurvy prevails. This is the caſe not only of ſailors, but of all others, when milk, greens, and fermented liquors are wanting, and when the greateſt part of the diet conſiſts of meats long ſalted, which, though rendered palatable by the ſalt, are in effect putrid. Whatever accident, in ſuch circumſtances, tends to ſtop perſpiration, is apt to increaſe the diſorder, and eſpecially if the moiſture of the air concurs with ſuch unwholeſome aliment.

* It has been the opinion of ſome phyſiologiſts, that the blood is kept from putrefaction by its motion only; but for this they aſſign no other reaſon, than their obſerving the greater purity of running water, and of the ſea when agitated by the wind, in compariſon of the ſame when ſtagnating. But here, as motion ſeems only to be the accidental cauſe, by furniſhing means to the water for exhaling its more corrupted particles, ſo in like manner, the circulation can only enable the blood to throw off ſuch matter as would corrupt it, if retained too long in the veſſels.

† See exper. xlv. and Obſerv. part iii. ch. vii.

Now

Now, inſtances of this ſort are ſo common, that it may ſeem ſtrange how the corruption of the humours ſhould ever have been contradicted; and indeed for this I can only aſſign the following reaſon. By ſome miſtake of the chemiſts, the notion of the putrefying principle, in animal ſubſtances, was confounded with that of an alkaline ſalt, which ſalt being looked upon as corroſive, they concluded that as it could not enter the veſſels without deſtroying both them and the nerves, ſo the blood could never be ſuppoſed alkaline or putrid whilſt the perſon lived. But from ſeveral of theſe experiments we find, that putrid ſubſtances are very different from alkaline. I have frequently given of the ſalt of hartſhorn a drachm a day, for a continuance, without obſerving any ſeptic effects; and ſince the introduction of Mrs. *Stephens*'s medicine for the ſtone, we ſee what large quantities of the fixed alkaline ſalts may paſs into the blood without doing any harm. So different therefore are theſe ſalts from putrid matter, that of all ſtimulating medicines they are perhaps the leaſt hurtful to the nerves and the veſſels; whilſt every corrupted animal ſubſtance is not only offenſive to the ſenſes, but to the whole nervous ſyſtem, as is evident from the *nauſea*, ſpaſms, palpitations, tremors, dejection of ſpirits, and other ſymptoms conſequent upon the admiſſion of any ſtrong ſeptic ferment into the blood.

It will appear that in theſe papers I have conſidered the ſcurvy as ariſing from a putrid cauſe only, without regarding

garding whether that putrefaction be owing to corrupted proviſions at ſea, or to the want of proper diet in marſhy countries. For, by not confining the ſcurvy in this manner, ſome writers of the firſt rank have confounded ſeveral diſeaſes under that name, though different in their cauſe, their ſymptoms and their cure. I cannot, for inſtance, ſee what relation the various kinds of ſcurfs and tetters (which are *ſpecies* of the leproſy) have to the diſeaſe of ſailors; or how thoſe who admit of putrefaction for one cauſe of the ſcurvy, ſhould at the ſame time acknowledge an acid acrimony for another. It would ſeem that they were led into this laſt inconſiſtency by obſerving how ſerviceable the *raphanus ruſticanus*, the *cochlearia*, and the like plants were in the cure. For, as all theſe were reputed of an alkaline or putrefying nature, an acid *ſpecies* of ſcurvy ſeems to have been invented in order to account for their virtues. But from the experiments laid before the Society it appears, that theſe vegetables are real antiſeptics *, and therefore poſſeſſed of qualities very different from what thoſe celebrated authors imagined, when they conſidered their alkaline parts as ſeptic, and their reſolution as tending to putrefaction only, and not to fermentation.

* Exper. xi. xx. xxv. xxxviii. 5.

AN

AN

ANSWER

TO

PROFESSOR DE HAEN

AND TO

M. GABER,

Concerning ſome remarks made by them on the preceding work.

I. WHILST the third edition of my Obſervations was in the preſs, I met with a treatiſe on fevers *, publiſhed by Dr. *de Haen*, profeſſor of medicine in the univerſity of *Vienna*. Upon peruſal, I was a little ſurpriſed at obſerving, that the learned author, in his ſection *de Febre Miliari*, after finding fault with Dr. *Huxham*'s ſentiments and practice in regard to that fever, ſhould add, "that if, in oppoſition to his own opinion, any thing were "advanced from my writings ſimilar to what he had con"demned in Dr. *Huxham*'s, the ſame arguments which he "had uſed againſt him would ſerve againſt me."

* The title is *Theſes Siſtentes Febrium Diviſiones*, &c.

Now,

Now, if either Dr. *Huxham* had copied from me, or I from him, or indeed had there been an exact conformity between us, this ſhort remark might have been ſufficient; but as none of theſe circumſtances are true, Dr. *de Haen* will, I hope, excuſe me for ſhewing ſome of his miſtakes on this occaſion, ſo far as I am concerned: for as to what relates to Dr. *Huxham*, as I am ſatisfied he is well able to anſwer for himſelf, I ſhall leave him to ſay what he thinks proper upon the ſubject.

For my part, I have been ſo far from propoſing any opinion about the nature of a miliary fever, or the method of treating it, that I have never mentioned the diſtemper but in the moſt tranſient manner. Once, in order to diſtinguiſh the puſtules peculiar to it, from thoſe of the itch; in another place, to diſtinguiſh thoſe puſtules from the *petechiæ* (where I have expreſsly added, that the miliary fever was not to be confounded with the hoſpital-fever *;) again, when I obſerve that I never ſaw the hoſpital-fever accompanied with miliary puſtules †; and laſtly, when I ſay, that the miliary fever is a rare diſeaſe in the hoſpitals of an army ‡. Hence it will appear, that I have never conſidered the hoſpital-fever and miliary fever as ſimilar diſeaſes: and indeed I may venture to affirm, that as no

* Obſervat. on the Diſ. of the Army 1ſt edition p. 302. preſent edition p. 296.

