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**SAFE DRINKING WATER FOR EVERYONE: BALANCING
THE RISKS **
(Miami Beach, Florida)**

Everyone here must at some time have read or heard Coleridge's Rhyme of the Ancient Mariner and will remember the verse

Water, water everywhere
...And all the boards did shrink
Water, water everywhere
...Nor any drop to drink

For his crime in killing the albatross, the ancient mariner was condemned to bemoan the lack of safe drinking water as he lay becalmed and looked at the wide expanse of an unfriendly sea. There is no about his fate without access to safe drinking water, as water is second only to oxygen in importance for sustaining life. Coleridge may or may not have been aware that of the 1.5 million square kilometers of water on earth, 97% is in the oceans and seas and only 0.12% is potentially drinkable. It is this potentially drinkable water that concerns us and I must congratulate ILSI for bringing the matter before us again.

As I read the excellent publication from the previous meeting held six years ago, I wondered what new facts or orientations could emerge, and what I who am not by any means an expert in this field could contribute. I concluded that the value of this meeting lay not only in the new data that will be unveiled but that it represented a forum for drawing attention to the availability of safe drinking water for everyone. There is still need for vigorous advocacy about the nature of the problem in large parts of our world and the possible solutions. Thus my focus will be more general, will not deal with the minutiae of the various methods of disinfection and will be certainly influenced by the experience of the Pan American Health Organization and some of the basic values and principles that guide our Organization.

I cannot address the issue of water safety or the safety of water disinfection without first looking at the wider picture of the availability of water, what our countries

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need to provide this resource and the effects of not having it in quality or quantity. For the majority of the world's people the issue is more the availability of potable water that has been disinfected by the most basic methods, rather than a concern about the relative risks that are attributable to one or other method of disinfection.

Various experts opine that about one fifth of the world's population does not have access safe potable water. One study that identified the water and water demand situation of the largest 118 countries of the world revealed some striking and even frightening data. The study did not deal with water quality, but with total water availability and divided the countries into two broad groups. In one group they were 377 million people projected to be in absolute scarcity by the year 2025. If one so structured the data to include the arid parts of China and India, then something over one billion people were projected to be in the group with absolute water scarcity. This implies that they would not have water to meet the basic needs of their projected populations, and choices would have to be made as to whether to reduce water for irrigation purposes or find additional new and certainly expensive sources of water for domestic and industrial use. The other group of countries was relatively well off although there needed to be continued development of water sources to meet projected population increases.

Although I am always reluctant to accept the Malthusian type projections with their apocalyptic scenarios, yet the prospect of a billion or more persons with such shortage of a basic resource calls up the possibilities of major social dislocation and confrontations. Safe water for these populations will not be a matter of scientific inquiry, it will be a matter of survival for which they will struggle with every means at their disposal.

When we speak of safe water and water shortages in these countries we usually address only superficially the potential impact on the daily lives and work of the populations. However, I do see much written about the fact that the majority, if not all those who draw the water, are women who add this to their many other domestic chores. They are also the ones who are charged with looking after the children or others who fall ill because of the lack of safe water.

The actual and potential depletion of ground water is a problem of huge proportions and it results in a way from the technological success in drawing down the fresh water aquifers. In parallel and partly as a consequence, there is an intrusion of surface waters such that aquifers are polluted and no longer suitable for extraction.

In considering the mechanisms for arriving at policies for providing safe water, it is inevitable that the economics of water use will enter the discussion, as well as the need to consider water as an economic good in the sense that it has a value for which consumers will pay. Particularly in developing countries there is a disproportionate benefit to the rich in that they enjoy the use of subsidized water especially in the urban areas. Our own experience is that the marginalized urban poor who are often not connected to public systems pay inordinately high prices for the water they consume. The cost to the rural poor is high both in money terms as well as in terms of the time and

energy consumed in ferrying water for domestic use long distances. There is great need for investment in producing safe water, but apparently the resources for this purpose are diminishing. One report from the World Bank showed that funding for water and sanitation actually declined during the second half of the Water Decade which was from 1981 to 1990. The economic situation of many of the countries that need water most is not such as to make us hopeful that there will be significant increases in investment in this sector.

