Overview on Drinking Water Quality Management in Japan

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1. Introduction

In Japan, the Drinking Water Quality Standards (DWQSs) have been set as Ministry's order so that water supply systems are always able to supply potable water from taps. In 2003, responding to situational changes surrounding water quality management, as well as taking the third edition of the WHO's Guidelines for Drinking Water Quality into account, the Ministry of Health, Labour, and Welfare (MHLW) laid down a new set of the DWQSs, which went into effect on April 2004.

Considering some cases that took place in 2006, the government is now preparing for new revision of the DWQSs: there were several water quality incidents at small facilities, which involved some people infected by drinking water, a high level of unregulated substance was detected in Kanto Area (near Tokyo), Japan.

2. Revision of the DWQSs

2.1 Fundamental principles

In addition to the Drinking Water Quality Standards (50 items), which are based on the Water Works Law, the Complementary Items for Water Quality Management (27 items) have been set by the Director General of Health Bureau of the MHLW since 2003, whereas the Items for Further Study (40 items) have been suggested by the Minister's Health Science Council to put under observation in order to cope with various emerging and future issues on water quality management.

- Drinking Water Quality Standards

Tap water quality must meet the DWQSs based on the Water Works Law. Thirty

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items are set from the viewpoint of human health, and twenty items are set from other reasons including user needs on water quality and control level at purification plants. The Water Works Law requires the water suppliers to monitor the tap water quality regularly to make sure that the water meets the standards. The DWQSs basically include items that are detected or can possibly be detected in purified water at levels of 10% of the health-based value or higher.

・ Complementary Items

The Complementary Items for Water Quality Management are items that the MHLW requests water suppliers to monitor. Fifteen items (including the total of 101 agricultural chemicals) are set from the viewpoint of human health and twelve items are set from other reasons including user needs on water quality and control level at purification plants

・ Items for Further Study

The Items for Further Study are items of which health-based value are provisional, or items of which detect level and frequency in purified water are not clear. Further studies are needed to collect more information and knowledge on these items.

2.2 The state of the water quality in Japan

The present DWQSs and Complementary items went into effect on April 2004. Since then, water suppliers have monitored these items and the results show that water suppliers have to pay attention to the items which follow.

・ DWQSs

Lead is sometimes detected in purified water at higher level than the standard value. This is caused by lead water pipes which still have been used in private buildings or houses.

Nitrate and Nitrite are detected in purified water at level of higher than the standard value in a few points. Many private drinking water wells are at risk and would need precaution against contamination.

Bromate is sometimes detected in purified water at higher level than the standard value. The major causes for the formation are impurities included in Sodium hypochlorite. In addition, formation in the ozone treatment system is also to be noted.

・ Complementary Items

Chlorate is detected in purified water at 10% level of the health-based value in many points. And it is detected at higher level than the health-based value in a few places. It has been reported that chlorate may be formed in oxidation of Sodium hypochlorite, being used as disinfectants, more rapidly at warmer temperatures.

2.3 Addition of chlorate to the DWQSs

Considering frequent detections of high level of chlorate, the MHLW took an action to the Health Science Council, held on Aug 4, 2006, to add chlorate to the DWQSs. It was agreed by the Council to forward to the Food Safety Commission, which was established in July 2003 to undertake risk assessment under the Food Safety Basic Law to respond to the growth of national concern about food. The Commission is independent from management organizations such as the MHLW. The Commission conducts risk assessment on food in a scientific, independent, and fair manner. Hence, the MHLW have been requested to inquire the Commission to conduct risk assessment when the MHLW wishes to make any changes on the DWQSs. According to this rule, the MHLW submitted the draft for deliberation to the Commission on Aug 31, 2006 in order to conduct risk assessment to add chlorate to the DWQSs. After receiving the Commission's report, the draft will be disclosed by the MHLW for public comments for one month. After checking public comments, the MHLW will finalize the standard. The proposed standard value is 0.6mg/L, which is decided from the viewpoint of human health, as it causes damage to the oxidation of blood cells.