† Ib. 1ſt ed. p. 358. preſent ed. p. 339.

‡ Ib. 1ſt ed. p. 359. preſent ed. p. 341.

two ſpecies of fevers can be more unlike, ſo neither the theory nor the practice in the one can be regulated by analogy from the other.

But Dr. *de Haen* inſiſts on a near relation between the miliary and the petechial fever*; and as he will have that malignant fever which I treat of, to be the ſame with his petechial fever, he thinks proper, in his ſection on the miliary fever, from principles relative only to that diſtemper, to reflect upon my practice in one of a very different kind.

The malignant fever, which I ſaw, is not the *febris petechialis*; for I have remarked, that though the eruptions, which I call the *petechiæ*, often appear in the jail or hoſpital-fever, yet they do not conſtantly accompany it, and therefore have not a title to characterize that diſorder any more than the plague, of which likewiſe they are a frequent ſymptom. This diſtinction between a petechial fever, and a fever ſometimes attended with *petechiæ*, not apprehended by Dr. *de Haen*, is well laid down by *Sennertus* in his account of the *morbus Hungaricus*, which, as I have elſewhere obſerved, was a camp-fever raiſed to a high pitch of malignity. His words are, *Nonnulli morbum* Hungaricum

* At the concluſion of his ſection *de Febre Petechiali*, he ſays, *Multa de* Petechiis *dicenda ſuperſunt; maximè de iiſdem tum præveniendis, antequam fiant; tum, cum adſint, curandis. Verùm cum hæc quoque ad* Miliarem *eruptionem pertineant, ipſaque* Miliarium *hiſtoria eam* Petechiarum *elucidet, atque explanet, unâ fideliâ hunc utrumque parietem dealbabo.*

garicum *et febrem petechialem planè pro eodem morbo habent; ſed mihi quidem videtur, non ſatis rectè. Etſi enim petechiæ et maculæ illæ quandoque etiam in morbo* Hungarico *conſpiciantur, tamen non ſemper id accidit, et poteſt hic morbus eſſe ſine maculis. Contra verò maculæ in febre petechiali omni inveniuntur; unde et nomen hæc febris habet* *.

I have therefore all along conſidered the hoſpital or jail-diſtemper (in regard to others that commonly occur in theſe parts) as a fever *ſui generis*, at leaſt as different from either the mere inflammatory, the miliary, or other eruptive fevers which are known here. And indeed, unleſs at the times mentioned in my treatiſe, I never met with ſuch a diſeaſe; and I believe that ſome learned and experienced phyſicians of this place, employed for thoſe who were taken ill of the jail-fever (at the Seſſions held at the *Old-Bailey*, in the year 1750) had, from the mortality attending it, too good reaſon to believe that this diſorder was not to be treated in the ſame manner either with the miliary fever, or any other which they had been converſant with before †.

One great cauſe of Dr. *de Haen*'s miſtake, and the confuſion of other authors in treating of theſe fevers, may be the undetermined meaning of the word *petechiæ*; and indeed the ambiguity here is ſuch, that I muſt regret my

* De Febrib. lib. iv. cap. xiv.

† See the account of it in the preceding Obſervations part iii. ch. vii. § 6.

having at all uſed the term, and my not being ſatisfied with barely deſcribing the eruption, without giving it any name. Nor do the terms *lenticulæ* and *punctícula*, given by *Fracaſtorius*, afford a juſt idea of the ſpots which I conſtantly ſaw; or if with others we uſe the expreſſion *morbus pulicaris*, the only reſemblance will be in the colour of thoſe ſpots to the bites of fleas, though theſe laſt are always redder*. *Febris purpurata* is not more proper; becauſe the purple colour I have but ſeldom ſeen, and that chiefly when there were large blotches, *plagæ* or ſtreaks of a conſiderable length upon the ſkin. *Diemerbroeck*, upon the plague, ſays that the mortification in the *petechiæ* reaches from the ſkin to the *periofteum*; where it is plain, that he can only underſtand ſuch purple ſpots as are ſeen in the bad ſmall-pox, ſcattered here and there, and not ſuch an efflorescence as appears in the jail-fever, often covering the whole trunk, arms and legs, ſo thick that at a little diſtance the interſtices can ſcarce be diſcerned. Dr. *de Haen* ſays that in the *German* language the *petechiæ* are called *pfefferkorn*, (pepper-corn) on account of their round figure; and in another place, he defines them *punctula rubra, aut cinerea, aut purpurea, aut livida, aut nigra.* But I have never ſeen thoſe ſmall ſpots of any regular figure, nor of the *color cinereus*; at leaſt, if he means the colour of

