

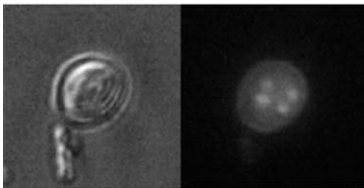


WaQuAC-NET Mini-talk No. 3

Cryptosporidium in Southeast Asia

~lecture by Dr. Kenji Kimura~

WaQuAC held mini lecture on 11th November regarding 'Protozoal diseases in developing countries' by Dr. Kimura who was a leading expert of protozoa study in Japan. Dr. Kimura is a friend of Mr. Sasaki who is a biologist of Yokohama water works and member of WqQuAC. Seven persons participated in. Dr. Kimura had carried out study of protozoa at the central laboratory of Maezawa Kogyo for long time. Now he is a researcher of Kobe Univ. and Kanazawa Univ. and also working with Toyo Sekkei company as a senior advisor.



Oosyst of *Cryptosporidium*

Cryptosporidium has become popular since 1996 when the outbreak occurred in Ogoose town in Japan. Cryptosporidium is a kind of protozoa sized a few microns ~ a few ten microns, bit larger than coliform. It is not a bacterium such as fecal coliform, but a parasite which lives in a mammal's body. It brings about diarrhea because it glows rapidly at the digestive tube in the body and blocks absorption of water.

Many of persons may have a question how is the current condition of protozoal disease in developing countries where a lot of diarrhea diseases are reported. There are only rare countries having counting instrument and technique of protozoa. However, Dr. Kimura has conducted investigation in Nepal and Laos with the help of collaborators on site. His lecture was so interesting and surprising, and especially, I would like to point out two notable topics. First one is that

the group infection of protozoal disease in developed countries seems to occur in a certain area through water supply, on the other hand, developing countries' protozoal diseases are found scattered in wide area. Second one is that the infection route in developing countries might not be drinking water.

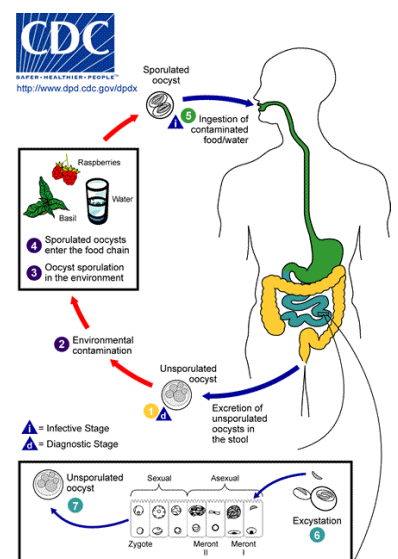
[Group infection in developed country]

Dr. Kimura has deeply concerned with the protozoa primarily triggered by the large scale outbreak in Milwaukee in USA in 1993. It was miserable incident and took 400 death and more than 4 million infected patients. Dr. Kimura instantaneously noticed the serious outbreak and started investigation. Therefore, he could get one step ahead in developing procedure of detection in environmental water and measurement of inactivating effect by cell cultivation

Cryptosporidium is growing in the body of host and then goes outside as Oosyst (one developing stage of life cycle). (See the following figure).

Oosyst is chlorine-resistant so it cannot be killed by chlorination. The group infection of protozoa by water supply demolished the commonsense that existence of residual chlorine is a proof of safety for biological contamination. It

came to as a big shock.



Referred to website of Center for Disease Control and Prevention
http://www.dpd.cdc.gov/DPDX/HTML/ImageLibrary/A-F/Cyclosporiasis/body_Cyclosporiasis_il7.htm

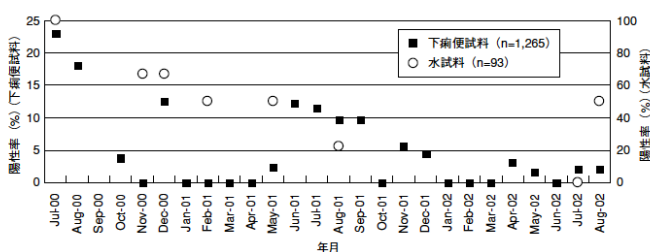


Protozoa disease only causes diarrhea and healthy individuals can develop immunity and usually are cured within a week. It is not so serious as usual. However, it can be critical to the person like immune deficit, weak or baby. Protozoa can survive from chlorination, but it is very weak for heating. If it was kept in warm water which temperature was about 45 to 50 degree Celsius only one minute, it would become extinct. That is, cooked vegetable is safer than fresh one.