3. Recent water quality incidents

3.1 The state of the occurrence of water quality incidents

Water suppliers in Japan always make efforts to supply potable water under the proper water quality management. However, a few water quality incidents take place every year. In 2006, more than ten incidents which lead to cutting off the water supply happened. When the MHLW receives the report of the incidents, it takes measures to prevent recurrence of the accident. For example, when an incident happened as a result of inappropriate coagulation management, The MHLW would issue a letter to all water suppliers in Japan in order to remind of the importance of appropriate use of coagulation chemicals. When it happened because of contamination of water source, the letter would focus on observation of water source.

3.2 Infectious diseases caused by drinking water

A few infectious diseases caused by drinking water happened in 2006. In Fukushima Pref., a small-scale water supply service supplied water without chlorination and 71 persons who drunk the water showed the symptoms of diarrhea, stomachache, or fever. The facility was not inspected appropriately. As a result, the deposition of sodium hypochlorite clogged the chlorine injecting nozzle. To make matters worse,

measures taken against the accidents was delayed because they disregarded the accident when they recognized that chlorine was not detected in the water. The inspection of untreated water of the facility and feces of the patients proved that the bacteria which caused the symptoms were *Campylobacter*.

The table shows the infectious diseases caused by drinking water in Japan. Many of them occurred because of the inappropriate management or defects of disinfection, therefore, taking proper management is essential in small-scale water services. Now the information of virus is so limited that further studies are necessary to gain more information and knowledge.

Table: Infectious diseases caused by drinking water in Japan

WHEN		WHERE	ORIGIN	PATHOGEN	FACILITIES	EATER	PATIENT
1999	July	Nagano	spring	*enterohaemorrhagic E. coli* O157	home	unknown	30
2000	Feb.	Kyoto	well	*enteropathogenic E. coli* O126	restaurant	unknown	50
2001	June	Nagano	spring	*enterotoxigenic E.coli* O169	accomodations	310	181
2002	Oct.	Akita	spring, swamp	*Campylobacter jejuni*	home	unknown	13
2003	Mar.	Niigata	well	*Noroviruses, Clostridium perfringens, Staphylococcus aureus,Campylobacter, E. coli*	restaurant	227	151
	June	Ishikawa	well	*Norovirus*	restaurant	522	76
	July	Chiba	small water supply system (water cooler)	*Rotavirus* group A	school	86	47
	July	Oita	well	*enterohaemorrhagic E. coli (verotoxin-producing)*	home	4	3
	Sep.	Ehime	private water supply system(water cooler)	*Campylobacter jejuni, Campylobacter coli*	school	525	69
2004	Mar.	Hiroshima	well	*Genus Escherichia*	home	17	15
	Aug.	Ishikawa	small water supply system	*Campylobacter jejuni, Campylobacter coli*	accomodations	78	52
2005	Mar.	Akita	small water supply system	*Norovirus*	home	unknown	29
	June	Yamanashi	small water supply system	*Campylobacter jejuni, Campylobacter coli*	home	unknown	76
	Jyly	Oita	small water supply system	*Plesiomonas shigelloides*	accomodations	280	190
	Jyly	Oita	well	*enterotoxigenic E.coli* O168	campsite	348	273
	Aug.	Nagano	spring	*enteroaggregative E.coli* O55	accomodations	81	43
	Aug.	Kochi	well	unknown	home	28	16
2006	Aug.	Fukushima	spring	*Campylobacter jejuni*	home	unknown	71
	Sep.	Miyagi	well?	*Clostridium botulinum* type A	home	9	1

4. Measures to unregulated substances

Although the Water Works Law does not require regular monitoring on unregulated substances, unless listed in the DWQSs, observation of water source should be done wider perspective. With this in mind, the MHLW has been investigating unregulated substances in collaboration with research institutes and water laboratories of large water suppliers. It is also necessary to take measures immediately when unregulated substances are detected in tap water, as they might be caused by disorder of treatment facilities or some other important reasons. In other case, agricultural chemicals should also be monitored even if they were prohibited from marketing: it was the case in groundwater in 2006, and the water supplier had to stop taking water from the groundwater and strengthened the watching for water source.