* As theſe fevers are chiefly ſeen among the lower people, I have ſuſpected that the real bites of fleas have ſometimes been taken for theſe morbid ſpots, and that from this miſtake ſo many common fevers have been called *petechial.*

wood-

wood-aſhes. Nor did I ever ſee them black, or purple, though the large ſtreaks and *vibices* have much of that caſt. Poſſibly the hot ſtoves, and unventilated apartments ſo common among the lower people in *Germany*, may ſometimes change the ordinary fevers into one of a ſpotted kind, which he calls petechial. And I am the rather inclined ſo to think, as I have ſcarce met with a phyſician here (who had not attended the army, or the ſick in jails) who could ſatisfy me that he had ever ſeen in any fever, either ſuch an efflorescence as I mean, or ſuch as Dr. *de Haen* deſcribes, either in his private practice, or in the hoſpitals of this city. For my part, unleſs in the circumſtances which I have mentioned, I do not remember to have obſerved ſuch an eruption in any fever, in whatever manner it had been treated; nor indeed in any other diſeaſe, except twice in bad caſes of the *lues venerea*, when the patients were otherwiſe feveriſh. Nor have I found in any author this eruption ſo defined, that I could reckon it quite the ſame with that which I deſcribe. Dr. *Huxham* indeed, who during the former war had opportunities of ſeeing this malignant fever at *Plymouth* (whilſt the jails were crouded with *French* priſoners, and the hoſpitals with our own ſailors) obſerves, in his chapter on putrid, malignant and petechial fevers, " that the ſkin looked ſometimes as if it had been marbled or variegated with a colour like that of the meaſles, but more dull and lurid." This is the thing which I always ſaw. But as the learned

author

author likewiſe mentions the *petechiæ* as ſomething different from this *variegation* of the ſkin, I can only conjecture that he meant the ſame eruption, but called it *petechial* when the ſpots were ſingle, and more diſtinctly ſeen.

I conſider theſe ſpots, which I have called *petechiæ*, to be the effuſions of the *ſerum*, tinged with ſome red blood (which being reſolved by putrefaction, is enabled to enter into the ſerous veſſels) and that theſe effuſions are made in the *cryptæ* or cells of the *cutis vera*; which cells are ſmaller, but ſimilar to thoſe of the cellular membrane, of which, according to the beſt anatomiſts, the ſkin is formed *. And perhaps it is owing to the cloſer texture of the ſkin of the face, that ſuch effuſions ſo ſeldom make their appearance there. As to the *vibices* or ſtreaks of a more purple caſt, I ſuſpect them to be owing to ſimilar extravaſations, where the fine veſſels of the *cutis* made tender by putrefaction have given way, when the patient, by accident, has ſcratched himſelf: for I have ſometimes obſerved the ſtreaks ſo long and ſo parallel to one another, that I could not help thinking they were produced in this manner by the fingers †.

My

* HALLER. Prim. Lin. Phyſiol. § ccccxxiv.

† Dr. DE HAEN ſays, *Nec ſola maculorum ſedes cuticula eſt, &c.* p.33. where he does not mention the true ſkin at all, as the ſeat of the *petechiæ*, but the *cuticula*; which I wonder at, ſeeing the ſcarf-ſkin having neither cells nor veſſels, ſo far as we know, is not ſuſceptible of an inflammatory colour: nor can the effuſions be made between the *cutis vera* and the *cuticula*, without puſtules, or ſome elevations of the latter, which

My reaſon for calling theſe ſpots *petechiæ* was, becauſe *Fracaſtorius* and ſome of the older authors gave certain names to eruptions in fevers from a putrid cauſe, which names were afterwards changed to this appellation. I am perſuaded, that if Dr. *de Haen* had ever had an opportunity of ſeeing ſuch fevers as I have been converſant with, bred in jails, or in the hoſpitals of the army, and had attended to the eruption peculiar to them, he never would have ranked that *ſpecies* with the miliary fever, to which it has no more reſemblance than to the ſmall-pox. The miliary fever is incident to all ranks of people, living in the beſt air, and in the moſt cleanly manner; whereas the malignant fever, which I treat of, is ſcarce to be ſeen but among the loweſt people, crouded together in cloſe and foul places, ſuch as in military hoſpitals, jails, and tranſport-ſhips.

Dr. *de Haen* allows, on the authority of *Sydenham* and others, " that the *petechiæ* may be conſidered as critical in

which I never ſaw with that eruption. Further, I obſerve that Dr. DE HAEN joins with thoſe authors, who contend for the ſeat of the *petechiæ* being likewiſe in the fat, and in the fleſh, and does not diſſent from DIEMERBROECK, who imagined that he could trace them from the *perioſteum*, where from a broad baſe they tapered all the way to the ſkin. Now, if DIEMERBROECK found theſe pyramidal ſubſtances mortified, what muſt be the mortification of the body at the root of our *petechiæ*, when their points almoſt cover the ſkin? And even then the patient may not only recover, but is liable to no ſeparation of parts, as in a true gangrene. It is therefore plain, that either DIEMERBROECK muſt have been miſtaken, or that his *petechiæ* were very different from thoſe deſcribed by me, and by Dr. DE HAEN too.

" the

" the peſtilential fever;" but adds, " that even in the " plague itſelf, this eruption would ſeldom take place, " were the antiphlogiſtic method of *Botallus* and *Sydenham* " ſtrictly followed *." If ſo, what muſt he then think of the *petechiæ* in times not peſtilential, ſuch as ours? The author plainly tells us what he thinks, by applying to the preſent *German* phyſicians the cenſure which *Sydenham* paſſes upon his own contemporaries, *viz.* their converting, by means of " the *regimen calidiſſimum*, common fevers " into the *petechial* and *miliary* †." As to the latter, in particular, though he concludes (from *Sydenham) Miliaria exanthemata frequentiùs malâ arte progigni, ſponte longè rariùs* ‡, yet, in another place, he pretty plainly inſinuates, as if that eruption would never be ſeen at all under proper management; if ſo we may judge by the following paſſage, *Liceatne id addere, quod et medici complures et ego in noſocomio, ſive in vigore morborum, ſive eorundem in fine, nunquam noſtris in ægris, quibus a principio affueramus arbitri, miliaria deteximus* §. Now, as ſome of our writers have taken notice of the ſpontaneous eruption of the miliary puſtules, the authority of this learned perſon may influence ſuch are as unacquainted with our practice, to believe, that if the regimen which we uſe were not too hot, we ſhould not be troubled with this ſymptom.

