Workshop 3

"Is there a risk?"

This workshop was chaired by François Barthélémy, Chairman of the Board of Directors of the Rhine-Meuse Water Agency. The Secretaries were Claire Riou, Marc Hoeltzel and Roger Flutsch of the Rhine-Meuse Water Agency.

The participants were as follows:

Dr Denis Zmirou, Lecturer, Public Health Institute

André Lecloux, European Federation of Chemicals Industries

Bernard Baudot, Water Director, Ministry of Planning and the Environment

Christon Hurst, Environment Protection Agency (Ohio, USA)

Dominique Tricard, Manager of the Water-Related Risk assessment unit, French Food Safety Agency

Frédéric Marcel, Deputy Director, Chronic Risks Department, National Institute for Industrial Environments and Risks (INERIS)

Anne Stenger, Researcher in economics, National Institute for Agronomical Research (INRA)

Jean-Claude Tournayre, Union of Plant Protection Industries

Daniel Hedouin, Public Authority Risk Manager, National Office of Crédit Agricole

Professor André Lecloux, Scientific Director, Euro Chlor

Professor Martin Exner, Public Health Institute (Bonn, Germany)

Opening

François BARTHÉLÉMY
Chairman of the Board of Directors of the Rhine-Meuse Water Agency

Is there a risk? How is it to be assessed? What scientific data do we have to take action? What are the means for assessing risks? What is the economic impact of risks, and those of the measures required to prevent them? How are policy decisions in the field made? How are the policies implemented and managed, both in terms of installations and products marketed? Those are some of the questions we shall try to answer in the course of this workshop.

Characterisation of the health risk in the field of water

Dr Denis ZMIROU
Lecturer, University of Medicine of Grenoble

Specialists of water-related risks owe much to John Snow. In 1854, Snow took it upon himself to understand the reason for a new outbreak of cholera in London, using all the available tools of epidemiological analysis, which would subsequently be improved. He mapped out the fatalities on the one hand and the water drawing locations likely to be associated with the epidemic. In that way, he was able to show that the chances of fatality in people who lived close to wells downstream from a sewage outlet into the Thames were ten times greater than those in people who drew their water upstream from the outlet. That is how he identified the source of the cholera in 1854. His epidemiological analysis had enabled him to demonstrate the risk.

I. The concept of risk

A health risk is the probability of the occurrence of an adverse health event. When one analyses the occurrence of such risks, one must think about the effects they induce and determine if they could lead to diseases due to massive and sudden poisoning or chronic poisoning. The microbiological risk, which will be the main subject of this paper, occurs within a relatively short period after exposure.

In the presence of exposure, not all the individuals express the adverse manifestations of the effect to the same extent. The population is very heterogeneous, depending on the conditions in which it is exposed, the intensity of the exposure and personal proneness factors (immune deficiency, state of health). This probability characterises risk.

The major element for risk characterisation is the dose. As Paracelsus used to say, “Nothing is poison, but everything is poison”. The poison is in the dose. Finding a chemical or infectious agent that is potentially harmful is not proof enough for saying that a situation is dangerous. Everything depends on the intensity of the contamination. The presence of the agent is just an indicator, which must be taken into account.

II. Risk measurement

1. Public health monitoring

Monitoring refers to the ability to detect the occurrence of health problems in the population. Even an active system for monitoring the health of the population cannot monitor everything. That is why tracing diseases are selected for their ability to reflect the health of the people, the quality of the environment in which they live, and their behaviour.

Every year, the American magazine MMWR of the Centre for Disease Control retraces the frequency at which episodes of waterborne epidemics are reported to the system. Currently, there

are 10 to 15 such episodes every year on average. In the Rhone-Alps region, we have listed the epidemics reported to the monitoring system. From 1990 to 1996, there were a dozen epidemics in the population. If these figures are adjusted for the general population, the value is not far from that of the American figures. That means that the two situations are not differentiated by the sensitivity of the system, but by the possibility to investigate the demonstrated or probable causes as well. The American monitoring system is more sensitive in this respect. When the agents responsible for the disorders are found in water or in the stools of affected people, the epidemic is not found in 40% of cases. However, the American system is capable of describing the main chemical or protozoan responsible, which the French system cannot do. We do not have such statistics and there is no reason to believe that the American data can be extrapolated and applied to the French situation. That means that such a system would be required in some departments.

What is the proportion of actual cases that our French monitoring systems can identify? The actual percentage is not known, but it is probably fairly small. For gastro-enteritis to be detected by the monitoring system, the infected person must first be ill, sufficiently ill to see a doctor, the doctor must ask for confirming microbiological examinations and the results must be positive… The correct germs must be sought and the number of reported cases sufficiently high for the microbiologist to contact the health authorities. The large majority of these cases are not accessible to the system as it exists today. It is thought that we can detect 5 to 10% of these aggregates, not to mention isolated sporadic cases.

Those responsible for biological testing can see massive and brutal phenomena occurring within a few days. But if the number of cases is not large enough to reach the alert level, they are not detected. Also, there are sporadic cases that cannot be detected. As a result, the aim of those who devise monitoring systems is to lower the sensitivity of the system, even though all the cases can never be detected. Besides such comprehensive monitoring is not desirable either, because if the system could detect each and every case, the work of analysing the causes would be very lengthy and difficult! Besides, current scientific knowledge cannot as yet enable us to identify the causes of diseases. What is more, a fine analysis of the distribution of rare diseases in time and space shows that random phenomena can be misleading, and the occurrence of an aggregate of cases does not mean that a study of the causes must be started necessarily. That would be unthinkable with the current system.

III. Risk assessment approach

Science and investigation systems are incapable of answering all these questions. Many uncertainties remain. For all that, public action cannot expect to know all the facts before taking measures to reduce the risks. In that context, a very structured scientific approach was prepared in the USA in the 1970s in the field of chemical risks, followed by microbiological risks, called risk assessment. Indeed, epidemiology and experimental science cannot answer all the questions. Epidemiology consists in counting the diseased and the dead, while prevention is the preferable approach. Also, the studies would be long and costly, and still would not provide an answer to all the questions. Experiments provide very detailed information, but are subject to narrow limits.

Some thousand new chemicals appear in the world every year. The current systems for detecting the toxicity of the new agents are not capable of identifying their long-term toxicity. The same applies to

microbiological agents. Plus, animal experimentation provides information about the hazard, but not the reactions of humans. By basing the logic on experiments with rats, the levels of the protection to be implemented are necessarily too high or too low.

The risk assessment approach is an organised scientific approach aimed at using the most advanced knowledge available at the time and models. Scenarios are drawn up on the basis of the knowledge available at a given time, in accordance with the principle of conservatism. These models provide values for the probability of the risk. After that, the determination of the level of risk from which action is taken is a policy decision. All the tools used to make the models must be scientifically founded. But the tools used currently have their limits.

In the field of microbiology, we can measure the experiments with animals or healthy adult volunteers, which are different from those obtained with young children and immune-deficient people. For instance, our team has just completed a study of the probability of falling ill depending on the concentrations of a protozoan, Giardia, in drinking water. The results of the experimental approach used thirty years ago on healthy volunteers were compared with animal strains and the epidemiological observations by following up a population for nine months. In some hypotheses, we were able to come close to the dose-response functions of the experimental literature. The tools are becoming quite suited to risk management.