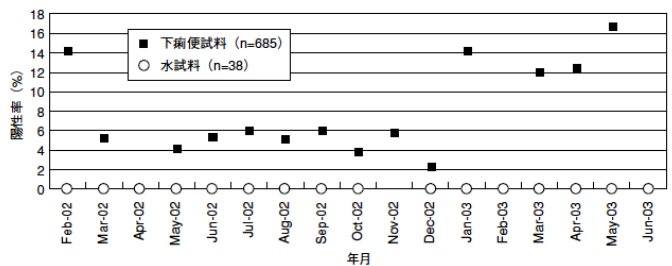
In the case of Ogoose town, the causation of outbreak has been found. Because the intake of water supply was located downstream of sewage treatment plant outlet, the Oosyst from patient came into the drinking water and was spread widely. This is general pattern in developed county. Meanwhile, it has become apparent that the protozoal disease in developing countries is caused by other route through long time investigation.

【Protozoal disease in developing country】

Dr. Kimura requests the collaborator to take sample periodically on site. Collaborators filter 20 to 30 liters of tap water by filter kit provided by Dr. Kimura, and send it to Japan by mail. Following figure shows the result obtained in Katmandu Nepal. ■ indicates the ratio of protozoa positive in the stool specimen of diarrhea patients.○ indicates



the ratio of protozoa positive in the drinking water sample. Obvious correlation is not found.



Next figure shows the result in Vientiane Laos. Water sample shows free of protozoa, but patients are there.

It is a big surprise for me because I thought that Cryptosporidium disease was surely water-borne. I have realized the fact that the commonsense in developed country is not always commonsense in developing country.

Next question is how people in developing countries get diseases. Dr. Kimura thinks it is fecal-oral infection. The source of infection is feces of patient, that is, someone generally takes something from feces. Definitely, the hygiene education is very important to cut such infection route. As was expected, the diarrhea can be decreased by not only the improvement of water supply but also improvement sanitary condition and raising awareness of hygiene.

【Countermeasures in Japan】

Britain defines drinking water standard for Cryptosporidium as one cell or less per 10 liters water. But Japan and USA don't have such standard, and instead of it, these countries use turbidity. It is thought that protozoa can be removed if the treatment process is controlled well enough for keeping very low turbidity,. Currently, water works in Japan are requested to control maximum turbidity as 0.1 degree at the outlet of filter pond. It is very severe regulation. Besides, exposure to U.V. emission can be used for inactivation. This method is authorized for treatment procedure of Cryptosporidium and Giardia in Japan.

Usually, bacteria are examined by cultivation

method, but protozoa are so difficult to cultivate that these are counted under microscope. Dr. Kimura said 'It seems very beautiful the brilliant microscopic views under U.V. reflection even though it is a sample of diarrhea stool.' He is so nice! The question in very beginning what is the importance of the study of Cryptosporidium in developing country is solved completely. He talked comprehensively. I would like to say thank you again.



Dr. Kimura talking

Additionally, Mr. Sasaki explained about current

countermeasures to protozoa in Yokohama water works. If only one cell of Cryptosporidium is detected in filter water, the water distribution will be stopped. It is understood chlorine-resistant creature gives rise to big problems. This type of problem may require the consideration of risk management. It is also interesting topic to discuss in future.

Yasuko Kamegai

The figures in text are referred by 'Relationship between contamination of tap-water and protozoa-related diarrhea in developing countries' Kimura, K. and Uga, S., Modern media, 52, 12, 19-25

http://www.eiken.co.jp/modern_media/backnumber/2006.html

Information Sharing Seminar for "Water" SMEs for Expanding into Southeast Asia

Water businesses' expansion to overseas has been receiving increasing attention. Some Japanese WaQuAC-NET members think "I am interested in expanding business to overseas, but I do not know how to do", or "it would be too high risks to dare to expand overseas independently". In the second general meeting of WaQuAC-NET Kyushu branch held in last July, discussions were made on SMEs" (small and medium-sized enterprise) expanding into Southeast Asia, which had been proposed by Mr. Akaishi in the newsletter Vol6. Following these discussions, information sharing seminar was proposed to hold. Here I would like to report the result of the seminar.