In juſtice therefore to the country, as well as to myſelf, I muſt obſerve that to whatever exceſs the hot regi-

* Theſes, p. 35. † Ib. p. 35, 36. ‡ Ib. p. 68. § Ib. p. 66, 67.

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men was carried in *Sydenham*'s time (and I believe the exceſs was great) or whatever may ſtill be the ſentiments of a few amongſt us, the general practice is at preſent very different. In the beginning of moſt fevers we bleed, keep the body open and cool, temper diaphoretics with nitre and other medicines of that kind; we give acids, diluting liquors, and recommend a free air; yet in certain ſeaſons, miliary eruptions will appear, and (contrary to Dr. *de Haen*'s ſentiments) will often relieve the patient; nay ſometimes prove wholly critical. And as to the jail or hoſpital-fever, I can ſtill more freely aver, that the *petechiæ* accompanying it were not the effects of a hot regimen; but on the contrary, that theſe *exanthemata* were never more apt to appear, than when the patient was largely blooded in the beginning, and in the advanced ſtate took nothing cordial. Indeed this is not to be wondered at, if theſe ſpots, being the effects of putrefaction, ſhould be moſt readily produced when the vital powers are at the loweſt. Thus, ſometimes they did not come out till the laſt agonies, or even till after death itſelf; whereas the ſmall-pox, meaſles, ſcarlet efflorescence, *eryſipelas*, and miliary puſtules, being more of an inflammatory nature, and attended with ſome kind of tumour, are moſt conſpicuous when the circulation is ſtrong; and, on the other hand, generally ſubſide, or even diſappear before death. I ſhall add, that in common fevers I have never ſeen any ſuch ſpots upon forcing ſweats, or uſing

any warm regimen; which ſeems to be a proof of a ſpecific difference between the petechial and the miliary eruptions.

Nor does Dr. *de Haen* ſufficiently attend to what *Sydenham* ſays on the ſubject of the *petechiæ*. For, though *Sydenham* aſcribes them, for the moſt part, to too hot a regimen, yet he acknowledges that they come out ſpontaneouſly in the plague and in the confluent ſmall-pox *: and I have endeavoured to ſhew that the jail or hoſpital-fever belongs to the peſtilential claſs of diſeaſes. Even Dr. *de Haen* deſcribes his *petechiæ* in ſuch a manner, as would make *Diemerbroeck* and *Riverius* conſider them as peſtilential. *Sydenham* indeed believes that thoſe *petechiæ*, which he mentions, depend upon a high degree of inflammation, but he does not prove it; and I ſhould think it more probable that they are the effect of blood reſolved by putrefaction; a principle which *Sydenham* does not ſeem to be acquainted with. As to their being rarely critical, I ſhall venture to go beyond both *Sydenham* and *de Haen*, and ſay, that even in the plague itſelf, I much doubt whether they are more critical than in the fever of jails or hoſpitals, where indeed they never are ſo.

Laſtly, as to the hot regimen in the miliary and petechial fever (for which Dr. *de Haen* blames Dr. *Huxham*, and

* *Rarò ſponte ſua efflorеſcunt, præterquam ſub adventu peſtis ipſius, atque in initio variolarum iſtarum confluentium, quæ ſummæ inflammationis participes ſunt:* SYDENH. *Schedul. Monitor.*

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me through him) it muſt be clear how little I am concerned, when it appears, that I do not at all meddle with the miliary fever; and how probable it is, that Dr. *de Haen*'s petechial fever is different from that of our hoſpital. But granting them to be the ſame, the author ought to have obſerved, that the regimen which I preſcribe is far from being hot throughout. Sweating, I indeed adviſe upon the firſt ſymptoms, in order to prevent the fever; but I promote that ſweat by mild ſudorifics. Half a drachm of *theriaca*, with ten grains of ſalt of hartſhorn, once in four and twenty hours, waſhed down with vinegar-whey, to a ſoldier lying in a bed without curtains, and often in a cold ward, is no ſuch heating medicine as may be imagined. And as I am convinced, that in my own caſe I have more than once prevented this fever by ſweating (when I had reaſon to believe I had taken the infection) I muſt recommend that practice to others which I found ſo beneficial to myſelf; though I muſt own, that as I am eaſily thrown into a ſweat, my ſudorific was no hotter than ſpirit of hartſhorn with vinegar-whey, or the *ſpiritus Mindereri* in a draught of ſome diluting liquor. When the fever was formed, the patient took the ſame medicines as in inflammatory caſes; and I never preſcribed the hot courſe, if ſo it muſt be called, till his pulſe ſunk and his ſtrength failed; ſtill attentive ſo to moderate this new regimen (which conſiſted chiefly of wine) as never to increaſe the feveriſh heat, much leſs to force a ſweat, or to haſten any other *criſis*

before the natural period of the fever. I have expreſsly ſaid in all the former editions, as well as in the preſent: "I "have obſerved that a *delirium* would ariſe from two op- "poſite errors; one, from large and repeated bleedings; "and the other, from wine and the warm cordial medicines "given too early; it appears therefore how nice the prin- "ciples are that regard the cure; thus, neither a hot nor a "cool regimen will anſwer with every patient, nor with "every ſtate of the diſeaſe *."

