Sent: Monday, October 20, 2003 2:47 PM
Subject: AMERICA'S [& THE WORLD'S] DRINKING WATER DILEMMA

Dear Aquathin Dealer OnLine, Splash NewsBulletin and Allergic Reaction NewsBulletin Members;

Well, this most impressive article below is a bit longer than our standard informative "quick reads",and is extremely well detailed. But one thing is for certain....while anyone is looking to solve "this dilemma", Aquathin Customers already have !

I love my Aquathin !!

Warmest regards to all...as well, your comments are always welcome and very much appreciated.

FOR THE BEST TASTE IN LIFE
Think Aquathin..AquathinK !!
Celebrating our 23rd Birthday in 2003 !!!
(visit the allnew http://www.aquathin.com)

"Alfie"
Alfred J. Lipshultz, President

P.S. "Splash NewsBulletins", "Forum Q & A" , "Allergic Reaction" , Biz Bank, Tech Bank and Quote Bank... ARE ALL FREE services to all Authorized Aquathin Dealers and their clients to keep you abreast of technology updates and industry news.

FROM WATER AND WASTEWATER NEWS BRIEF 10/20/03

America's Drinking Water Dilemma

Do Drinking Water Standards Really Protect the Public Health?

By Patrick J. Sullivan, PhD, Franklin J. Agardy, PhD and James J. J. Clark

In today's chemically dependent society, it has been undeniably demonstrated that America's drinking water contains numerous industrial chemicals, pesticides, pharmaceuticals and compounds from the water treatment process itself. [1, 2] Our primary defense against this chemical assault is the water industry's compliance with the Safe Drinking Water Act (SDWA) and Primary Drinking Water Standards. This defense, however, may not be adequate. Consumer confidence in the quality of it and our government's ability to effectively ensure the purity and safety of drinking water would appear to be at an all time low. This is evidenced by a growing trend in the number of lawsuits against water utilities. For example, in California there are 20 pending lawsuits, involving 2,200 plaintiffs and 123 defendants, that claim drinking water is unhealthy, even if it does meet government standards.[3] Given this environment of eroded trust, should the American public continue to put faith in a regulatory policy (i.e., the use of drinking water standards) that is supposed to protect their health? And if there is any reasonable doubt about the effectiveness of these standards, what are the potential solutions?

Beyond A Reasonable Scientific Doubt

For a civil case in a court of law, the plaintiffs have the burden of proof. It will be almost impossible for any expert to establish beyond a reasonable scientific doubt that there is a causative link between consuming drinking water that contains low levels of a pollutant(s) and a specific human illness. This is, in part, the direct result of not having actual chemical-specific information on the relationship between the exposure to known concentrations of chemical and human health effects. On the other hand, the water utilities are faced with the same dilemma in establishing that there is no harm. Unfortunately for the water industry, the plaintiffs have a reasonable argument simply because there are chemicals of concern in drinking water as a result of obvious flaws in the current application of standards to protect human health. It can be argued, therefore, that drinking water standards cannot be demonstrated to be protective of the public health for the following reasons:

1. Drinking water standards are not based on actual human exposure data to specific chemicals (i.e., except lead). Damage to human health has not and is unlikely to ever be calibrated to a specific chemical concentration in drinking water, nor can these standards be validated in the real world. In other words, it is currently impossible to collect human exposure data because the human environment is too complex, humans are often exposed to a large variety of potentially harmful substances and toxicity studies for the most part will not use humans in the place of laboratory animals.

2. Human risk assessment methods are nothing more than models that are not calibrated or validated using human exposure data. At best, they provide an educated guess of risk.

3. There is virtually no data on the toxicity of chemical mixtures on animals, let alone humans. Drinking water does not contain just one chemical pollutant.