In 2006, perchlorate, one of the unregulated substances, was detected by researchers' investigation in Tone River, which flew down through Kanto Plains. Although no body paid any attention to perchlorate by that time, the MHLW took measures and requested researchers to keep investigation on perchlorate and advocated investigating its level in wide- ranging area.

5. Conclusion

Water suppliers in Japan always supply potable water, which we can drink directly from taps without any cares or any special treatment. But recent researches reported that the number of people who drink tap water directly is decreasing. This may have been caused by a discontent on the tastes of tap water or popularity of bottled mineral water due to its convenience. Under this situation, in order to improve the popularity of tap water and improve the reliability of consumers on safety and reliability of drinking water, the MHLW will continue further efforts in cooperation with all water suppliers to take measures for appropriate water quality management, such as preventive measure against water quality incidents, encouragement to introduce advanced water-treatment facilities, and valuable information exchange on water quality management.

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Overview on Drinking Water Quality Management in Japan

1. Introduction
2. Revision of the DWQSs
   (Drinking Water Quality Standards)
3. Recent water quality incidents
4. Measures to unregulated substances

1. Introduction

1. Introduction

State of Water Quality in Japan

- Source water quality has been improved
- The overall situation is good

① Current state depends on continuous efforts
② Further safety expected
③ Rising Concern about tasty water

2. Revision of the DWQSs

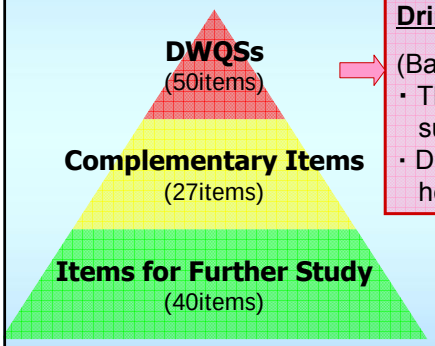
2. Revision of the DWQSs

Drinking Water Quality Standards

July 2002	MHLW inquired the Health Science Council about revision of the DWQSs
April 2003	The Council submitted a report
May 2003	MHLW laid down a new set of the DWQSs
April 2004	New DWQSs went into effect

2. Revision of the DWQSs

2.1 Fundamental principles



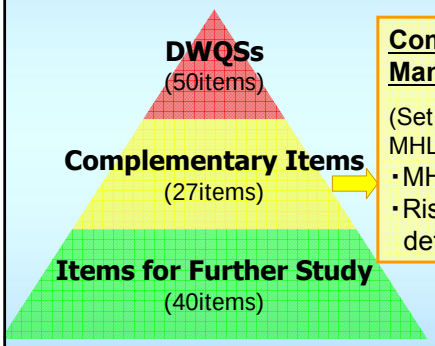
Drinking Water Quality Standards

(Based on The Water Works Law)

- The Water Works Law requires the water suppliers to monitor
- Detected in purified water at 10% of the health based value or higher

2. Revision of the DWQSs

2.1 Fundamental principles



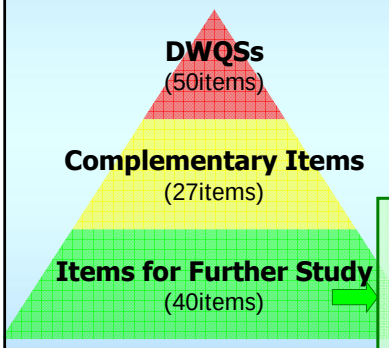
Complementary Items for Water Quality Management

(Set by the Director General of Health Bureau of MHLW)

- MHLW requests to monitor
- Risk assessments are provisional or detected at few points