IV. Conclusion

In other words, there is a risk. Snow had demonstrated it, as had Honoré Daumier at the same time. However, the risk is no longer the same. Today, the risk is not that of brutal accidents within the population, but more diffuse risks that appear in the longer term. Risks appear more often in the field of chemicals than in that of microbiological organisms, but that does not mean we should be lulled into a false sense of security. Risks are becoming more difficult to bring out and the risk assessment approach has become an essential tool. The monitoring of environments is a fundamental component for estimating the risk to which a population is exposed. But we must recognise that the production of scientific knowledge earlier on in the process to use the tools effectively is relatively mediocre in France as compared to other countries in Europe and the world. The North-American continent is very much ahead of us in that respect. We must develop scientific knowledge as part of European collaboration projects in order to continue the enlightened management of risks using modelling tools.

Discussion with the audience

André LECLOUX, European Federation of Chemical Industries
The legislation is increasingly stringent. This morning, we spoke of monitoring tap water. What measures are the authorities taking to implement the regulations concretely? Are the laws and regulations not too idealistic to enforce?

Bernard BAUDOT, Water Director, Ministry of Planning and Environment

I think it is important to remember that we are engaged in a European approach, which is progressing satisfactorily and in which health and the environment are now separate.

As regards the environment, we are working increasingly on the basis of requirements prepared with all the partners. When you fix ceilings that must not be reached, you have to have some regulatory measures. However, I share your point of view. The regulations must be compatible with business activities and conform to policy decisions that are made on the basis of the impact on health and the environment.

The requirements lead to the issuing of authorisations. Activities are not banned, but they are required to meet new environmental restrictions. Companies will sustain economic harm if they do not integrate these environmental factors and costs in the price of products and in the decision-making process.

Lastly, the enforcement of the requirements is a big problem, for instance in the field of water.

Thierry MICHELON

For nine months, I have been in charge of environmental health issues in the General Health Authority. I am impressed by the number of health problems we have to face. There is a new issue every week – glycol ether, cases of lead poisoning, leukaemia etc. We are surrounded by risks.

The human and financial resources are limited and we must prioritise the problems. In this respect, I would like to stress that in Guyana, which is part of France, there are places with no drinking water or electricity. The people live in shantytowns. The Amerindians eat fish containing mercury. That situation is quite far removed from the decisions taken elsewhere in France on the basis of the precautionary principle. I do believe that there will be much to do in future in my line of work!

It could be that we Frenchmen are too rational in the preparation of a regulatory system. Anyway, mentalities cannot be changed by regulations alone. Such measures should have financial support, and be accompanied by awareness and explanation campaigns. The decrees of 1996 and 1997 relating to asbestos or the circular on Legionnaires' disease in hospitals came with no financial assistance for those concerned. Actually, they only serve to soothe guilty consciences. The impact and implementation of the regulations should be evaluated. I think that there are a large number of diffuse health risks, which we know nothing of and which we must combat, particularly by banning some products.

Danièle PIC, Councillor, Drôme Departmental Council

I find that the regulations are fairly good, but I would like them to be enforced more strictly. In my canton, water test reports are displayed in town halls that are only open half a day every week. You really have to make a serious effort if you want to get to see them. It would be so simple to require mayors to inform their communities of any problems found in the tests.

Bernard BAUDOT

In addition to elected officials, pharmacists and doctors must also be kept informed. At lunch, I heard a pharmacist complain about the lack of information as regards the quality of water. Information is not given out rapidly enough to doctors either.

Danièle PIC

Municipalities have set up sewage treatment systems, but only for the centre of villages, and not for scattered farms and houses. Above all, the sewage from breeding operations is not treated and our lovely rivers are fit for neither bathing nor drinking. Why do we let farmers take water from rivers in which the fish are dying to water their vegetables? Is that not a risk?

Caroline HENRY DE VILLENEUVE

Excesses can indeed be seen in the hinterland of Drôme in the field of irrigation. In summer, the rivers are dry and what little water remains is of poor quality. The problem concerns all of France. The Water Authority is managing it by using the new tool of eco-conditionality of aid, applied more particularly to the quantitative management of water. We are trying to provide assistance in the installation of water meters and we require readings of the cubic meters consumed before distributing public aid to farmers.

A member of the audience

Mr Baudot spoke of the new openness in France, and told us that consumers should be given simple information. In reality, it is very difficult for the “average consumer” to get simple information about the quality of water. In La Tranche-sur-Mer in Vendée, I had to be very dogged to obtain information.

The decision-makers in Paris, particularly the Health and Environment Ministers, give out no information! The only answer I got was “we have a website”. And how are the many people who do not have access to the Internet supposed to get information? The existing information is limited to statistics that can only be understood by engineers. To find books that address water issues for consumers, you have to look towards Quebec or Belgium. Could the ministers not issue simple booklets of some twenty pages ?

Caroline HENRY DE VILLENEUVE

Detailed information is available for consumers, on different levels. The first channel of information is posting in town halls. Consumers are also to be given information with their annual water bills. Besides, the local Health and Social Affairs Authorities submit to the Environment Ministry brochures that are remarkable for their pedagogy. The situation of each municipality is presented on the basis of five to ten parameters. The information is accessible to all citizens. Also, the local Health and Social Affairs Authorities readily give information. Water distributors are also required to provide data. Even if you do not have access to the Internet, you can find a variety of information about the quality of water.

Jean-Claude BLOCH

Has a study been conducted on the impact of waterborne infections, let us say in terms of man days lost ?

Dr Denis ZMIROU

The incidence of diarrhoea in the general French population with a water supply that complies with the regulations varies from 0.5 to 1 case per person per year. The risk is twice as high in children. When the quality of the water does not meet the regulations, the risk increases also, depending on the nature of the agent.

One out of five affected people goes to see a General Practitioner. One out of three goes to a pharmacist. The others do nothing or resort to self-medication. One out of the three or four people who go to a GP takes sick leave (because they are sick or because their child is sick). The figures mean that 60 million adverse gastric events can be attributed to water every year.

Estimation of the risk of infectious diseases related to pathogenic germs in drinking water

Christon HURST
Environment Protection Agency (Ohio, USA)

First of all, I would like to thank the organisers of the conference for inviting me. My talk will have to do with one of the studies mentioned by Jean-Claude Block.

Today, we can put a figure on the risk of infectious diseases related to the presence of pathogenic germs in drinking water. The data presented here will form a chapter in the second issue of the *Manual of Environmental Microbiology,* of which I am the editor. It will be published in mid September by the American Society for Microbiology. In fact, the chapter will be a simplified version of the book *Modelling Disease Transmission and its Prevention by Disinfection*, published by the Cambridge University Press in October 1996.

I. Principles

The estimation technique used takes account of three probabilities:

? **the probability of infection**
It is important to remember that infection and disease are not the same thing. While you can be infected but not ill, you cannot be ill without being infected. We express the probability of infection as follows: one divided by the minimum number of organisms required for infection. I will focus on the risk relating to the ingestion of organisms and would like to specify that this study was mainly conducted on a population of university students, who are often strapped for cash and looking for ways to earn money.