1. **Date and time:** 20/11/2010 13:00~17:00
2. **Place:** Fukuoka city, Japan
3. **Organizer:** Kyusyu branch and secretariat of Wa.QuAC-NET
4. **Participants:** 9 participants; Mr. Akaishi, Mr. Kakegawa, Mr. Yamashita, Mr. Nakashima,

Mr. Kagata (from Kyusyu), Mr. Ebashi (from Osaka), Mr. Mori, Mr. Takebe, Ms. Yamamoto (from Tokyo). Self-introduction of members firstly participated.

1) Mr. Takebe Shigeru;

CEO, Fuyo Consultant Co., Ltd.

I have just been members since Nov. 2010. I got to know and interested in WaQuAC-Net which Ms. Yariuchi introduced it in Journal of Japan Water Research Center. I am a designing consultant on water treatment, and feel this domestic industry has been getting more severe recently. Major firms try to expand their business to abroad with government. We, a medium scale enterprise, have been considering what we could do. We have experience of a project on basic design of sewerage treatment in China, but no project could follow it. I found it would be difficult to get into by ourselves independently. I expect to gather information of developing countries through WaQuAC-NET.



2) Mr. Ebashi Nobuo;

CEO, SebaKMT Japan Co., Ltd.

Since 1976, I have worked as a JICA Volunteer in



1976 in the Philippines in the field of Agriculture and then worked as a vegetable seed breeder for total of 15 years. Later worked for a British company who manufacture of the equipment for detecting underground utilities. And, moved to a German company who manufacture for the water leak and underground utility detection since 5years ago as a head of Japanes company. I am a business associate with Mr. Nakashima and this is the first time to participate to the seminar.

➤ **Other participants**



5. Introduction of case of activities

1) "Situation, Risks and Challenges of Going into Cambodia"

Speaker: Mr. Nakashima Eiji,
CEO, Nakami Japan Co., Ltd.



Our company works for survey mainly underground utilities. I have stayed to work in Phnom Penh for JICA's Technical Cooperation Project as an expert of leakage detection in 2005 and 2006. That was good occasion for me, and started to consider running a business in Cambodia. It has past two years since I set a liaison office and one local staff in Phnom Penh for a first step for setting up of an overseas company. From then, I visited there four times a year. However, in Cambodia it costs only around USD 2,500 to set up and register a new company, but costs more than USD 1,000 per month to manage it including tax payment, keeping books. Considering these spending, I am not sure that a new company could earn and afford enough for these costs.

Recently, Japanese major private company trend to go abroad under cooperation with Japanese government, but we, SMEs, cannot cooperate with

authorities, and could not get good outcome if we would have associate with majors. Therefore, presently I just started to satisfy needs of developing countries such as necessity of spare parts by utilizing the connection which I got during my dispatch as JICA Expert. On the other hand, I keep contact with local Japanese society, and local companies to collect information for exploring possibility of profitable business. I expect this business be able to afford cost of local staff. I began to work with a Japanese company which has long experience to develop business there. We have idea to cooperate each other not only for procurement of equipment, but also for establishing an engineering company on technical assistance, drafting specification and construction and maintenance

Cambodia has different custom and rules from Japanese one. Many Japanese companies have tried to enter the market until now, but most of them have resulted in failure; only some trading companies and people who live there have been staying.

We should recognize their culture to accept it. We might say easily that corruption is bad, but it also might be absolutely necessary for the people who work with extremely low salary.

Considering priority of the business, I can say that simple and cheap technologies are prioritized to advanced technology. For example in the field of water treatment, conventional treatment process is good enough, not advanced treatment. I have an idea for a business of a treatment unit. This can be used in rural area, and its maintenance can be delegated to Japanese NGO or local company after technical instruction. SMEs have difficulties on its resource, and cannot have enough employees in various specific fields. Therefore, SME can diversify their business more through associating with other companies which have different specialties from its own. The Japanese market seems to be full of stagnation currently, and it is good timing to go

abroad. For that, however, we should examine carefully what the customers need, and human relationship is also important. I have heard there is a request from rural private water utility for technical advices on expansion of supply networks. And we have more ideas for business; a coagulation chemical which is made of polyglutamic acid (PGA) extracted from processed soybean, and electrolytic-generation manufacturing system of sodium hypochlorite as disinfectant instead of chlorine gas.

I will deliver equipment to EDC (Electricite Du Cambodge) shortly. As working continually, I can receive much information on a business from various sources. I would like to establish a local company in the next fiscal year.