2. Revision of the DWQSs

2.1 Fundamental principles



Items for Further Study

(Suggested by the Minister's Health Science Council to put under observation)

- Risk assessments are provisional
- Detected level and frequency in purified water is unclear
- Further study to collect more information and knowledge is needed

2. Revision of the DWQSs

2.2 The state of the water quality in Japan

Results of water-quality monitoring

Drinking Water Quality Standards	
Lead	・Higher than standard ---- 6 / 2,886 (points) ・Causes: lead water pipes
Nitrate and Nitrite	・Higher than standard ---- 1 / 4,158 (points) ・Private drinking water wells need precaution
Bromate	・Higher than standard ---- 18 / 5,695 (points) ・Causes: impurities in Sodium hypochlorite also formed in Ozone treatment system
Complementary Items	
Chlorate	・Higher than health-based value ---- 6 / 248(points) ・Causes: oxidation of Sodium hypochlorite

2. Revision of the DWQSs

2.2 The state of the water quality in Japan

Causes of excess Chlorate

- Oxidation of Sodium hypochlorite, being used as disinfectants
- More rapidly at warmer temperatures

↓

- Temperatures and purchase frequency are to be noted

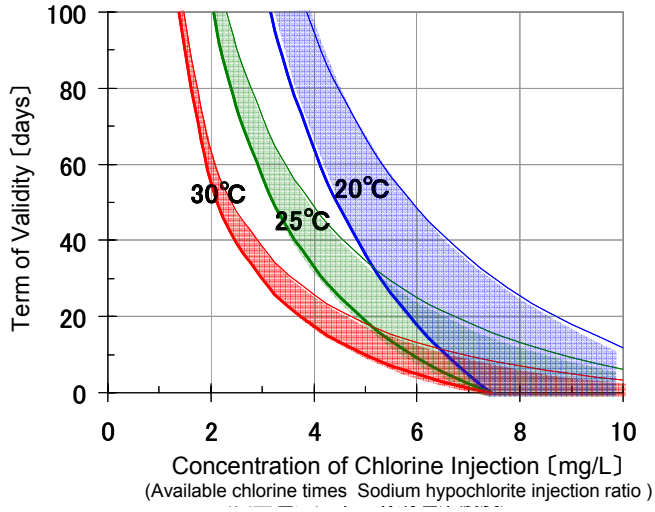
Complementary Items

Chlorate	・Higher than health-based value ---- 6 / 248(points) ・Causes: oxidation of Sodium hypochlorite

2. Revision of the DWQSs

2.2 The state of the water quality in Japan

Causes of excess Chlorate



2. Revision of the DWQSs
2.3 Addition of chlorate to the DWQSs

【Background】

Result of water quality monitoring in FY2004 shows

- Chlorate is detected in purified water at 10% level of the health-based value in many points
- Chlorate is detected at higher level than the health- based value in a few places

2. Revision of the DWQSs
2.3 Addition of chlorate to the DWQSs

【Action】

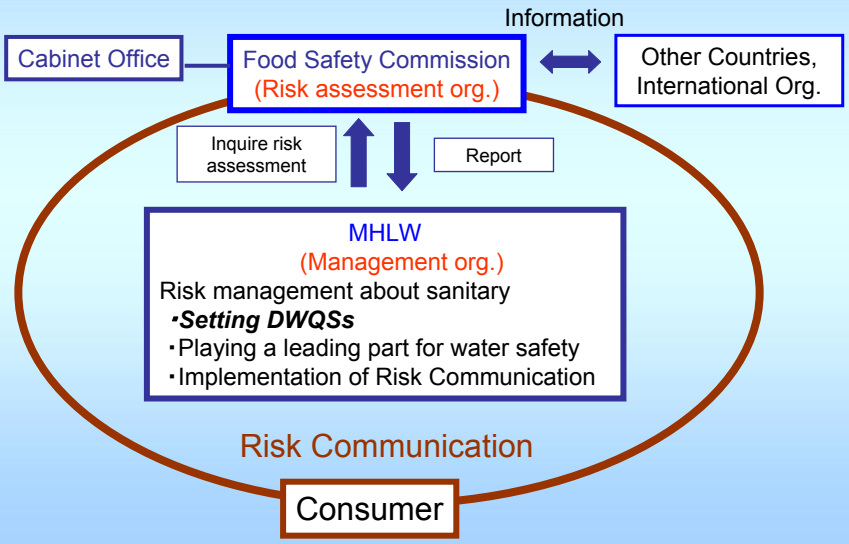
Aug 4, 2006 MHLW took action to the Health Science Council to add chlorate to DWQSs