? **the probability of disease**
This is the number of infected subjects who subsequently develop the disease. This probability is obtained by dividing the number of students with signs of the disease by the total number of infected subjects.

? **the probability of fatality**
These data were collected from epidemiology studies – we were certainly not going to let one of our students die! This is the number of people who die of a disease divided by the number of people with symptoms.

II. Methodology

The study focused on the entero-pathogenic bacteria that lead to typhoid fever and cholera. It must be noted that they are divided into two categories. Type 01 bacteria have a much larger probability of infection. In other words, you need a small number of bacteria for the infection to occur. Such bacteria are also behind most of the cholera outbreaks reported in recent times. By evaluating the

different pathogens and viruses on the basis of the aforementioned criteria, you obtain a median value for each of them. When the value is greater than 1, the virus or pathogen is more harmful to humans than to animals.

In order to evaluate the risk of infection, you must know the number of organisms contained in a litre of water. The Environment Protection Agency bases its projections on an average consumption of two litres of water every day. That figure is then multiplied by the indicator for the probability of infection. The risk of disease is equal to the risk of infection multiplied by the probability of disease. The risk of fatality is equal to the risk of disease multiplied by the number of deaths.

III. Validation and conclusion

I used two additional studies to validate the evaluation technique. The first one was conducted shortly after a failure in the water treatment system of Montreal. The risk of disease per individual per year was estimated to be 0.08. In other words, each individual had an 8% chance of falling ill by drinking the mains water. The progress was considerable, as a previous study had provided a probability of 0.26. In the second study, the risk of gastro-intestinal disease was evaluated to be 66%, from which the population using filtered water (0.5) was to be subtracted.

We knew that the virus concentration was 4.13 per litre of untreated water. We multiplied that figure by the number of litres consumed every day (two litres, 365 days a year), the probability of infection (0.5) and the probability of disease. We knew that the effectiveness rate of the water treatment centre for the elimination of the virus was 99.9921%. The figure may seem impressive, but it actually reflects fair performance. That gave us a probability of infection of 0.068, i.e. 6.8 %. The concentration of *cryptosporidium* was 0.14. By doing the same calculation, we obtained a probability of infection, by noting that the effectiveness of the filtering of *cryptosporidium* was 99.9639 %. As for *Giardia*, we based our work on a quantity of two organisms per litre of untreated water and obtained a probability of infection of 0.00373.

The calculations relating to bacteria cannot be done in the same way, as the studies in question were based on faecal indicators. However, we want to establish data on the various bacteria and their contribution to the risk of disease. We found that the risk of disease related to a virus was 8% per year, representing 85.9% of the risks in water. *Cryptosporidium* represented 1.5% of the risks, and *Giardia* represented 1.2% of the risks.

If we take account of these three types of risk, everybody who drank municipal water had a 92% chance of falling ill. In order to evaluate the number of organisms present in the water, we had to reverse the calculation. We reached the figure of 1.86 organisms per litre of treated water.

However, certain points must be made clear. First of all, two litres of water include not only the water that is drunk as it is, but also boiled water in which food is prepared. In other words, the water is “treated” by the consumer. Besides, even though the technique is efficient, we must remember that our ability to detect these pathogens is not perfect. Lastly, you have to keep in mind the fact that these are endemic diseases – during the period of the study, no epidemic of any type was reported.

Risk management analysis by the authorities

Dominique TRICARD
Manager of the Water-Related Risk Assessment unit, French Food Safety Agency

I. General principle of health safety

This morning's session showed that issue of risks has existed and continues to exist, even though its forms are have changed. Measures have been taken to handle the risks. In France, a very complete circular was introduced as early as in September 1885! Some measures were introduced in France about a hundred years ago to protect the health of users from water-related risks. The measures covered the entire circuit, from catchment at the source, to treatment, interior systems and delivery to the users, including special uses by the food industry or for medical treatment. The measures can be classified into levels.

? **Technical measures applicable to the circuit from catchment to interior systems**
These measures handle issues relating to catchment and the designing of systems within buildings or water towers.

? **Administrative procedures**
This approach is used to analyse the local situation and make sure that the catchment project is suited to the resource. That explains the need for permission from the prefect, which is required for each catchment point. The paths of systems must also be reported to the authorities so that epidemiological studies can be conducted if cases occur in different locations within a community. The area around catchments must be protected, which is not yet so everywhere in France.

? **Application of a European directive**
The directive provides that where surface water is used for drinking, the treatment shall be more powerful if the quality of the water is poorer.

? **Quality requirements for tap water**
The nitrate level is set at 50 milligrams per litre, the water must be free of bacteria etc. Often, the protection rules are reduced to these requirements, whilst the previous levels are often greater, as the quality of water is a result.

? **Water quality monitoring**
Such tracking includes two obligations:
- ? Obligation for distributors to monitor their system or have it monitored;
- ? Obligation to set up testing by the Health Authorities. Such regular testing includes visits to the installation and sampling followed by testing by approved laboratories. The results must be published.

? **Obligation to inform the public**

? **Obligation to manage nonconforming situations**
Procedures have been put in place in the French regulations. They are reinforced by a recent European directive.

In this way, the water supplied to consumers' taps is supposed to be of good quality. However, in some cases, it can be insufficient. That calls for a reaction and the management of the residual risk by the user. That is why the people in some areas are asked not drink tap water, because the resources that have been in put in place do not make it fit for drinking. In some cases, for uses such as the food industry or dialysis, the heightened risk imposes special testing.

II. Major current problems

These problems can affect the water resources or the treatment and distribution of water.

1. Resources

? **Accidental pollution**
These risks occur every year and lead to the closing of catchments or plants.

? **Microbiological conformity, particularly in respect of parasites**
In some small municipalities, the water is not up the mark in terms of its microbiological characteristics, as a result of defective treatment or insufficient catchment protection.

? **Nitrates, pesticides and other chemicals**
In some regions in France, chlorine solvents from industrial and waste effluent enter the water. The problem of endocrine disruptors is increasing.

? **Soil quality and hydrogeology**
Arsenic and fluorine problems occur in some areas in France, particularly in Lorraine. Selenium can also be found in other places. Karstic soils make it very difficult to treat water and can lead to major risks for users located downstream from them.

2. Treatment

Great technological progress has been made in the field of treatment, as illustrated by emerging membrane type techniques. The question is whether or not the membrane remains intact during the treatment and what is its actual effectiveness depending on its specificity.

Activated carbon techniques are being used more often. They offer a number of benefits, but also raise problems.

Treatment processes, particularly chlorination, lead to by-products that may be considered to be health risks. New Community rules limit the quantities of these substances in the water.

In some cases, the treatment introduces aluminium in the water, which leads to queries. Lastly, turbidity is a lack of transparency, but reflects the many difficulties encountered upstream.

3. Distribution

We have to face risks in public and private distribution systems. The risks have made some people offer treatment at the tap, which shifts responsibilities. That raises the question of the safety of systems inside buildings. In some cases, the pipes are mixed, which can lead to the contamination of drinking water.

Many discussions have been held on the national and community level about the materials that come in contact with the water and the coating of tanks, pipes and valves. The materials must withstand water and not release substances in it.