Dr. *de Haen* might likewiſe have taken notice, how anxiouſly I recommend a free circulation of air; which perhaps none of his pupils would believe after he makes the following exclamation: *Quam ſapiebant præ nobis Antiqui! Videte apud* Cælium Aurelianum *Methodicos, calidis in morbis, in id præcipue intentos, ut cubiculum et amplum, et aëre bene perflatum, et ſubfrigidum eſſet* &c. I wiſh, I ſay, by taking notice of the following paſſage, he had done me juſtice with his pupils, who after the hints which he has thrown out againſt my practice in this diſtemper, will ſcarce expect to find in the chapter on the jail or hoſpital-fever (in all the editions) this plain admonition, yet almoſt as ſtrong as any of the ancients upon ſuch a ſubject: "In the firſt "ſtate (*viz.* of the hoſpital-fever) as well as in all the "reſt, the fundamental part of the cure is to remove the "patients out of the foul air. When that cannot be done,

* Obſerv. part iii. ch. vii. § 5. page 316.

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"the room or ward is to be purified by making a ſucceſ- "ſion of air by means of fires, or letting it in by doors "and windows, diffuſing the ſteams of vinegar, or the "like; for whatever medicines are given while the cor- "ruption of the air continues, or indeed increaſes by "the *effluvia* of the ſick, there can be little hopes of "recovery. Therefore in every ſtage, though the pa- "tient can breathe no other infectious air but that of his "own atmoſphere, it will be neceſſary to keep the cur- "tains open, and to uſe all other means to procure a free "ventilation. On the ſtrict obſervation of this rule, the "cure will in a great meaſure depend *." As to the caution of not loading the ſick with blankets, I confeſs I have omitted giving any of that ſort; becauſe in this country phyſicians do not ſuppoſe that a patient, in any fever, is to lie warmer than in his beſt health. To this cool management, it may be obſerved, that I add the uſe of acids, and recommend the loweſt diet; ſo that hitherto there is no reaſon to apprehend any inflammatory ſymptom from my regimen. The ſmall proportion of the contrayerva-root, in the compound powder of the *London* Diſpenſatory, in the doſe which I ſpecify †, occaſions no ſenſible heat, eſpecially as it is joined to nitre. The camphire can only heat by accident, when it diſagrees with the ſtomach, and then it was always laid aſide.

* Obſerv. part iii. ch. vii. § 5. p. 305.

† In a ſcruple of this medicine (which was my common doſe, repeated once in ſix hours) there are only about five grains of the contrayerva-root, and the reſt of the compoſition is a teſtaceous powder.

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It was therefore only in the advanced and low ſtate of this fever, that I began to ſupport the ſtrength by medicines of a cordial nature, and yet with ſuch effects as rather to abate than to augment the ardour. By theſe, and eſpecially by wine, I will venture to affirm, that I have frequently ſeen every ſymptom ſoon change for the better, that is, the head become clearer, the ſkin cooler, and the thirſt leſs; and indeed this is not to be wondered at, when we conſider how probable it is, that the putrefaction, gaining ground by the ſinking of the *vis vitæ*, occaſions that acrimonious heat ſo remarkable in this diſeaſe. Here, the ſalt of hartſhorn was only uſed occaſionally in great depreſſions; and even in other caſes I have never been ſenſible of its raiſing any inflammatory or fixed heat, but only a momentary glow. The conſtant medicine was the alexipharmac decoction, conſiſting of the Bark and ſnake-root, with a ſmall proportion of the *aqua alexeteria ſpirituoſa cum aceto.* It is to be hoped, that though the alexipharmacs have been long abuſed, as to the choice, the quantity and application of them, yet no offence will be taken at the name. Four ſpoonfuls of that decoction, once in four or ſix hours, to a ſoldier with a ſunk pulſe, lying in an open bed, ſeldom occaſioned any extraordinary heat; if it did, I either leſſened the doſe, or, believing the time not yet proper for adminiſtering any warm or ſtrengthening medicine, I ſuſpended its uſe for a day or two longer. The diſgrace of alexi-

pharmacs has been chiefly owing to the opiates joined to them, as in the *theriaca*, *diaſcordium* &c. but in the hoſpital-fever theſe laſt were never uſed, unleſs in order to check a colliquative looſeneſs; or about the *criſis*, when the patient was worn out by want of reſt: at ſuch times I have known the opiates very ſerviceable.

In fine, Dr. *de Haen* may be aſſured, that the regimen which I propoſe ſtood at firſt on no other foundation than experience, after my having ſeen the bad effects of a contrary method, whether by too large, or too frequent bleedings in the beginning, or by giving hot things too early, in order to raiſe the pulſe when it began to ſink, or to force a *criſis* before the common period of the diſeaſe. Some of the medicines may be ſuperfluous, but I am pretty ſure that none of them are hurtful. The firſt perhaps might have been omitted, I mean the diaphoretic powder (conſiſting of the *pulvis contrayervæ compoſitus*, camphire and nitre) ſince I never knew the fever ſhortened, or any ſymptom abated by its uſe. But having once got into a method, which brought about as many cures as ſeemed otherwiſe conſiſtent with the circumſtances of the patients, lying in a foul air, amidſt a conſtant noiſe, and often neglected by the nurſes, I did not attempt to reduce my practice to a greater ſimplicity than appears in the former editions of this book. Yet, whatever confidence I may have in the directions which I have publiſhed, I am ſtill ready to alter any part of them, upon a fair repreſentation

from thoſe who have had equal opportunities with myſelf of ſeeing and treating this fever. But to oppoſe either mere theory, or analogy from other fevers, where the ſimilarity is ſo diſputable, or to oppoſe ſome general maxims from *Hippocrates* or *Sydenham* to the obſervations which I have offered, as the reſult of a long and painful practice, in a diſtemper that no phyſician could well know but in ſuch circumſtances as mine, is a manner of writing, I muſt ſay, more fitted for diſputations in a ſchool of medicine, than for the inſtruction of a practical phyſician.