It was agreed by the Council to forward to the Food Safety Commission

Aug 31, 2006 MHLW submitted the draft for deliberation to the Commission

2. Revision of the DWQSs
2.3 Addition of chlorate to the DWQSs

Assessment and Management



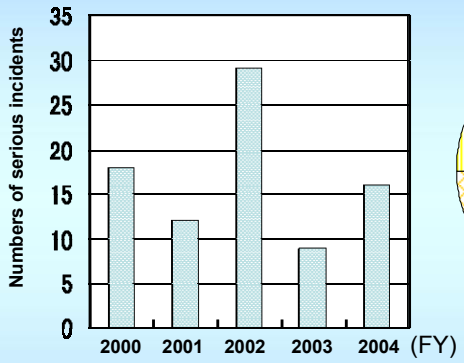
2. Revision of the DWQSs
2.3 Addition of chlorate to the DWQSs

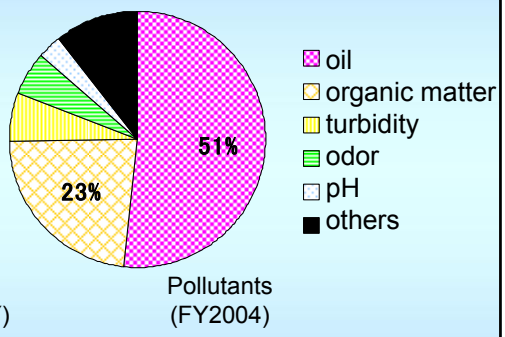
- ◆After receiving the Commission's reports, the draft will be disclosed by the MHLW for public comments
- ◆MHLW will finalize the standard
- ◆Chlorate causes damage to the oxidation of blood cells
- ◆Proposed standard value is 0.6mg/L

3. Recent water quality incidents

3. Recent water quality incidents

3.1 The state of the occurrence





In 2006, more than ten incidents leading to cutting off the water supply

3. Recent water quality incidents
3.2 Infectious diseases caused by drinking water

A few infectious diseases happened in 2006

One Case at small-scale water supply service

- Aug 17-25, 2006
- Supplied water without chlorination
- 71 persons showed the symptoms of diarrhea, stomachache, or fever
- This facility was not inspected appropriately
- The bacteria is *Campylobacter*

MHLW issued a letter to all water suppliers to remind of the importance of appropriate management on chlorination

3. Recent water quality incidents
3.2 Infectious diseases caused by drinking water

Infectious diseases in Japan (2004-2006)

WHEN		WHERE	ORIGIN	PATHOGEN	FACILITIES	EATER	PATIENT
2004	Mar.	Hiroshima	well	*Genus Escherichia*	home	17	15
	Aug.	Ishikawa	small water supply system	*Campylobacter jejuni, Campylobacter coli*	accomodations	78	52
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3. Recent water quality incidents

3.2 Infectious diseases caused by drinking water

Measures to incidents

- Many of incidents happened by inappropriate or poor management
- Appropriate management in small -scale water service

- Information of Virus in drinking water is limited
- Further study and knowledge