Lead is one of the issues of the new European directive relating to water for food use. We will have to see how we can achieve the limit of 10 micrograms per litre in a few years.

Work must be done right up to the point where the water is consumed. We must think of particular uses and provide for systems that can respond to complaints and the occurrence of effects on the health or epidemics.

These problems require investigations and thought, on the basis of risk analysis techniques. Currently, one can distinguish risk assessment, which is done in advance, risk management and communication between the various parties concerned.

There are two types of risk analysis: that conducted on the international or national level and that conducted locally, which addresses the solving of problems in a given area. These analyses contain the same number of stages but do not have the same context. In both cases, communication is important.

The French Food Safety Agency was set up two years ago. It is a public body under the responsibility of three ministries, namely Health, Agriculture and Consumers. The agency is in charge of risk assessment, as risk management is the responsibility of the administrative bodies. The ministries or approved consumers associations can refer matters to the Food Safety Agency. The Agency issues advice, which is posted on the website or can be obtained upon request.

To prepare its advice, the Agency uses internal technical expertise resources, such as laboratories, and also expert committees with an average of 25 experts. A dozen such committees have been set up in recent months.

Eco-toxicology, a test tool

Frédéric MARCEL
Deputy Director, Chronic Risks Department, National Institute for Industrial Environments and Risks (INERIS)

Risk assessment involves four steps.

1. Definition

While we have finally reached an agreement about definitions, it would be of use to develop a common glossary. Citizens are liable to confuse health, environmental and natural risks. For instance, the terms are still not unified in the field of geo-techniques.

In any case, everybody agrees that risk is the likelihood of occurrence of an adverse effect relating to the production or use of chemicals. To give a concrete example, you can go about with a pack of cigarettes in your pocket, which are a danger. But you run no risk as long as you do not smoke.

Besides, saying that an event is unlikely or improbable does not mean that the probability is nil. A statistics professor once said: *"snowfall in May is unlikely. But I would never say that the probability is nil"*. Messages relating to these subjects are not always easy to put across.

2. List of potentially polluting substances discharged

This stage is important while reviewing an installation. These lists make it possible to select risk-tracing pollutants that will be used to characterise the risk.

3. Hazard assessment

Hazards are assessed by determining the environmental concentration with no effect. In the conditions of a given environment, the toxicity of the sample for certain organisms is determined. The environment conditions are agreed and the biological agent is used on a population of young men with a defined sensitivity. The environmental conditions are such that in fact, a battery of tests must be used in order to try to characterise environmental impacts.

The tests can determine the boundary concentration in the environment, which may be called the reference toxicology value. The concentration is compared to the concentration of the offending substance in the environment, which is measured or estimated by modelling or diluting the effluent if it concerns a future installation. For sediments, a hypothesis of a balance between suspended solids and water is made. For aquatic organisms, the literature is researched. The risk assessor does not produce data, rather, the assessor looks for existing data.

The assessor looks for bio-concentration factors in fish, in order to measure the impact on environment and health at the same time.

4. Risk characterisation

A risk indicator is used to characterise the risk. The indicator is the measured or estimated concentration ratio divided by the concentration that has no effect on the environment.

Dr Zmirou clearly showed the limits of modelling. Of course, for existing installations, measurements are preferable to estimates, but in some cases, modelling is indispensable. The two techniques are complementary and neither is more necessary than the other for assessing the environmental risk.

I would like to insist on the fact that legislation must be accompanied by enforcement measures. The role of my Institute includes helping consulting firms and industry to apply the applicable regulations. As part of the assessment of health risks relating to chemicals, in September 2000, the Institute put in place a risk assessment guide to supplement the risk assessment reading guide and the health parts drawn up by INVS in order to help industry and consultancy firms to apply the method.

The Institute also wants this method to apply to the greatest number of industries. At the first level of the assessment approach, the figures are reasonably increased, for rapid assessment. If necessary, a second approach level can be developed to put in place methods and tools to diminish the uncertainty intervals.

Discussion with the audience

Francis Marchand

Dominique Tricard spoke of the main problems we face currently, but did not mention BSE prions. What is the current status of work of the prion issue and the possibility of transmission through water?

Dominique TRICARD

The situation in this respect is fairly complicated. The question is being studied. The French Food Safety Institute recently issued a document relating to the reassessment of animal meal risks. The document is posted on the Internet and distributed in its printed form. It contains a section on environmental risks and an analysis of the risk relating to water and the sludge from water treatment plants in which the effluent may have entered. We hope to take account of the entire animal meal issue. The report does not go very far, but it does raise questions and propose orientations about possible treatment techniques. The report was published a month or so ago.

We are currently working on the second phase of work, consisting in deepening the management of local situations, particularly on the basis of an analysis of existing technology in order to check its actual effectiveness. You will see in the report that because of their chemical specificities, prions are more present in the organic material in sludge than in water. Separation techniques can therefore be used. There is also a discussion about destruction. I cannot tell you what is the infecting dose or the effectiveness of treatment. Current knowledge does not extend that far. The report stresses the need to locally analyse the installations exposed to risk by examining the procedures and tracking the pipes. All the data must be grouped nationally in order to identify the most difficult points.

Concretely, some water production installations located downstream from risky sites, particularly rendering facilities, have been stopped for the sake of safety.

Water, health and economics: research by the National Institute for Agronomical Research (INRA)

Anne STENGER
Researcher in economics at the National Institute for Agronomical Research

While they play no part in the technical analysis of risks, economists must take account of the results of the technical side of research to throw light on the subsequent process: the taking into account of the risk by the players, the economic issues of risk management and the preparation of government policy.

I. The National Institute for Agronomical Research

The question of risk is present explicitly or implicitly in all the research subjects of the Institute for Agronomical Research, particularly in social sciences and economics. Water, economics and risk belong to the priority research fields of the Institute and raise questions relating to policies for the economic regulation of pollution risks, within the context of agricultural production on the one hand and from the standpoint of consumers and citizens, who are more concerned about health issues, on the other.

The aim of the Institute is to conduct publicly funded research to make up centres of excellence that lie at the intersection of the following fields: food, agriculture, environment and planning. The environmental and health risk is a major challenge for the Institute. It has led researchers to identify operational recommendations relating to sustainable practices for agricultural production and the management of resources and environments.

II. Background

The issues relating to water, risk and the economy are principally related to changing social demands, i.e. the requirements of consumers in respect of food safety and the right to know.

The subject of risk assessment is present on practically all the levels, in terms of the economic risk or the health risk. In the second case, the aim is prevention, by protecting the resources and identifying the factors that determine the behaviour of consumers.

Risk analysis and management exist as objects of research applied to food issues, regarding the perception of risks or the management of actual risks. The research must make it possible to prepare public policy.

The report of the scientific activity of the National Institute for Agronomical Research in 2000 shows that risks are approached in terms of food and health, for instance with the development of a method for estimating the demand for drinking water, by developing tools to analyse risk in irrigation decisions or by preparing a framework for analysing samples to determine the quality of underground water.

The subject of risk is explicit in the quantitative and qualitative management of water, for instance in respect of the assessment of the potential benefit of improving the quality of water. Such benefit assessment can apply to different uses of water, each of which requires certain quality standards.