II. I muſt unwillingly take notice of ſome more inadvertencies of the learned Dr. *de Haen* with regard to me; for treating of camphire, he ſays, *Quantiſne laudibus effertur in malignis camphora, veluti collapſas vires blandè reſtaurans, et ſomnum ipſo opio tutiùs adducens! Conſulite modò egregios viros* Huxham & Pringle *. The author then proceeds to ſay, that the phyſicians of *Breſlaw* found no ſuch virtues in that medicine, in a malignant epidemic of that country; but, on the contrary, obſerved that it rather did harm. Now, the reader muſt be ſurprized when I affirm, that I have no where aſſigned either a *paregoric* or a *reſtorative* quality to camphire, nor uſed any expreſſions to that purpoſe. I mention my giving it in inflammatory fevers, but with no other intention than in order to aſſiſt in abating the ſpaſms, and promoting a *diaphoreſis*; and when I preſcribe

* De Haen Ratio Medendi, part. iii. cap. i.

ſcribe it in the high *delirium* ſometimes attending the hoſpital-fever, yet even there I ſay nothing of thoſe alledged qualities, but only offer it as one of the beſt internal medicines for that ſymptom, that is, as one of the beſt which I then knew. This in truth was ſaying but little in its commendation. In my experiments I have indeed aſſigned to camphire a conſiderable antiſeptic power; but that has nothing to do with the virtues in queſtion, nor have I, for that reaſon, ever given it the more freely. It would ſeem as if Dr. *de Haen* finding ſuch a conformity between Dr. *Huxham* and me, with regard to the jail or hoſpital-fever, believed the harmony to be ſo great, that whatever is written by Dr. *Huxham*, I muſt be of the ſame opinion and anſwerable for it.

III. Further, Dr. *de Haen*, in the firſt part of his book called *Ratio Medendi*, mentions ſome experiments, which, in imitation of mine, he had made with antiſeptics upon urine; when he found, that acids reſiſted its putrefaction more than any of the alkaline ſalts, the ſpirit of hartſhorn excepted. In this the learned author does not contradict me, as ſome of my friends have imagined, ſince not doubting of the antiſeptic quality of the acid ſalts being in general ſuperior to that of the alkaline, I never made any comparative trial. Nay, I have here the ſatisfaction to find a perſon of Dr. *de Haen*'s credit confirming, in this inſtance, what I long ago advanced, *viz.* that the volatile alkalis are powerful in preſerving animal ſubſtances from

corruption. I only wiſh that Dr. *de Haen* had mentioned his experiments with more preciſion, and in particular had told the proportions which he uſed of the acids and alkalis; ſince it muſt ſeem a greater paradox than any that I have yet advanced on the ſubject, that, quantity for quantity, the ſpirit of hartſhorn ſhould reſiſt putrefaction more than any of the mineral acids. But when in the next paragraph the author adds, *conſtititque urinam alcalicis* (viz. *ſalibus alcalicis fixis*) *miſtam longè citiùs putreſcere eâ, cui affuſum nihil*, that is, " that a portion of urine mixed with " the fixed alkaline ſalts putrefied ſooner than another " portion to which nothing was added;" here indeed is a plain contradiction to the concluſions I have drawn from my experiments, which allow of no ſeptic quality in any of thoſe ſalts, fixed or volatile.

In order therefore to ſee which of us were in the wrong, about the end of June 1760, I made the following experiment. I took three phials, of between three and four ounces each, and into each poured an ounce of recent urine made by a perſon in health; to one, I added five grains of ſalt of hartſhorn (as being of a more conſtant ſtrength than the ſpirit, which ſo much varies according to the manner of preparation, and the time it is kept;) to another, I added as much of that ſalt which is ſold in the ſhops for *ſal abſinthii* (but which, in fact, is a thoroughly calcined lixivial ſalt drawn from the aſhes

of any of the common vegetables;) to the third, I joined nothing, reſerving it for a ſtandard. Theſe phials being corked were placed in a cloſet of a ſouthern aſpect; ſo that conſidering the ſeaſon they ſtood moderately warm. Upon the firſt mixture, the phial with the ſalt of hartſhorn had ſcarce any other ſmell but that of the volatile ſalt. The phial with the ſalt of wormwood, upon ſhaking, became turbid, and of a whitiſh colour, without any efferveſcence; but it had that diſagreeable ſmell which I have always taken notice of upon mixing animal ſubſtances with the lixivials. The next day the ſtandard was not ſo freſh as at firſt; the phial with the ſalt of hartſhorn ſmelled as before; and that with the fixed alkaline began to have the ſmell of a volatile ſalt, but leſs diſagreeable than that of ſtale urine. In two or three days longer I could ſcarcely diſtinguiſh between the ſmell of the urine with the ſalt of hartſhorn, and that with the ſalt of wormwood; and this reſemblance continued for twenty-four days, after which I examined theſe mixtures no longer. With regard to the ſtandard, it remained all that time with a ſickiſh offenſive ſmell, neither like that of ſalt of hartſhorn, nor that of corrupted fleſh or blood; and I had obſerved, that ſometime before, it had gathered a mouldineſs upon its ſurface.

