Drinking Water and Public Health: How Serious Is the Problem

Reed Kellner
Drinking Water and Public Health: How Serious is the Problem?

by Reed Kellner

Pure drinking water is a necessity of life. However, most pure water is utilized for numerous household and industrial activities, substantially degrading its quality. Consequently, in order to provide the public with a safe supply of drinking water, anthropogenic (man-made) and natural contaminants must be removed. Most drinking water available in the United States today contains significant amounts of contaminants even after treatment. Such water is of questionable safety. Thus, when you take a drink, you are also taking an undetermined risk.

Treated drinking water is not a recent phenomenon. Evidence of water treatment is found in Sanskrit medical lore and in Egyptian inscriptions. Hippocrates, in his writings on public health, suggested that rain water should be boiled and strained before drinking it.

More recent history links the growth of U.S. cities to the acquisition of an abundant water supply for domestic use and fire protection. However, it has been painfully learned that water quality is an issue as significant as water quantity. Frequent pathogenic contamination of municipal water systems has resulted in devastating epidemics. From 1861 to 1870 the country lost 120 people per 100,000 to typhoid fever (a contagious disease which spread through the water supply). In 1880, the death rate in major cities from typhoid fever ranged from 31.9 per 100,000 population in New York, to 58.0 per 100,000 population in Philadelphia and Baltimore—shockingly high by present day standards. By 1914, water treatment breakthroughs (sand filtration and chlorination), which removed 99.9% of the bacteriological impurities, produced marked reductions in the incidence of waterborne disease. Typhoid fever was virtually eliminated. Proud U.S. citizens proclaimed having the “best water in the world.”

Since those early breakthroughs, water treatment techniques have remained basically unchanged except for some engineering refinements. Despite the high level of confidence in drinking water supplies, the water is still not completely safe. Studies indicate that between the years 1961 and 1970 more than 46,000 illnesses resulted from 130 outbreaks of waterborne disease. In 1968, the town of Angola, N.Y. experienced an outbreak of gastroenteritis which afflicted 30% of the town’s residents. The problem did not end with the sixties. In 1975, more than 10,000 cases of waterborne enteric (intestinal) disease were reported across the country.

The “Tip of the Iceberg”

While bacteriological contamination of the nation’s drinking water is a serious problem, the Environmental Protection Agency (EPA) has described it as “only the tip of the iceberg.” The EPA and other public health officials are more concerned about the omnipresence of potentially carcinogenic (cancer causing) chemicals in the nation’s drinking water. In 1974, the EPA found traces of 100 organic chemicals in New Orleans tap water. One year later, the National Organics Reconnaissance Survey (NORS) detected potentially carcinogenic compounds in the drinking water supplies of each of the 80 cities surveyed. As of March 1979, more than 700 organic contaminants have been identified in U.S. drinking water. Yet, experts believe that this figure represents only about 10% of the organic chemicals in the water.

The sources of these chemical contaminants are industrial and...
Drinking Water and Public Health...

municipal discharges, urban and rural runoff, and natural decomposition of vegetative and animal matter. In addition, it was found that a major source of the contamination is the chlorination treatment process. Chlorine combines with chemicals in the raw water to form trihalogenated methanes (suspected carcinogens).

Congressional Response

It was the contamination of drinking water with organic chemicals which provided the impetus for Congress to pass the Safe Drinking Water Act in 1974. The Act required the EPA to commission a study to determine maximum drinking water contaminants levels which would protect the public from any known or anticipated adverse health effects. This information was to be used to set Maximum Contaminant Levels (MCL's) which allow for an "adequate margin of safety." The Administrator of the MCL program did not need absolute proof of an adverse effect on health to set the levels. Rather, he was only required to make a reasoned and plausible judgement that a contaminant may have such an effect. While it has been possible to set MCL's for the contaminants created by the chlorination process because their high concentrations makes monitoring feasible, it has been impossible to set MCL's for the other organic contaminants. For most of the 700 contaminants, monitoring techniques either do not exist or are prohibitively expensive. Furthermore, the Drinking Water and Health Study commissioned by the EPA, pointed out that one cannot set a safe level for carcinogenic contaminants even if they could be inexpensively measured. Thus, the only feasible option available to the EPA was to prescribe a general water treatment technique which would reduce human exposures to those immeasurable chemicals as much as possible. This alternative approach is in accord with the Act which states: "if in the judgement of the Administrator, it is not economically or technologically feasible to ascertain the level of a contaminant, the Administrator will specify a treatment which reduces the concentration of such contaminant."

The EPA has found that granular activated carbon (GAC) filtration is the preferred treatment technique. It is a broad spectrum system which effectively removes most organic chemical contaminants. However, it is not a panacea: all organic contaminants are not removed. Cost is also a major factor. Although large communities can afford the new system, smaller communities will be faced with very large capital expenditures due to the economies of scale. The EPA recognized this dilemma and is initially requiring GAC only on the systems serving 75,000 people or more. In addition, GAC filtration may produce some negative health effects. Bacteria growth on the filters and the creation of new toxic substances as water passes through the filters are currently being investigated.

New York State has not been immune from the national drinking water problem. The state health department stated in a January 1980 report that "the manufacture and use of synthetic organic chemicals is widespread throughout New York State, and as a result these chemicals have and are likely to continue to contaminate sources of drinking water." It is the goal of the Health Department to provide the state with a rational regulatory policy for dealing with the drinking water problem. However, as a Health Department official stated, "determination of the policy is partly a public decision which involves balancing acceptable health risks against increased regulation and higher costs." The threshold question, then, is how much are we willing to pay to safeguard our lives when the risks although certain, are not quantifiable?