Risk can also be approached from the point of view of the value of water as a non-marketable good. For instance, it could involve estimating the value of the conservation of an aquifer.

Risk also appears in the search for economic instruments and the management of the quality of water. If the quality is harmed by any production activity, there would be a difference between the social optimum and the producer's optimum. In this case, the risk must be reduced by giving the producer incentive to reorient the production methods, by making grants dependent on environmental policy, taxing inputs, reducing production inefficiency etc.

The study of water, risks and the economy leads to addressing the issues before consumption as well as after, for potentially exposed individuals. That means that special stress is laid on the use of water and the perception of the risk by consumers. In this case, the context is one of a cost/benefit or risk/benefit analysis, the aim being to assess the net benefit to be derived from a policy.

The health risk is assessed in terms of costs (loss of income, medical expenditure) or in terms of the willingness of the society to pay to reduce the risk.

While assessing the benefit of conserving or improving the water resources, two aspects must be taken into account:
? The quality of water is to be considered relative to its use;
? The perception of quality and risk depends on the users.

Even if there were objective quality criteria, the benefits depend chiefly on the perception of users. Uses may be direct or indirect.

III. Methods

The assessment of the benefits of conserving or improving water resources depends on (a) the variables of the condition (quantitative and qualitative variables at a given time) and (b) the variation in the characteristics over time. The level and change of the characteristics depend largely on the policy that is to be put in place.

Conservation policies include all the action taken to ensure that none of the values is degraded, both in terms of incoming flows and in terms of outgoing flows. The analysis and identification of the factors that make it possible to maintain the characteristics is the business of disciplines other than economics.

The move from one level of value to another implies a variation in the services provided by the water to its users. That variation of services can be appreciated financially with appropriate methods, by taking account of the type of use and the benefit. The choice of the assessment method depends on the nature of the effect on welfare and the environment. The different estimation techniques are differentiated on the basis of whether or not the variation in the behaviour of consumers can be taken into account. These techniques can be more or less direct.

IV. Conclusion

Assessments have been conducted by the Institute, e.g. in respect of the values of conserving the quality of underground water or the assessment of the potential recreational benefit to be derived from improving the quality of coastal water in Brest harbour. We have also prepared programmes to measure the willingness to pay for quality drinking water.

These assessments prove the existence of economic and financial stakes. However, keep in mind the fact that the context is not always risky. Sometimes, it is uncertain or ambiguous. Risk is not easy to grasp and uncertainty can surround the supply and demand for water alike.

Economists cannot say whether there is a risk, but can say if the consumers perceive a risk. Economists can then try to determine the difference between the perceived risk and the actual risk if there is one. If the difference is great, care must be taken to improve communication and information, in order to obtain more reliable monetary evaluations.

The Union of Plant Protection Industries – missions, risk management and action

Jean-Claude TOURNAYRE
Union of Plant Protection Industries

On behalf of the Union, I would like to thank the Water Agency for giving our Union an opportunity to express its views.

I. The Union of Plant Protection Industries

The Union of Plant Protection Industries (UIPP) is a federation of some thirty companies serving the plant-protective substance market in France. The turnover of the companies in France dropped from FF. 13 to 14 thousand million in recent years to FF. 12 thousand million last year. Research & Development account for 10 to 12% of the turnover of the companies, which employ about 5800 people in France.

The task of these companies is to discover, develop and introduce plant-protective products for integrated and sustainable farming. UIPP does not produce any research before the process, but acts as an interface with the relevant authorities and the farming industry.

II. The assessment of the risks of plant-protective products

This approach is part of the plant-protective product approval process, in accordance with the European procedures and directive 91-414. In particular, it is applied on three levels.

1. Appliers

Calculations are used to assess the risks taken by the person who applies the product. Patches and air quality control systems are used in the field by the farmers participating in the research. Those who handle the products and the workers in the manufacturing factories are also monitored. The impact of toxico-vigilance can be seen in our companies.

2. Consumers

Studies are conducted to assess the risk of both the acute toxicity and the chronic toxicity, by means of systems defined by international health authorities and by the recording authorities of all major world regions. The studies are used to establish values such as the No Observed Adverse Effect Level (NOAEL) for the most sensitive animal. Safety factors are then applied to transpose it to humans in order to determine the Acceptable Daily Dose (ADD). Before the products are released in the market, residue studies are conducted to determine the level of residues found in untreated food products and calculate the chronic daily ingestion and identify the risk if any.

3. Environment

We produce environmental studies based on international protocols. They relate to the fauna, flora, soil respiration and atmosphere. We also assess the risk of the products being transferred to underground and surface water, with the help of models that make it possible to approximate the risk and assess the physical reality of a hazard. The studies are based on "foreseeable concentrations in the environment". They make it possible to define the eco-toxicological risks related to the product in question.

In addition, we conduct studies of the traceability of the products in the natural environment. Work done in open fields, with studies of catchment areas, is used to confirm the results obtained in the laboratory.

As regards traceability throughout the food chain, we monitor food treated with the products. Such inspections may be carried out by UIPP, and also by the authorities (Consumer Protection and Fraud Authority and regional plant-protective agencies).

Studies were also initiated in the field of epidemiology three or four years ago. These studies are lengthy and relatively difficult to interpret. They ought to be completed this year or in the course of next year.

III. The channels of communication between UIPP and the farming industry

FARRE is the acronym of the French forum for environmentally responsible integrated agriculture. Its chief aim is to spread the principles of integrated farming. Much work has been done in the field, but the results are not yet shared by all. However, real progress is being made continuously every day, and we are coming closer to establishing recommendations for integrated agriculture.

FARRE includes very diverse organisations, such as UIPP, ANIA (the national agribusiness industries) and also Auchan, Carrefour, Casino, Danone, Gerblé, Asnia and Sigma. Today, FARRE is developing its activities in 57 departments or regions, which gives it a strong basis. The recommendations of the FARRE network are now being followed in at least 200 farms.

A report on *Environment and Health* was published about a year ago. It includes 35 voluntary measures taken by the member companies of UIPP independently from the approval procedure, that is measures that extend beyond the normal indications. These 35 measures have been selected by a steering committee. They include the rehabilitation of field boundaries, studies about grass-covered systems or ISO 14001 plants of members of UIPP.

We also address the issues of empty containers of plant-protective products and unused (obsolete) plant-protective products, which can unfortunately still be found in some regions. Discussions were held with the relevant authorities and a durable system is being put in place to destroy the empty containers. The association Pic Agri, the members and funding of which have been defined, works to support the initiatives taken to collect and destroy these containers. A system will also be put in place to collect and destroy obsolete plant-protective products.

Some companies are committed to the creation of a CD-ROM about good agricultural practices, storage and the development of all the activities and recommendations issued to date by CORPEN (inter-departmental multidisciplinary group). The group has published a booklet about the best conditions of use of products in order to keep them from entering water resources.

Our companies are also implementing measures with the farming industry, farmers, retailers, agricultural advisers, the French association for plant protection, regional plant-protection agencies etc.

Within UIPP, industry workgroups have been set up to address the issue of residues in food, through the production of goods such as wine, beer, biscuits etc. I, for instance, lead a workgroup on water, soil and air.