In the beginning of September following, to an ounce of recent urine poured into a wide-mouthed phial, I added ſix or ſeven grains of fixed alkaline ſalt as before;

and into another phial I put as much urine, without any addition, to ſerve for a ſtandard. Theſe phials were ſet in a place ſomewhat damp, open to the air, but under cover, to prevent any rain from falling into them; for they were not corked. The mixture with the fixed ſalt, upon ſhaking the phial, became turbid as formerly, and afterwards dropped a whitiſh ſediment, which ought to have been taken notice of in the firſt experiment. The ſmell of this phial, upon the mixture, was diſagreeable as before; the next day it was leſs ſo; and on the third day the ſmell began to change to that of ſalt of hartſhorn, which gradually increaſed, but with ſome degree of rankneſs like that of common ſtale urine. The ſtandard, for about eight days, had no ſmell of a volatile ſalt, but was otherwiſe offenſive; and upon its ſurface I perceived a mouldy ſcum thicker than that in the former experiment. I took no further notice of theſe phials till about the thirteenth day, and then I found them both ſmelling like ſalt of hartſhorn; but the ſtandard, that is, the urine by itſelf, ranker or more offenſive than the other. At the ſame time I found the contents of the ſtandard of a deeper colour, which I conſidered as another proof of its higher degree of corruption. For, I have conſtantly obſerved, that urine becomes of a browner caſt in proportion to the time it is kept, till it be thoroughly putrid; and in this caſe the *criterion* is the ſurer, as the fixed alkaline ſalt, when the urine ſettles after the mixture, makes it

it darker than natural; that is, on the ſecond day of this experiment, the water with the fixed alkali was not ſo pale as the ſtandard, but was paler than it on the thirteenth.

After this, I made no further trials, being ſatisfied that I had not been in the wrong about the general antiſeptic power of the fixed alkaline ſalts, and that I had diſcovered the cauſe of Dr. *de Haen*'s error. It is well known, that urine not only contains ſome of the corrupted parts of the humours (which Nature throws off by the kidneys, as well as by the ſkin) but likewiſe a large quantity of a ſalt of the ammoniacal kind, that is, one compounded of a volatile alkali and an acid. Now, this acid having a greater affinity with the fixed alkaline ſalt uſed in the experiments, than with its own volatile ſalt, abandons it, and cleaving to the fixed ſalt ſuffers the other to evaporate; much in the ſame manner as we produce a volatile urinous ſmell, upon adding ſalt of wormwood, or ſalt of tartar, to a ſolution of *ſal Ammoniacus*. Only in the caſe of urine, the combination of any fixed alkali with the acid of the urine, and the evaporation of the volatile ſalt of the urine, conſequent thereupon, is ſlow, on account of an oily or mucous matter with which that fluid is likewiſe impregnated. It does not therefore follow, becauſe putrefying urine always lets go its volatile ſalt, that all urine parting with this ſalt, is in a putrid ſtate. For, the ſame kind of ſalt, with its volatile ſmell, riſes from the moſt recent urine upon diſtillation;

lation; and, without that proceſs, inſtantaneouſly upon mixing ſome quick-lime with it. Nay, a fixed alkaline ſalt will immediately diſengage the volatile, and thereby give the ſtale ſmell, if the fixed ſalt be diſſolved in freſh urine made boiling hot. Even within the body, an animal proceſs will ſeparate this volatile alkaline ſalt, as I had once an occaſion to find in a perſon, who had been long under a courſe of Mrs. *Stephen*'s medicine, that is, of taking large doſes of lime and a fixed alkaline ſalt. This gentleman's urine, when quite recent, had not only that volatile ſmell which I mentioned, but ſtrongly effervefced with the common acids. This experiment he ſhewed me, immediately after making water, upon my ſeeming to doubt whether he had not been miſtaken.

I therefore ſuſpect that Dr. *de Haen*, not reflecting on this chemical principle, has been deceived by the volatile ſaline ſmell of the urine (occaſioned by the mixture of a fixed alkali) which he miſtook for the putrid *fœtor* of that fluid; and that though convinced, by his own experiments, of the ſtrong antiſeptic quality of ſalt of hartſhorn, yet he could not thoroughly free himſelf from the common error, of confounding the volatile ſaline with a putrid ſmell. But this diſtinction between an alkaline ſalt and putrid matter (in an animal ſubſtance falling into a ſtate of reſolution) which I attempted to explain in the preceding work, is at preſent ſet in the cleareſt light

light by the learned M. *Gaber* of *Turin*; of whoſe experiments, and juſt reflexions upon them, I ſhall now take notice.

IV. Some time ago, I received from that gentleman the preſent of a book, lately publiſhed, called *Miſcellanea Philoſophico-Mathematica Societatis Privatæ Taurinenſis*, accompanied with an obliging letter; of which, I hope, he will excuſe me for giving the following extract. *Ex tuis experimentis mea nata ſunt, quorum aliqua in hoc libro perlegere poſſis; reliqua, quæ nondum ita abſoluta ſunt ut publicam lucem mereri videantur, in poſterum, ſi libenter feras, tibi communicabo: Hæc autem experimenta, cum plerumque tuis conſentanea fuerint, in eâ tamen re a te me diſſentire cogunt, quod* alcali *exiſtentiam in corruptis humoribus dubiam reddidiſti; rationes propterea propoſui quibus eventuum diſſimilitudinem deſcribendam putavi, quas tu ipſe faciliùs, quam ego aſſequi poteris, ſi tuam experiundi methodum cum meâ comparare volueris.*