4. The time period between the introduction of a chemical into the environment and when it is recognized as being toxic to humans or animals often spans decades. For example, trichloroethylene (TCE) has been used as an organic solvent since the 1920s. Because of its widespread use in industry, most aspects of TCE toxicity were established in the 1930s. Beginning in the late 1940s, TCE was identified as an environmental pollutant. By 1975, TCE was identified as a possible carcinogen. Even with this knowledge, it took until 1987, or almost 40 years, for USEPA to establish a final maximum contaminant level in water of 5.0 parts per billion (ppb). This example is typical of the time period needed for the federal government to make political decisions based on science. Such delays should not be surprising since the National Research Council estimates that there are approximately 72,000 organic chemicals in commerce within the United States, with nearly 2,000 new chemicals being added each year.[4]

5. The chemicals that are currently being regulated under the SDWA are the pollutants of the past. The most pressing problem is how to determine which chemicals represent the hazardous chemicals in drinking water of the present and the future. This is particularly true for a vast array of endocrine disrupting chemicals, chemicals that are suspected to disrupt the endocrine systems (glands and hormones) of humans and wildlife, and pharmaceuticals that have been identified in drinking water. Given the current pace of evaluating chemicals for inclusion to the Primary Drinking Water Standards, it is impossible for the EPA to identify and regulate the current number of chemicals already in the environment, let alone the approximately 2,000 new chemicals introduced each year. For example, as part of the 1996 SDWA amendments, EPA is now required to publish a list of contaminants that are not currently known or anticipated to occur in public water systems. This list, the 1998 Contaminant Candidate List (CCL), currently consists of 50 chemical contaminants. These contaminants include industrial solvents, metals, pesticides, explosives, rocket fuels, biocides and common elements, but no pharmaceuticals. The EPA is required to determine whether or not to regulate no less than five of the contaminants (but not all of the contaminants). Timing, as always, is the key. Because of the way in which the

selection and implementation process is set up, a chemical that has been placed on the1998 CCL that has been identified as a health threat might not be actually regulated by water utilities until 2013. This regulatory scheme cannot keep pace with the rate at which chemicals are introduced into the environment. If this was not bad enough, the National Research Council[4] concluded that the methods used to select the CCL were flawed.

6. Drinking water standards are only partially based on science. The ultimate arbitrator is economics. The recent revision of the arsenic standard is a good example. In March 2001, President Bush's administration put on hold a planned reduction in the arsenic standard for drinking water from 50 ppb to 10 ppb. The administration then partially reversed itself and mandated that the 10-ppb standard be met no later than January 2006. The reason offered by the Bush administration for delaying implementation of the 10-ppb standard was the need to assure that this new standard was valid and affordable. This justification was based on politics, not science, given that epidemiologic data suggest that the standard should be zero[5] coupled with the fact that no standard is truly valid for humans. Indeed, the government's maximum contaminant level goal is currently set at zero. The real and unspoken reason for the delay was its potential cost to the U.S. economy. Changes of this sort at both the federal and state level typify the capricious nature of setting water quality standards and cast doubt on the scientific validity of these modifications.

7. No consensus exists within the various federal programs as to which chemicals pose a threat in food and which should be regulated in drinking water. Furthermore, the toxic compounds regulated under the Clean Water Act are also different than what is regulated in drinking water. This is significant because, **the American Water Works Association reported in 2001 that, "...the boundaries between water and wastewater are already beginning to fade." [6]**

8.Given the potentially large number of chemicals that can be found in drinking water, it is impossible to monitor for specific unsuspected compounds. Thus, monitoring will only provide some undetermined level of assurance for those chemicals that have been selected as being a threat.

These arguments do suggest that there is reason to doubt the ability of drinking water standards to protect the American public. Clearly, the use of standards is behind the times, and from a practicable standpoint, incapable of adapting to a rapidly changing environment. This further suggests that a new method of protecting the public health should be considered.

A Need for a New Policy

In addition to all of these points, it must be remembered that by using standards, we allow pollutants to remain in drinking water. In other words, industry has a license to pollute. Thus, because the fundamental economics of industrial development in the United States are supported by governmental programs that allow chemical pollution of our water resources, and as since there is no current practical solution for controlling pharmaceutical and widespread non-point source pollution, it is virtually guaranteed that chemicals will always be in our drinking water. Therefore, from an objective viewpoint, the only way to achieve chemical-free drinking water is to remove chemical pollutants from drinking water to their lowest possible levels. This means switching from a standards-based approach to a technology-based policy that will actively protect the public health by removing both known regulated and unregulated chemical pollutants in our drinking water. This alternative is far superior to litigation.