2) "Applied to a JICA project of BOP(Base of Pyramid)"

Speaker: Mr. Mori Hajime,

President & CEO, KISUI Water Treatment Design & Engineering, Inc.



I had worked for oil business in a trading company for 23 years since graduation from a university, and am familiar with Mid-east Asian countries. At the time of the Gulf War during my stationing in Dubai, I was shocked at terrors of shortage of water, and recognized appreciation of water. This experience may lead me to work for water sector as participating in launching water business in GE (General Electric), and reaching to the current position. Our company has expertise on water deionizer, filtration of hot spring water, geothermal power generation and so on.

It is said that 4 billion people are the poor in the world, and 3 billion of them live in Asia. I would like to develop my business to Asia with my belief that "Deliver water to people needs water". Recently we often hear "BOP (Base of Pyramid) business" which likens economic level of world's population to a pyramid. And BOP business targets 4 billion people who are in base of the pyramid. I think this business

would be suit for a SME.

I admire Thomas Alva Edison very much; who was a great inventor and marketer, and said he would make what people need. As we develop our business abroad, we should consider what they need, not what we can do, I think. That would be 3 L (Low-Tech, Long- Term, Low- Return). Recently I offered a proposal to a JICA's preparatory survey (Promotion of partnership for BOP business). I proposed a project to utilize rainwater and underground water in India. I would like to find a way to get fund from not only a bank but government to develop business abroad.

3) Recent activities on PPP in Kita-Kyushu municipality

Speaker: by Mr. Kagata

Katsutoshi (Kita-Kyushu Water and Sewage Works Association)



I work for the secretariat of Kita-Kyushu Oversea Water Business Promotion Committee, which is established recently. Before that I have worked for receiving foreign trainees and dispatching experts abroad in the association after retiring Kitakyushu Waterworks Bureau. The 1st meeting of the Committee was held on Aug. 31, more than 50 companies participated. Until now 78 companies have been registered. The committee has 4 objectives; (1) grasp of seeds (survey to reveal advantage of participating companies through questionnaire), (2) understanding of needs in overseas (focusing on cities /countries as targets, where the Kita Kyushu has had relation such as Dalian in China, Hai Phong in Vietnam, Cambodia and Saudi Arabia), (3) consideration of measures of PPP, (4) formulation of a project. Its first activity in overseas is participation in the seminar which would be held as the 105th anniversary event of the Hai Phong Water Supply Company, Vietnam from 24 to 27 November. Participants would survey local needs and promote their products in the exhibit booths. I feel

differences of purpose participating among the companies, it make us difficult to integrate.

6. Possibility of Expanding abroad and Cooperation of Companies (Discussion)

- ✧ Avoid being competitive with local companies, and cooperate with them; for example, Japanese company instructs maintenance technique of their equipment to them and delegate maintenance of the equipment.
- ✧ Receiving trainees from developing countries to Japan and make them favourite over Japanese products. It can help Japanese companies to do business in the long run.
- ✧ Counterpart of ODA projects can be involved.
- ✧ Japanese are said to be good at teamwork, but not good in partnership among companies
- ✧ Each SMEs has own specialty and their expertise is high. Good partnership can be made by gathering these expertises.
- ✧ Each participating company of the seminar works in different field incidentally. We can utilize this occasion to work together.
- ✧ Japanese advantage is on advanced technologies but that is different from what developing countries need. There might be

another system to treat water at cheaper cost such as slow sand filtration system.

- ✧ It is difficult for developing countries to sustain the O&M properly even simple system. This point should be focused more.
- ✧ To know the real situation of other countries, I visited Cambodia first, and the South Korea. I plan to visit Thailand next. I can get to know the things that I could not see when staying in Japan.

Participants came from various field of companies; study and design, water treatment facilities, water leakage / underground utilities detection, O&M and sales of equipment, water quality analysis and hydroponics, JOKASO promotion, and geologic survey.

Participants concluded the seminar that "we will hold information sharing meeting to explore partnership about once a half year", and also "first of all, let's go to a developing country!" The scheduled time of the seminar was three hours, but extended 1 hour. Participants made comments that the seminar was very meaningful. (By Yamamoto)

Introduction of New Member Ms. Toki Ayaka

Nice to meet you all. My name is Ayaka Toki, recently joined this WaQuAC Net as a new member. I have been working as a JICA volunteer for two years in Bolivia and returned to Japan at the end of June 2010. In Bolivia, I was working for JICA's project; Water is Health and Life, as a program officer. Through this project, I met Ms. Yamamoto and Mr. Horie and



they taught me useful knowledge to work at drinking water supply area.