Information brochures are available for all readers. They address research as a source of innovation, the approval of plant-protective products, consumers' health, the safety of farmers, plant protection and the quality of water, environmental safety and also environment and health.

You can obtain these documents from UIPP, which is based in Boulogne-Billancourt. Alternatively, you can visit our website.

The products have been studied for several years. In that respect, I am not completely in agreement with the point of view expressed this morning by Professor Pelt, who has limited his studies to only a few years. Today, it takes 10 to 12 years to release a product in the market. That time is used to study the products seriously, not only the active material, but also the products of degradation, the metabolites. Of course, we do not have the answers to all questions. But our companies are doing what is possible today with the most advanced scientific knowledge. We are gradually including new knowledge, in order to achieve ever greater product safety.

The banking risk

Daniel HEDOUIN
Public Authority Risk Manager, National Office of Crédit Agricole

While the banking risk may seem far removed from environmental and health risks, it does have things in common with them in some respects.

Crédit Agricole is made up of 49 regional offices. These are independent mutualist banks, which are shareholders of the national office. Each regional office is closely involved in the economy of its region in all regards, environment included, on a number of levels. The regional offices are local players, and also lenders. Furthermore, the individual members are inhabitants of the region. Some of them may even be local elected officials. That is why Crédit Agricole has to be concerned about the environment, including the quality of water.

For several years now, most environmental investment is made by local authorities. Such investment accounts for about 20% of the infrastructure budget of those authorities. Water in the wider sense accounts for investment equal to approximately € 4.5 thousand million, i.e. FF. 30 thousand million. Because Crédit Agricole is a major source of funding of local authorities, it plays a part in these public or private investment schemes.

Crédit Agricole contributes to the funding of installations aimed ultimately at ensuring the quality of water. The installations may affect the distribution or sewage system, but their aim is always the same – providing quality water at the end of the process and maintaining the quality of the environment, including collection systems, separating systems, water treatment plants, storm and settlement tanks, sludge storage etc.

Unfortunately, environment investment is part of the overall investment of local authorities and is not always easy to separate from the rest. For instance, the renovation of the wastewater collection system may not necessarily appear as such – it is part of the overall need. Because we generally fund the overall needs of local communities, we cannot always identify environmental investment. However, we attach much importance to such investment, which is one of the largest items after public highways.

That is why we endeavour to individualise environmental investment and study it as such, i.e. verify its technical, economic and financial viability. We also verify the involvement of partners, who must be able to face unforeseeable events, and the strength of the local authority. We try to avoid disproportionate investment, which is desirable neither for the authority nor for the taxpayers, nor even for the banker.

We check if the regulations are complied with, if the installation and the effluent meet standards and if the project has the necessary authorisations. The entire project must comply with all applicable regulations. A bank cannot go further without interfering in the management of a company or local authority.

These requirements do not meet a legal safety requirement on our part, but relate to responsibility and citizenship. All these elements are integrated into the appreciation of the project.

The banking risk is the possibility of having a borrower who is unable to pay back the amounts due when they are due. A banker buys money, sells it on and makes a profit margin between the two. We must therefore make sure that the entire project is viable and that it will cover funding over time when operated normally. These projects are amortised over a period of 12 to 20 years, sometimes more.

We have published a guide for the regional offices in order to detail the various verifications required for such investments.

1. Technical viability

A union of 250 municipalities came to us with a waste treatment project based on the use of a new technique, which has only been tried out in Russia and Nigeria. That led to a few interrogations, as we make sure that the techniques are recognised and controlled and that the expertise required to implement them is indeed available.

In particular, we make sure that the capacity meets the needs and that the location is appropriate. Also, we take interest in the expected outlet for the products or by-products. We also find out if a communication campaign has been conducted so that everybody understands the project. Lastly, we ask if the water agency has examined the project or not and if it has approved it. If that is not so, we are less willing to contribute to funding the project.

2. Economic viability

This includes determining whether the investment and operating costs are reasonable and if they are correctly covered. Delays must also be avoided, as they can upset a funding plan completely.

We also look at the grants given to the project and any possible market for the by-products.

Lastly, we look at the long-term forecasts in order to find out if the project is viable and we see if the funding plan meets the actual needs.

The procedure is specific to investments in the field of the environment. That is because it is desirable for such projects to bring together the various partners as early as possible, in order to minimise difficulties. All the aspects must be approached from the start. That is essential, because if any problems or interruptions due to administrative or legal action were to occur, the equipment would not operate as planned initially and that could lead to problems.

As regards water, we turn to the water agencies. In general, when a water agency is involved, that means that it has analysed the investment and approved it. For us, that approval is a positive element. All these considerations enable us to decide if we wish to take part in the funding of such investments.

We do not only finance local authorities or parties appointed by them. We also help fund water treatment projects by companies, which have made considerable progress in the course of the last twenty years. The investment is therefore not as large as it was in the past. Today, 3% of corporate investment is estimated to be devoted to wastewater treatment. Today, the projects relate more to changes in procedures and water saving measures.

We also fund projects of farmers. In particular, we will take part in the implementation of PNPEA projects in the coming years.

Our funding action is not limited to conventional credit. For instance, a group of municipalities submitted a project worth FF. 13 million, based on a well-controlled process for the subsidiary of a major corporate group. The project included a plan to use the output sludge and its price was reasonable (15% increase in the price of water). The operating plan seemed viable and we granted credit in the amount of FF. 13 million. Besides, we sometimes fund plans in other forms, for instance with Sofergie leasing schemes. These involve three-party agreements, say between Sofergie, the water agency and the operator. From the tax standpoint, that makes it possible to minimise cost. These original financing projects are well suited to agriculture. Among other things, they make is possible to spread the load of operating over time.

Project analysis by Crédit Agricole is aimed at protecting the bank and making sure that it gets its money back as planned. But ultimately, the attention paid to the investment is useful to all. It keeps failure at bay and provides benefits to local authorities and consumers as well.

The voluntary risk assessment measures taken by the European chemicals industry

Professor André LECLOUX
Scientific Director, Euro Chlor

I would like to start off by thanking the organisers for giving the chemicals industry an opportunity to state its views at this forum.

I. Role and missions of the European Chemical Industry Council (CEFIC) and Euro Chlor

CEFIC includes 22 national federations, plus 100 industry associations and 41 large industrial corporations. Consequently, the council represents 40,000 companies in 22 European countries, 2 million jobs and 30% of the world's chemicals production.

The essential mission of CEFIC is to make the European chemicals industry more competitive in accordance with the rules of free enterprise and fair trade and the principles of commitment to Responsible Care to contribute to sustainable development.

CEFIC is also responsible for supplying the chemicals companies present in Europe with an organisation for discussing supranational issues and defining common positions. It is also the spokesman for the industry on the international level. Lastly, it can undertake scientific studies on behalf of the industry.

Euro Chlor is a European association of manufacturers of chlorine and derivate products and affiliate of CEFIC. Surprisingly enough, the word "chlorine" has not yet been uttered this morning, in what is a conference on water. The only exception was the historian, who explained that that was the solution. I will be the second person to speak of chlorine, despite its negative image. Euro Chlor includes 42 companies, 82 industrial facilities and 39,000 direct jobs in 19 European countries. Euro Chlor represents 98% of the European production of chlorine.