As long as consumers have an awareness that pollutants are in drinking water and advanced technologies are available to treat water to the point where chemical pollution is minimized, there will always be the specter of litigation. However, some would recommend that this issue can be best resolved by new federal legislation aimed at making standards the sole criteria against which to measure treatment performance. In other words, the public cannot litigate against water utilities unless water quality standards are exceeded. Such an approach assumes that standards are based on "good science" and ignores the fundamental problems with standard-based policies. The only logical solution for meeting our rapidly changing environment is to utilize a combination of the best advanced water treatment technologies (depending upon the needs of each water utility) to ensure that the maximum concentration of chemical pollutants is removed.

Advanced Water Treatment Technology

Advanced water treatment technology is not only available, but has been employed in the United States as well as in several European countries for years. Because these technologies are available, the simplest alternative to protecting the public health from the threat of chemical pollutants is for water utilities to voluntarily install the best available technologies to minimize chemical pollution in their product. If these technologies were employed, no change in governmental regulations would be required since all existing pollutant levels would be below existing drinking water standards.

Because each source of drinking water is unique, each individual water utility would need to assess the proper sequence of technologies to address the specific environmental characteristics of their water. Fortunately, there are a wide range of technologies available to address all forms of chemical pollution. For example, ion exchange has been employed for decades to remove both negatively and positively charged inorganic compounds from water. In a similar fashion, granulated activated carbon has been used since the 1920s to remove organic pollutants from both water and industrial processes. More recently, ozonation has been employed as a substitute for chlorine and bromine as a means for disinfection, but has also been used to oxidize organic constituents (which is widely used in Europe). Membrane separation technology (i.e., reverse osmosis, nanofiltration and microfiltration) is very effective at removing a wide range of organic and inorganic compounds from water. Even new pollutants such as methyl butyl ether, which is a gasoline additive found in more than 80 percent of reformulated gasoline, can be significantly reduced by the combination of ozonation and hydrogen peroxide. Furthermore, the use of continuous monitoring instrumentation has improved the efficiency of water treatment systems. Indeed, technologies do exist to remove chemical pollutants from our drinking water. Yet, in most regions of the United States, it is argued that they are not employed because of their cost. However, is cost an actual or perceived barrier to the implementation of advanced technologies?

The Cost of Employing Advanced Technology

When considering the cost of employing advance water treatment technology, it must be evaluated in terms of both long-term and short-term applications. For example, one long-term solution would be to provide water treated by advanced technologies that are used only for drinking while providing a lesser quality water for landscaping, showers, toilets, laundry and firefighting. This would mean that only approximately 10 percent of domestic water use would have to be treated for drinking water purposes. Thus, the cost of treating drinking water would be significantly less, but would obviously require separate water distribution systems. Separate systems could be provided when the utility infrastructure is replaced or during new construction in planned communities.

Another approach, such as proposed by Walter Weber of Michigan State University[7], would be the use of advanced water treatment technologies in a satellite mode. These highly advanced treatment systems would be employed at the neighborhood level to improve the quality of the water coming from the central water treatment plant. The objective of using such a system would be to provide the highest quality water to a limited but specialized consumer base (i.e., housing subdivisions, apartment complexes or commercial districts). This approach has merit since a satellite system installed at a point of need would be much smaller and would require a much shorter length of parallel distribution. Professor Weber has written that "...potable water is of questionable quality...we're going to be facing the reality that water supply is, in fact, wastewater." Historically, the water industry has led the way in employing the best available technology to deliver quality water and once again the water industry has the advanced technology by which to achieve the highest level of water to the consumer. When one reflects on the fact that the latest cost projections for drinking water infrastructure needs range from $11.6 billion per year to $26.3 billion per year[8], it not unreasonable to assume that a careful consideration of employment of advanced technologies system wide or in the satellite mode might prove to be more cost effective while achieving the higher goal of truly pollution-free water.