Almost six month has been passed after coming back from Bolivia and currently I am working at ERM Japan as environment consultant. As my specialty is Agricultural Economics, I feel inadequate of technical knowledge all the time. Still I am not sure how I can engage this community; however I would like to learn from all of you. Thank you.

**Introduction of
WaQuAC Member**



Water Supply in Bolivia

JICA Senior Volunteer Mr. Makino Yoshihide

1. Introduction

It has past one year since I was dispatched to Bolivia as a JICA Senior Volunteer. I work in Beni Province which has rainy and dry season as subtropical climate. During rainy season, it is difficult to move by a car because of worsen condition of roads. Until now I could visit to water treatment plants two times.

Beni Province is in a vast plain at the height of 200m, which is upstream of the Amazon River, and located in the north of Santa Cruz. A large river runs through the Province. About 400,000 people live in the area which is half the size of Japan.

2. Water Source

Though it seems that they do not have any shortage of water source, it does not actually. Floating substances in the rusty-colored water are too light to be settled properly. And during rainy season water runs in plenty, but in the dry season it is difficult to take water because surface of water goes far down.

People living in a vast plain use water of dug puddles for drinking. However, quality of the water worsens



"Pozo" (puddle)

as dry season gets deeper. People rely on stored rainwater, but precipitation is not stable. There are wells which were constructed with support of foreign aid, but those water quality is not good, and cannot provide water stably, it may be caused by too small sand of aquifer.

3 Treatment Plant

There are four water treatment plants for urban population in Beni Province. Three of them use surface water as its raw water, and the other treats water from deep well by removing irons.

The surface water treatment plants distribute water almost as raw water is; such as using a bypass hose in filtration basin, or overflowing filtration sand. On the other hand, the under ground treatment plant removes iron with aeration. Because water of the well is not enough, they supply water intermittently. People remove water meter and install pump for connecting to service pipe to get water. It seems to cause wasting water a lot.



Bypass hose in slow sand filter basin



Bypass hose also in rapid filter basin

I found common characteristics of these treatment plants that they did not have any equipment for control and monitoring; such as water-level gauge and flow meter. They seem to think it must be harder to manage if they equip electrical equipment. But these plants are far from energy saving; the staff operate pump sweepingly.



Iron removal process by aeration and filtration

4. Conclusion

Though I am here to make advice to improve for

these treatment plants' functioning, it is hard for me to communicate in Spanish. Even if I asked a staff "Why?", he may just answer "No se. (I don't know)" I feel difficulties to understand the real situation.

For maintenance of facilities, water committees have been organized among local communities, but they do not willing to do such too much of a bother. I heard one case recently that they are lazy to wash regularly iron removal facilities installed in the well, so they put a hose to bypass the treatment process. It is big issue for me to make them understand

necessity of filtration process.



Water meters were replaced with pump!

~ *Report from overseas* ~
**Present condition
of regional water supply in Vietnam**

Hiroshi Sasayama;
Chief Advisor,
The Project on Capacity
Development for Urban Water
Supply Utilities in the Central
Region of Vietnam



We held survey at 5 water supply companies (WSCs) in the central region in August and October 2010. The purpose of survey is grasping present condition of WSCs and finding training needs of WSCs. Visiting people's committee of each province is also important activity to show that the project began and obtain their cooperation to the project. The survey team members are about 20; consisted of JICA experts and counterparts. Target WSCs were selected to represent various condition and characteristics of WSC in the central region by Vietnamese side. Survey was carried out with interview and discussion to confirm and complement the answers to questionnaire which was sent to each WSC before survey.

As the result, we found common problems such as inefficient management, inhibition of managing Water Safety Plans (WSPs) by sectionalism,



Courtesy call to People's Committee in Khanh Hoa



Interview in Dak Lak WSC

undetermined master plan causing less idea of updating of facility. We also found that it was installation, maintenance of equipment and water quality management of WSCs that there were quite big gaps among WSCs. We will develop training programs to improve problems in those fields. It is not easy to design appropriate programs with considering such gap among WSCs.



Question & Answer Corner

We welcome any opinions, and questions to this Q&A corner!