Because of my position and orientation, I am naturally interested in the relation between water and health and disease. I like the classification of the principal water related diseases into those that are water-borne, those that are water-washed and those that are water-based. The first is the commonest and includes diseases such as cholera and typhoid. The second group relates mainly to the occurrence of disease when there is not enough water for basic hygiene and will include some of the infant diarrheas and some skin diseases. The third group includes those caused by pathogens that have their intermediate hosts in water. Schistosomiasis is such a disease. Global Water –a watchdog international group- affirmed “the lack of safe drinking water is the primary cause of disease in the world today. Every day thousands of people die from causes directly related to contaminated water. And for those who survive, without good health there is little chance for a normal and productive life”. The World Bank estimated that close to one billion cases of diarrhea occur every year in the world. In our Region of the Americas 5.3% of reported deaths in children under the age of 5 years are due to diarrheal diseases which are almost certainly caused by lack of safe clean water.

It was the occurrence of cholera in epidemic form here in the Americas in 1991 that brought the problem of unsafe water sharply to the fore. The epidemic has subsided and the tendency is to forget that cholera still exists in endemic form in many of our countries as an indictment of our systems of water and sanitation. Contaminated foods represent the main vehicle for transmission of the vibrio. PAHO and UNICEF are currently engaged in a major effort to assist countries of the Central American isthmus to eliminate cholera through programs of education, provision of safe water and basic sanitation.

The Environmental Protection Agency still says that microbial contaminants and the byproducts of disinfection represent the highest potential drinking water risks to human health in this country. President Clinton, when he signed the Safe Drinking Water Act Amendment of 1996, said: “Today we helped to ensure that every family in America will have safe clean water to drink every time they turn on a faucet or stop at a public water fountain. From now on our water will be safer and our country will be healthier for it”. While the balance of concern in the developing countries is towards the problems that may be caused by the pathogenic microorganisms, the developed countries concern themselves with both the removal of the pathogenic microorganisms as well as with the side effects or consequences of the methods used for disinfection. The EPA, in its analysis of the major themes to be addressed in seeking to fulfil President Clinton’s implied promise, point out the emphasis on “risk-based priority setting”. This will imply

an approach of decision to act based on an analysis of the risk of their being an adverse health effect of the possible contaminants in the water.

I have been fascinated to read of the studies of the risk associated with chlorination—a line of research that is only about 25 years old, although chlorine has been in use for water disinfection for close to 100 years, and has been responsible for the virtual elimination of typhoid and cholera from North America. My understanding of the research is that it shows that chlorine disinfection byproducts are potentially mutagenic especially when the chlorination is of untreated surface water. Although there is only a potentially causal relationship between some cancers and the presence of chlorine breakdown products, there is enough of a risk to spur a search for options that do not involve the use of chlorine, and when chlorine is used, to establish the maximum safe content level of some of the breakdown products.

This represents an excellent example of the relative importance of risks in approaching water disinfection. Chlorine is the mainstay of water disinfection in the world, and the risks of becoming ill from water-borne pathogens in undisinfected surface water are substantially greater than any that may occur from the breakdown products of chlorine. It is only when the treatment and supply characteristics of the water supply system are so good that they protect against water-borne diseases that we should begin to be concerned about the remote risks derived from the chemical breakdown products of chlorine. Attempts to reduce these products are still a luxury that most of the developing world cannot afford.

There is always concern on my part that our officials will be so caught up with these chemical byproducts of chlorine interaction and fascinated by technology to measure and perhaps reduce them that they forget that the principal approaches have to be those found to be valuable over decades. There is still a long way to go in ensuring that the drinking water in the majority of our countries is so filtered or otherwise treated by physical measures to remove particulate matter, and disinfected with sufficient chlorine that there is minimal risk of transmission of pathogens that can cause disease. There is suspicion that the outbreak of cholera in Peru in 1991 may have been due in part to the fact that there was such concern with the breakdown products of chlorine that the local water supplies were under-chlorinated. The control of gastrointestinal diseases, the most dreaded being cholera after disasters that resulted from El Niño and hurricanes Mitch and George, was based in large part, at least in the areas in which there was no regular supply system or the system was broken on the distribution of chlorine tablets or hypochlorite solution to households with instructions on how to filter and chlorinate the drinking water. PAHO is placing considerable emphasis on the local production and distribution of chlorine.