The point in queſtion relates to my firſt experiment, which ſhews, " that bodies, by putrefaction, become little, if at all, alkaline." But the ingenious author, in the paper which he alludes to in his letter, clearly proves, " that the marks of alkaleſcence, in putrefying animal ſub-
" ſtances, are greater or leſs, or none at all, according
" to the time in which the experiment is made after the
" putrefaction begins; that ſuch ſubſtances, upon their
" firſt putrefaction, do not effervefce with acids; that
" afterwards

" afterwards they effervefce manifeftly with them; but " that at length they ceafe from doing it, though the " putrefaction ftill continues." The experiments proving thefe facts being repeated with fo much clearnefs and precifion, leave me no room to doubt of the truth of what M. *Gaber* fufpects, *viz.* " my having made the trials " of effervefcence upon putrid bodies, either before they " were fufficiently corrupted, or after the volatile alka- " line falt was wholly evaporated, though the procefs of " putrefactiom ftill went on."

At this diftance of time I cannot fufficiently recollect the circumftances of my experiments, whereby to judge whether the acid was dropped into the putrid liquors before, or after the exhalation of the volatile falt; but as I am fatisfied that it might have been the one or the other, I muft fubmit to M. *Gaber*'s correction, and allow, that whilft animal fubftances are in a ftate of putrefaction, there is a time when they will afford marks of an alkaline falt, by their manifeft effervefcence with acids. And I am the more inclined to yield to his opinion, as I can now produce a cafe fomewhat parallel to what he mentions, relating to the effervefcence of morbid bile with acids.

A gentleman of thirty-fix years of age, who died of a dropfy following an obftinate jaundice, was opened about twenty-four hours after his death. The liver, by its tenderneſs,

derneſs, ſeemed to be in a corrupted ſtate. The gall-bladder was full of bile, and three times larger than is common. The *ductus communis* was ſo cloſely ſtopped at its entry into the *duodenum*, that no bile could be ſqueezed out of the bladder into that gut. As the diſſection was made by candle-light, I could not then examine the bile; but the next morning, Mr. *Forbes*, the ſurgeon who had opened the body, returned to the houſe, and at my requeſt made the following experiment upon that liquor, which had been kept all night in a tea-cup, in a room without a fire, in the winter-ſeaſon. He divided the bile into three portions; to one, he added ſome fixed alkaline ſalt; but that occaſioned no change in the colour, which was of a dark green; into another, he dropped ſome ſpirit of vitriol; into the third, ſome common vinegar; and he obſerved in both thoſe a manifeſt effervescence, with a change of the colour to a light green. The experiment was purſued no further; but I doubt not, that had the bile been allowed to corrupt longer, the effervescence would have appeared leſs and leſs, and at laſt have intirely ceaſed, by the ſeparation of the alkaline from the corrupted parts, agreeably to the obſervations of M. *Gaber*. But from all this it appears more and more evident, " that the volatile ſalt, in animal ſubſtances, is very " different from the putrid part; that an animal ſubſtance " may abound with this volatile alkali, and yet not " be the more corruptible; and on the other hand, be

" highly putrid, without any mark of alkaleſcence; laſt-
" ly, that the volatile alkaline ſalts are all of an antiſep-
" tic nature." Theſe principles, which I endeavoured to eſtabliſh, have been more fully demonſtrated by M. *Gaber*; and I muſt ſet the greater value upon his labour, as it has ſatisfied the learned M. *de Haller*; who, in the ſecond volume of his Phyſiology, makes ſeveral objections to my opinion about the diſtinction to be made between putrid and alkaline ſubſtances; but afterwards, whilſt his book was ſtill in the preſs, having ſeen M. *Gaber*'s paper upon that ſubject, in the laſt page he candidly acknowledges that the experiments of that gentleman had fully reconciled him to my ſentiments on thoſe matters.

A GENERAL

A GENERAL INDEX.

[The *Arabic* numbers refer to the Obſervations; the *Roman*, to the Appendix.]

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FINIS.

ERRATA.

Page 96. *line* 11. *for* Vigetius *read* Vegetius.
Page 108. *line* 5. *for* Hale's *read* Hales's.
Page 129. *To the extract of Dr.* Clerk's *letter, ſubjoin the following paragraph.* Some doubts ariſing, ſince Dr. CLERK's death, about the doſe of his ſquill-mixture, I conſulted his ſon Dr. DAVID CLERK, one of the phyſicians to the Royal Infirmary at *Edinburgh*, who informed me, that he believed there was a miſtake, in the extract of his father's letter, of *acetum ſcilliticum* for *ſyrupus ſcilliticus*; and that his father did not give the *ſpiritus Mindereri* mixture in the ſame quantity with, and without the *ſyrupus ſcilliticus*. He added, that he had found in the *Liber Memorialis* of his father the following receipt: ℞. *Aquæ hyſſopi (vel cinnamoni ſine vino) ſpiritûs Mindereri, ſyrupi ſcillitici aa.* ℥ij. *miſce. Dentur cochlearia* ij. *bis die.* That this was his father's common doſe of all his *julapia ſcillitica*; but that when the ſtomach could not bear ſo much in the morning, he then gave but one ſpoonful. That he himſelf did not particularly remember how much of this mixture his father gave in the pleuriſy and peripneumony, but believed that the quantity did not exceed four or five ſpoonfuls in the day. He concluded with remarking, that conſidering the different manner of making the vinegar of ſquills here, and at *Edinburgh*, the *London* preparation was likely to be much ſtronger than the other.
Page 331. *line* 8. *for* council *read* counſel.
Appendix, *page* xlvii. *line* 9. *for* was *read* were.