We want to change the disinfectant from the **chlorine (Cl₂)** gas into **sodium hypochlorite (NaClO)** by thinking about safety in our water treatment plant. NaClO is used in a lot of water treatment plants in Japan. Please teach following.

Q-1) Comparison between Cl₂ gas and NaClO

Q-2) Comparison between commercial NaClO and house generation produced by electrolysis method. (**Answer of the 2nd question will be placed in News letter no.9*)

(Mr. M.N. Cambodia)

Q-1) Comparison between Cl₂ gas and NaClO (characteristic, easiness of O&M, cost)
How many grams of commercial NaClO correspond to the Cl₂ gas 1g?

A-1-1) *This answer was quoted from "Design Criteria for Waterworks Facilities 1990" Japan*

Chlorine agents include liquefied Cl₂, NaClO and calcium hypochlorite (including the high-grade bleaching powder). Additionally, sometimes, NaClO is produced by electrolysis at purification plants.

a. Liquefied Cl₂ is the liquefied Cl₂ gas charged in a container. Since Cl₂ gas is heavier than air, has pungent odor and strong toxicity, handling should be taken with thorough care while strictly observing legal requirement. For quality, as the available Cl₂ in liquefied Cl₂ is nearly 100%, the quality is stable, and compared with other chlorine agents, the storage capacity can be smaller.

b. Commercial NaClO is a pale yellow liquid with an available Cl₂ concentration of 5-12% and has strong alkalinity. The higher the concentration is, the more the stability is decreased and available Cl₂ is lost during storage. Compared with liquefied Cl₂, both the safety and ease of handling is better. However, since bubbles (oxygen) separated from the solution accumulate in the pipes

and the pumps, which may disturb the flow of the solution, thorough consideration is required.

c. NaClO produced by a house generation system (by electrolysis) is a thin solution with 1% or less of available Cl₂ concentration. Accordingly, it is relatively free from bubble troubles compared with the commercial NaClO but the facility is complicated.

When selecting a chlorine agent, in addition to the above-mentioned characteristics of different chlorine agents, it is necessary to take into account the relative ease of maintenance and safety performance of the facility in case of disasters. Generally, it is desirable to use a commercial or house generated NaClO. Sometimes, house generated NaClO is used for avoiding secondary disaster by traffic accident.

A-1-2) Case of K City in Japan

With regard to the change of Cl₂ gas to NaClO,

1. The first reason was safety. Before changing, we used 19 containers of Cl₂ gas (50kg/ a container). When staffs changed a container, a very little gas leaked normally and we worried their health. When staff had to change the container in the midnight or weekend, the risk for staffs increased, because staff numbers in midnight and weekend were less than in the daytime of weekday.
2. The second reason was high cost and heavy workload by maintaining the chlorine dosing pipe and regular testing the container capacity to resist pressure. And also these works were complicated.
3. The third reason was the change of living environment in the surround of a water treatment plant (WTP). And awareness of people living near WTP changed. Now WTPs are not located in a desolated field like before. Houses and factories increased near the WTPs and we worried big accident and considered people's fear.

When we compare the actual consumption of Cl₂ gas in 1993/ 1994 with the actual consumption of NaClO in 2007/ 2008 in K City, Cl₂ gas 3.6g was consumed for treated water 1m³ in average and NaClO consumption was 21.0g (as 12% of concentration) as well.

(Mr. Odashima Akihiko,
Kitakami City Waterworks
Department)



A-1-3) Case of KQ city in Japan

Commercial NaClO contains 13% of chlorine concentration. However, while NaClO is in the storage, the concentration reduces to 10% around. If you keep it longer, it reduces to less than 10%. We manage the stock of NaClO not to keep so long time in storage. We calculate dosing rate using 12% of chlorine concentration. Eight point three (8.3) times of NaClO in weight correspond to Cl₂ gas. (Mr. Kagata Katsutosh, Kitakyushu water and sewage works association)

Introduction of New Members

(as of December 2010)

- Ms. Toki Ayaka (Japan)
- Ms. Hul Soursdey (Cambodia)
- Ms. Daraporn PHUSING (Thailand)
- Mr. Shibazaki Satoshi (Japan)
- Mr. Takebe Shigeru (Japan)

***We welcome new member any time.
Please contact our office.***

WaQuAC-NET Newsletter No. 8

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Next Activity

- Newsletter No.9 "Leakage and Safe Water"