The best short-term solution is for the water utility industry to simply implement the use of advanced treatment technologies and avoid the potential cost of litigation, potential damages or costs associated with lobbying to change regulations. Given that the added cost to a water utility of implementing advanced treatment technologies has been estimated to be no more than 15 percent to 25 percent, some communities could voluntarily make the necessary upgrade without state or federal support and pass the added costs on to the consumer.[9] This situation is a likely scenario. For example, as a result of the widespread pollution of drinking water by pesticides, some water utilities in the corn belt region of the United States have already upgraded water treatment facilities[10] at increased costs to both the community and consumers. Furthermore, with the implementation of the Stage 2 Disinfection Rule, those community water systems that exceed the new standards will have to reduce the amount of dissolved organic carbon in the raw water, switch to a non-chlorine/bromine disinfection systems (e.g., use ultraviolet light) or install advanced treatment technologies. In those cases where some degree of advanced treatment technologies are implemented to comply with the Stage 2 Rule, the cost of the additional improvements needed to reach minimum pollution in drinking water should be marginal. Thus, for some water utilities the leap to providing a truly pollution-free drinking water to their customers is not that great. Ultimately, are water utilities capable of implementing the necessary technologies to attain drinking water that is close to pollution free as possible without state or federal funding support? The answer is yes, but are they willing to do it?

A simple exercise shows that the consumer resistance issue may not be as prohibitive as many assume. If an average family spends $50 per month for water (which, is higher than what the majority of consumers pay monthly), and if one assumes that water treatment costs represent about 40 percent of the average cost of delivered water, then an increase of 20 percent for the implementation of advanced treatment technology results in a dollar increase of only $4 per month or a total bill of $54 dollars per month. This represents an increase of only eight percent -- a small price to pay for pollution-free water.

Treatment is the Only Solution

In the final analysis, safety can only be assured by refocusing our environmental policies on eliminating pollutants in our drinking water instead of limiting selected pollutant concentrations to modeled levels. To adopt such a policy, means switching from passive enforcement of pollution-based standards to actively removing pollutants predicated on technology-based water quality goals (i.e., maximum pollutant removal). Following this approach not only addresses the pollutants of the past but addresses the pollutants of the future in a manner that standards simply cannot do.

References

1. Kolpin, Dana W., et al., "Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance," *Environmental Science and Technology* (March, 2002).

2. National Drinking Water Contaminant Occurrence Database (www.epa.gov/safewater).

3. Amerikaner, S. A. and S. L. Hoch, "Drinkable or Dubious -- Who Decides?" *Water Environment & Technology* (July 2002).

4. National Research Council, "Identifying Future Drinking Water Contaminants," National Academy Press, Washington DC (1999).

5. Albert, Mark, "A Touch of Poison," Scientific American (June, 2001).

6. Maxwell, Steve, "Ten Key Trends and Developments in the Water Industry," *Journal of the American Water Works Association*, Vol. 93, No. 4 (April, 2001).

7. Landers, Jay, "Treatment Changes Needed to Ensure Sustainable Water Supply*," Water Environment & Technology* (December 2000).

8. Anonymous, "Who Should Pay for Water Infrastructure?," *Water Environment & Technology* (July 2002).

9. Communications with private and municipal water utility managers in California.

10. Cohen, Brain and Richard Wiles, "Tough to Swallow, how Pesticide companies Profit from Poisoning America's Tap Water," *Environmental Working Group* (August 1997).

This article originally appeared in the September/October 2002 issue of ***Water & Wastewater Products***, Volume 2, Number 5, page 30.

Dr. Patrick J. Sullivan, a soil chemist, and Dr. Franklin J. Agardy, an environmental engineer, are partners in Forensic Management Associates Inc., a company in San Mateo, Calif. that provides litigation support and expert witness services related to environmental disputes. Sullivan can be contacted via e-mail at psfmaenv@pacbell.net. Dr. James J.J. Clark has a PhD in environmental health sciences and has written numerous articles on emerging drinking water issues. He is senior toxicologist for Komex H_2O Sciences Inc. in Los Angeles, Calif., where his consulting activities focus on emerging contaminants issues.