But although our first and most important concern has to be with reduction of the risks of water-borne diseases, there are chemical contaminants of drinking water that are of importance in some developing countries. During the course of the conference you will probably hear of the problem of contamination of drinking water by arsenic that constitutes a significant problem in Bangladesh and neighboring countries. The problem

arises from the use of water from wells and the need for an appropriate and inexpensive technology to remove it. Because the problem exists to a lesser extent in some of the countries of our Region, the Pan American Center for Sanitary Engineering and Environmental Sciences in Lima, Peru has devoted considerable effort to developing a flocculation method for reducing the content of arsenic in well water to levels within the accepted range.

The question still remains as to when drinking water can be deemed safe for everyone. Theoretically this should mean that it is free from every agent that is actually or potentially harmful. This clearly is an impossible standard. The WHO Guidelines for Drinking Water Quality represent the gold standard and as they say, they are intended to be “used as a basis for the development of national standards”. The guidelines represent safe exposure levels of constituents that are known to be hazardous to health. They must take account of the national social, economic and cultural conditions. Thus the safety for which we must aim or rather that we can achieve represents a compromise between the ideal and the practical as determined by the local conditions and there cannot be the same degree of safety achieved by all the countries of the world at the same time. Part of our responsibility will be to see that all countries eventually achieve the ideal and as soon as possible.

I have stressed the availability of safe drinking water as critically essential for human health, but it is proper here that I recall the place of clean water in relation to personal hygiene and basic sanitation. It is perhaps artificial to separate them because they are so interdependent, but one study that used the incidence of diarrheal disease as an indicator showed 36% reduction in morbidity due to water and sanitation combined with 26% due to sanitation alone and 17% to water alone. Provision of safe water must go hand in hand with improvement of basic sanitation. One can appreciate the emphasis in many developed countries on safe water alone since most of the problems of basic sanitation and personal hygiene have been solved.

It is essential to try to establish some strategies that will lead to the provision of safe water for those large numbers of persons who do not have it now. Perhaps the most important is the mobilization at the local level such that there is an awareness of the benefits and value of safe water, and the assumption of some responsibility for the development of the appropriate local schemes. There is an increasing tendency to entrust the provision of safe water to local authorities. In the more deprived areas where the application of simple technologies of filtration and chlorination are applied, it is critical that there be local ownership of the process and local supervision of the operation. Services will be sustainable only if there is local input and participation. The size of the local unit will vary but this does not negate the principle of local involvement. In light of my previous observation on the relationship of water to basic sanitation and hygiene, any strategy for ensuring safe drinking water must not be isolated from efforts to ensure the other two.

It is not enough to restrict attention to the mechanics of ensuring that water is microbiologically and chemically pure. There must be a strategy for monitoring the

quality of water on a continuous basis and ensuring adequate operations and maintenance management. Studies done during and after the outbreak of cholera in Peru showed that many of the systems, while probably excellent when they were installed had not been maintained and were perhaps worse than no system at all since there was probably a false sense of security in them. The schemes we have seen in our countries vary from the simple colorimeter to be used in the domestic setting to ensure sufficient residual chlorine to the strengthening of the local or national laboratories that are equipped to monitor the microbiological and chemical quality of the water that is sampled regularly. The financing of water supplies within the context of an integrated program must also be included in the consideration of any strategy. The world as a whole tends to place little economic value on water. It is generally heavily subsidized since it is regarded as an essential public good and unfortunately large quantities are wasted in both agricultural and domestic use. The schemes for financing water will have to consider some measure of privatization and regulation particularly in the urban areas. Research into affordable technologies must be included in any strategy. The Presidents and Heads of State of the Americas in their Summit in Santiago in 1998 accepted the initiative of Health Technologies linking the Americas. Among the technologies to be developed were some related to water and sanitation. PAHO is currently evaluating simple technologies for drilling and pumping as well as technologies for physical purification of water.