I would like to remind you that chlorine is involved in the synthesis of 55 to 60% of chemicals and plastics. 98% of the drinking water in Europe is disinfected with chlorine. 85% of drugs and 95% of plant-productive products are synthesised with the help of chlorine chemistry. Chlorine is therefore a key element in the welfare of people and not just the "devil's element" as it has been called sometimes.

The missions of Euro Chlor are:

? to ensure the sustainable development of the industry of chlorine and chlorine derivatives;

? to promote the best techniques available in order to ensure safety and protect the environment and health;

? to promote dialogue, a scientific approach and a constructive attitude in respect of all questions relating to chlorine and its derivatives;

? to promote the positive contribution of chlorine chemicals to the quality of life and welfare.

II. Voluntary measures to protect the environment and human health

1. Responsible care

This programme consists in improving health, safety and environmental performance by means of dialogue with all the stakeholders, publishing performance reports, voluntary action relating to some products, sharing experience – for example with Central and Eastern European countries – and reducing energy consumption.

2. Responsible management of chemicals

This aspect is aimed at informing all the stakeholders of the hazards and risks relating to the use of chemicals by publishing the toxicology data of the substances produced in quantities of more than 1000 tonnes per year (the high production volume initiative) across the world. The work is shared with our colleagues in North America and Japan. We also take part in promoting scientific risk assessment by targeting some specific fields.

3. Long-term research

We want to promote research and gain a better understanding of the possible interaction between chemicals and the human body, animals and the environment.

We work on new toxic effects such as neurotoxicity, immunotoxicty and endocrine effects. We study the levels of exposure and develop methods to asses risks.

Every year, we spend € 5 million on these studies. We are committed to publishing the results, however adverse they may be.

4. Examples of risk assessment and discharge reduction

Risk assessment chiefly consists in comparing the level of exposure at which no toxic effect is observed. After that, the predicted no effect concentration (PNEC) is determined by means of toxicology testing in definite conditions, and the predicted environmental concentration (PEC) is determined by measurements and modelling. After that, the ratio between the two values is calculated.

Euro Chlor has voluntarily decided to assess the risks for the aquatic environment presented by more than twenty organic chlorinated products and mercury. We have applied the toxicological approach using the methodology recommended by the European Union to define the no effect values.

For the degree of exposure, we have elected to use the concentrations measured and collected an impressive number of values measured in the environment. We then conducted statistics studies on water and sediments. These evaluations are available for all organic chlorinated substances currently included in the priority list of a European directive. They have been submitted to the commission.

In that way, we have measured the concentration of products in 6 European countries. The results obtained show that the concentrations of exposure to dichloroethane, chloroform, trichlorobenzene and hexachlorobenzene (necessary by-product of chlorine chemicals) are much lower than the no effect values. As regards the last product, which is heavier, we have also measured its concentration in sediments. By applying the technique defined by the European Union, we found that the values are still a bit too high in some sites, but it must be remembered that the non effect value already contains safety factors.

Besides, we have carried out time trend studies from statistical studies of the variation of the concentrations seen over time. The studies show a significant decrease in most chlorine products and mercury in surface water. For example, the mercury concentration in UK rivers dropped clearly from 1974 to 1994. The same goes for lindane, a chlorine product that has been used as a pesticide for many years. The pentachlorophenol concentration is also decreasing significantly in Germany. Lastly, the concentration of PCBs in the rivers of Great Britain was constant up to 1987 and then dropped sharply. That shows that PCBs, which were supposed to persist fully in the environment, were in fact destroyed relatively rapidly.

Lastly, Euro Chlor has taken the initiative of measuring the level of discharge of fifteen organic chlorine products in over 80 industrial facilities of its members from 1985 to 1997. In all the cases, the discharge was divided by four or even six in the same period. This is significant progress, which must be stressed. As regards the discharge into water, we have shown all the values, however imprecise. Variations can be seen as a result of the production but also changes in the type of production carried out by the companies.

III. Wishes and objectives

Statistical analyses of the concentrations measured in the environment make it possible to assess the level of exposure more reliably than models. Given that, most organic chlorine substances are no longer a threat for the aquatic environment.

Following the voluntary efforts of industry, the level of organic chlorine substances discharged has dropped sharply in the course of the last fifteen years. That has been accompanied by a drop in the concentration of the substances in the aquatic environment and the disappearance of associated risks.

The chemicals industry wishes to be considered as a constructive partner and not as a potential enemy, particularly when it comes to the mutual exchange of information with the authorities, e.g. results of water monitoring studies and values. I spend a lot of time trying to obtain information about the values measured in water. I have obtained some data in France, but it can be more difficult in other places. Just like consumers, industry has the right to know the measured values.

The chemicals industry would also like to be considered as a partner in the preparation of measures that make more technical and business sense that “zero values”, which may be politically correct but can never be achieved.

I would like to draw your attention to the need to make choices. We cannot address all the problems at once, and we must set our priorities.

Lastly, the chemicals industry would like the progress achieved through its voluntary measures to be recognised, along with the major contribution of chemicals to community welfare. Just think of all the objects around us, and try to estimate the number of chemicals that have brought all the well being we enjoy today!

We would like to collaborate in the scientific assessment of risks and therefore the choice of appropriate measures. Lastly, we would like environment problems to be treated rationally. They must not be used for emotional politicking.

The German point of view

Professor Martin EXNER
Public Health Institute (Bonn, Germany)

Thank you very much for inviting me to this conference. In a united Europe, it is important to find out more about the strategies used in other countries to prevent and control problems relating to health and the environment.

I would also like to stress the key role played by Lorraine in making European thought move forward.

I. A few historic facts

I must begin by referring to two eminent experts in the field, namely Johan Peter Franck and Robert Koch. Johan Peter Franck was the founder of new public health in Germany. He studied in Metz and Pont-à-Mousson in 1861. He was also very much influenced by philosophers such as Diderot and Rousseau. His work chiefly related to the risk of infection through water. As for Robert Koch, he studied cholera epidemics. In 1892, a there was a major outbreak of cholera in Hamburg. It so happened that the city of Hamburg did not filter its water. At the same time, other cities around Hamburg were spared from the disease because their drinking water was filtered. On the basis of that observation, Koch recommended the installation of control systems and draining before the city. Consequently, child mortality, which had reached record levels in 1892 in Hamburg, began to decline after that date, i.e. after the city decided to filter its water supply. In 1902, Robert Koch suggested to the city of Metz that it test its water from the bacteriological standpoint twice a week. That suggestion of prevention and inspection of drinking water drew on the principles of German philosophy.

II. Current regulations

Today, we have to face a great public health challenge while distributing water. Our water resources are threatened by contamination by microbes and salmonella. In buildings and hospitals, the water is heated and we do not know if it is safe. Consequently, we have to face serious problems due to micro-organisms. We must therefore define standards in order to determine how to distribute quality water. Our objective is certainly to enable the distribution of water in sufficient quantity to the appropriate quality standards. Given that aim, we must adopt a policy of prevention and subject the water to strategic testing. Prevention refers to all the measures that we must implement in order to ensure that we distribute water in sufficient quantity and quality. Testing refers to the study of the risk of disease. Besides, if there is a risk, testing make it possible to put in place an effective policy to manage the risk.