4. Measures to unregulated substances

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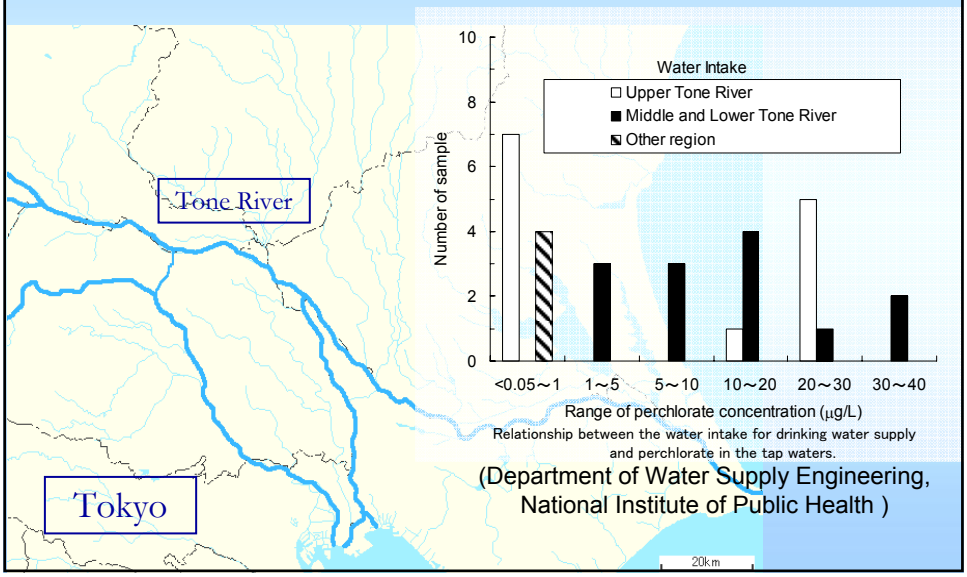
- Investigate into unregulated substances
- Research unknown substances
- Gather information on toxicity and knowledge

4. Measures to unregulated substances

Detection of Perchlorate



Relationship between the water intake for drinking water supply and perchlorate in the tap waters.

(Department of Water Supply Engineering, National Institute of Public Health)

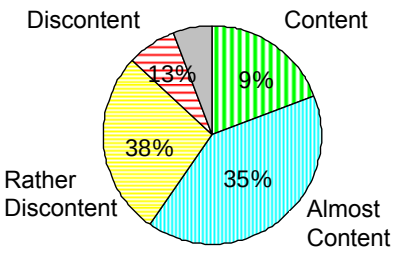
Conclusion

Conclusion

Image of Tap Water in City

Reason for discontent

① Bad tasety(61.8%)
② Concern about safety (42.7%)
③ Smell of chlorine (28.7%)
④ Tepid (26.1%)

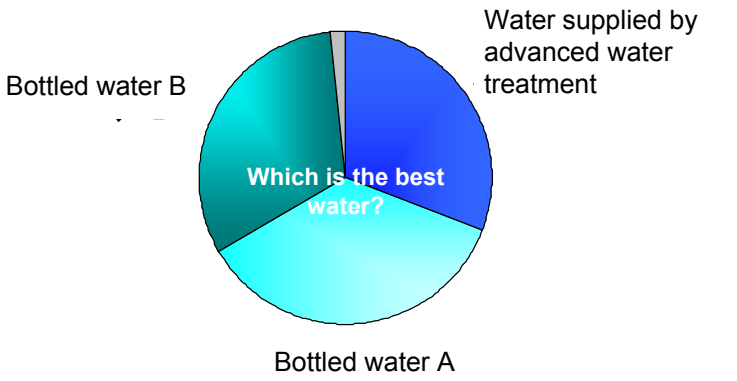


Questionnaire Survey

(2006, Tokyo, 453 persons)

Conclusion

Real Taste of Tap Water in City



Tasting test about drinking water
(1998, Tokyo, 392 persons)

Conclusion

In order to improve the popularity of tap water and improve the reliability of consumers on safety and reliability of drinking water,

the MHLW will continue further efforts in cooperation with all water suppliers to take measures for appropriate water quality management.

Thank you