During this and similar conferences the concept of risk and the need to balance risks relate almost exclusively to the risk of one or other agent producing disease. Elaborate models have been developed to measure these risks and in addition epidemiological studies provide evidence of varying robustness of the long term effects of some natural or added constituent of water. I can add little to these observations except to repeat that in the majority of the world the risk of becoming ill from microbes in untreated water is greater than the risk of illness arising from agents added to disinfect the water.

But we should give some attention to another aspect of risk that deals with communicating to the consumer the risk of using the water that has been treated. The concepts of risk communication and risk management are assuming greater importance as a discerning public questions procedures and practices that were previously thought to be beyond their concern. Sociological research is adding to our knowledge of the nature of risk perception and we know that the acceptance or rejection of risk is not necessarily related to the public's knowledge of the potential harm that may occur. An important factor is the extent to which the public has some input into the decisions being taken and has the possibility of choice. Another factor is the extent to which there is trust in the society in general. This is bound up with the strength of the social bonds and not only the relation of the public to the constituted authority. Institutional as well as personal trust is hard to acquire but easy to lose, and it is clear that in general the degree of trust and acceptance of risk is related to the confidence in the messenger and less in the content of the message.

It is also false to believe that risk communication and risk management are matters only for the more developed countries. The methods of communicating to the

poor will be different but this does not mean that there is no need to ensure their acceptance of risk by adequate communication. The more difficult issue is to make the judgement as to whether the risk for example of becoming ill from unchlorinated water is so great that there should be no open discussion of the potential risks associated with the breakdown products. The standard approach is to assume a certain authority in this matter and not enter into discussion or facilitate participation in the decision. This is the approach that derives mainly from the medical orientation that has traditionally assumed trust by the person or group being treated. These questions will come to the fore more acutely as information spreads rapidly from one part of the world to the others, and I can only hope that the consequences will be salutary for those in greatest need.

Mr. Chairman, I referred earlier to some of the values and principles that guide PAHO and influence our approach to the issue of safe drinking water for everyone. The two most important principles that guide us and shape our technical cooperation are equity and the Pan American approach. Our concern for equity is grounded in our belief in the aspirational goal of Health For All, which unfortunately has lost some of its lustre. The concepts of equity and social justice underpin the goal of Health For All and the unequal distribution of safe drinking water is one of the manifestations of the inequity in our Region. These differences in availability of safe water need not exist, and we deem them inequitable because they are technically and economically avoidable. The poor have less access to safe water and when they do, especially in the urban areas pay more than do the rich. The difference between groups of countries is also striking. When we divide our countries into five groups according their level of GNP per caput, we find that in the richest group only 4.6% of the population lack access to water, while the figure for the poorest group is 43.8%. This lack of safe water is reflected in diseases such as cholera whose persistence is a manifestation of the inequity that characterizes many of our health problems. It is the poor who lack access to safe water and suffer from cholera, and any mapping of the distribution of the disease shows the gross inequality, which because we deem it to be unnecessary and socially inappropriate we characterize as inequity.

Our concern for this matter of equity is not a matter of philosophical disquiet, but we believe that these avoidable inequalities in the distribution of those determinants of health such as safe water and a healthy environment must be the focus of technical cooperation by ourselves and all those who are interested in the health of groups and individuals. These inequalities can and must be reduced if not eliminated. It is sometimes the differences rather than the absolute deprivation of one or other essential service or good that creates unsupportable tensions in the societies. Thus I would encourage you as you contemplate the very specific technical aspects of water safety, to give a little thought to the wider picture and think of how some of the methods you discuss might be applicable to those for whom the spectre of not having a drop of safe water to drink is a real and frightening one.

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