Our prevention strategy begins with testing the water quality at its source and continues with water treatment. We must therefore check our water and decide whether or not it needs to be disinfected. That last question is currently the subject of a highly controversial debate in Germany. The question

is whether or not we should be adding chlorine to our water. The current trend is to stop adding chlorine. However, there have been some important changes and we cannot but recognise that the opinion on the issue is more conflicting today.

A study is currently under way in Germany. It relates to the definition of reference indicators and its aim is to determine standard methods. It is imperative that we put in place a surveillance system. Today, there is no surveillance authority in Germany. In my view, that absence of a surveillance system is very harmful. I believe that the best surveillance system existing today is that applicable England and Wales. In those countries, the data relating to the water parameters are very accurate.

New drinking water regulations will come in effect in Germany in 2003. The regulations include general recommendations and also microbiological and chemical recommendations. In terms of microbiology, the recommendations provide that the water must contain no micro-organism that is likely to be harmful to the health of consumers. In the USA, it is usually acceptable for disease to occur in one out of 10,000 consumers. In Germany, such a risk is not accepted. We want our consumers to run no risk. Besides, the recommendations contained in the new regulations relate to bacteria and also the presence of legionnella. The other necessity is that of informing consumers of the risks to which they may be exposed. The consumers must be given all the information required about the quality of water. They must also be kept informed of any problems that may arise in the field of water.

III. Present and future challenges

As a health professional, I would like to stress that we must take up the challenge of implementing HACCP as recommended by the WHO. Special attention must be paid to the situations with a high risk. We have had to recognise that parasites are not growing in the system and that in fact, they are present in the source water. As a result, the catchment must be of the best possible quality. What is more, it is imperative to obtain the best possible quality of water even before starting chlorination.

In Germany today, we have to face a special environmental problem. Many people collect rain water to wash clothes and clean their house. Now, rainwater is extremely likely to be contaminated, particularly by salmonella. Other difficulties can arise due to biofilms and opportunistic pathogen agents that can be found in hospitals. Such problems have also been encountered in France, particularly in the new Georges Pompidou hospital. However, we have found that you only have to add a sufficient dose of chlorine to eliminate the problem for several months. For the time being, we have no other solution for treating water in hospitals. Two tragic cases occurred last year. Two patients were contaminated by waterborne bacteria. Unfortunately, both of them died after a two-day stay in intensive care.

In hospitals, filters must be replaced every five days, but each filter costs DM 30. Given the number of filters in our hospitals, you can image the cost implications of such a measure for the operating budgets of hospitals.

Today, the surveillance of waterborne diseases in Germany is a disaster. Our system must necessarily be reinforced. Also, consumers must be better informed. We have found that incidents

occur more frequently after heavy rainfall and storms. Recently, after a spate of such weather, 2000 people were contaminated with E. coli 0157 and 10 them died as a result.

In future, the WHO guidelines will have to be implemented on a holistic basis. It is imperative to guarantee process quality. It is also essential to have an effective surveillance authority. In that way, consumers will be convinced of the fact that everything is being done to protect their health. At the same time, we must also know how to respond to chemical risks. However, I am convinced that the perception of risk has now become more rational.

Discussion with the audience

Serge RAMON, Rhine-Meuse Water Agency

Mr Hedouin, Crédit Agricole is often blamed for playing an active part in promoting intensive farming in France, by giving farmers loans. You say you support selected projects of farmers. I have noticed that while granting loans, you take account of the technical feasibility and financial solidity of the project.

Intensive agriculture leads to growth in productivity, and therefore meets your criteria very well. I suppose farmers have no trouble obtaining loans. Do you intend to take account of environmental considerations that are likely to have an effect on the sustainability of farming in the short term?

Daniel HEDOUIN

The model I described earlier mainly applies to local authorities. Environmental criteria are already integrated in our appreciation of companies. As I have never handled farmers' applications, I am unable to answer your question. I would just like to point out that I personally do not agree with your allegation that Crédit Agricole funds intensive farming. We did what the institutions and other partners did. For thirty years, we funded what was thought to be leading edge farming technology and techniques. Today, everybody agrees that that model has reached its limits, both for society and farmers.

Lastly, I would like to add in response to your question, that environmental factors are taken into account in the loan attribution criteria. For over three years, we have been offering maximum assistance to farmers who are changing over to integrated or organic farming. You could rightly reply that we are going to fund "fashionable" agriculture. And I would say you are right, because it is the form of agriculture that is thought to be the most relevant by the society today. Crédit Agricole has been effective in the last thirty years, because it has contributed to the development of productive farming.

Fabien POTIER, Rhine-Meuse Water Agency

Mr Tournayre, you tell us that UIPP was present in different actions such as phytomieux or FARRE. FARRE promotes integrated agriculture. In my opinion, there are several definitions of integrated agriculture, ranging from a token form to agriculture that truly offers wholesome products to consumers. I have had the opportunity of visiting several farms with the FARRE certificate in Champagne-Ardennes, and I have come to the conclusion that FARRE has simply renamed intensive agriculture into integrated agriculture. What is your opinion about this? Besides, have you measured the impact of water on integrated agriculture as defined by FARRE?

Jean-Claude TOURNAYRE

The agriculture recommended by FARRE is the one we support. It would seem that not all FARRE farms implement integrated agriculture correctly. FARRE began work some ten years ago. The needs at the time were not the same as those we have today.

Admittedly, the situation must be improved in some farms. FARRE is trying to promote the establishment of elements of simplification, in order to help farmers achieve the objectives of integrated agriculture. Integrated agriculture can represent all the recommendations published in the documents of CORPEN. Today, the situation is not ideal, except in some places. On the other hand, after three years of fairly strict monitoring of the recommendations published, surface water in the relevant catchment areas is almost compliant with requirements or even compliant over an entire year. The value of 0.1 microgram per litre allocated to drinking water and underground water was exceeded only in a few cases. This is therefore a major triumph.

Naturally, the implementation of the recommendations requires investment that largely exceeds the ability of plant-protective product manufacturers. Also, it involves the entire farming industry, or even the planning and development of rural areas. Lastly, they require the choice of appropriate products.

It is important to put events into perspective. If current efforts bear fruit, the results could be obtained in three years, and be fairly widespread over the national territory.

Jacques DEVÈZE, Defence official with the Ministry of Planning and Development

I would like to take advantage of the presence of friends from other countries to ask them how they handle a particular form of risk that was only referred to once, namely the risk of environmental blackmail threatening human health. Such acts have taken place in Eastern Europe in recent months. Do other countries have measures to prevent voluntary “terrorist” contaminations of drinking water?

Martin EXNER

At the present time, the risk of such contamination is not addressed in Germany. We know that such assessments are done in the USA. Of course, we know that such risks remain possible. For instance, we saw during the Gulf War that bacteria could be added voluntarily to water pipes. Contaminations by terrorists would obviously be a catastrophe. But for the present, we have no means of monitoring such risks. Today, our risk assessment only takes account of the most frequently encountered risks.

François BARTHÉLÉMY

As there is no other question, I would like to thank you for your participation and close this session.

Prepared by Hors Ligne on the basis of recordings made during the sessions.