

Drinking Water Regulations & Standards: An International Perspective

By Stephen R. Tischler

*E*stablishing standards for the quality of drinking water is a relatively old, yet at the same time recent development in the history of humankind. What I mean by that is people have been drinking water for a long time and those same people have been developing ways to make the water safe to drink. Water treatment is an ancient art, but the comprehensive establishment of quality standards is relatively new.

History of Water Treatment

From the earliest recorded history, since people have been gathering together into civilizations, the need for safe public water supplies has been paramount to survival. Ancient civilizations gathered around “clean” sources of water. Water treatment originally focused on aesthetic properties of drinking water. As early as 4000 B.C., ancient Sanskrit and Greek writings documented ways to improve the taste and odor of drinking water. Methods like filtering through charcoal and exposure to sunlight, boiling and straining in order to eliminate cloudiness were suggested. As early as 1500 B.C., Egyptians used the chemical alum to remove suspended particles by coagulation.¹ Early Egyptian paintings that date from the 13th and 15th centuries B.C. depict devices that clarify water.

In the fifth century B.C. Hippocrates, the Father of Medicine, invented the Hippocrates Sleeve, a cloth bag to filter rainwater. Between 343 B.C. and 225 A.D., Roman engineers created aqueducts that delivered 130 million gal daily. The first public water supply systems were born in Rome, Greece, Carthage and Egypt at the end of the 3rd century B.C.²

Several sources indicate that little progress in public water or water treatment took place between 500 and 1600 A.D.

In 1804, John Gibb built the first public water facility in Paisley, Scotland that supplied the entire town. Within three years, filtered water was piped directly to customers in Glasgow, Scotland.³ Sand filtration was being used regularly in Europe. Along with the proliferation of public water came the realization that diseases like typhoid, dysentery and cholera could be spread by pathogens in the public water supply.

Antonie van Leeuwenhoek is credited with the first observations of microorganisms in water in 1676. During his career as a microbiologist, van Leeuwenhoek identified many such microorganisms. Unfortunately, the connection between these microorganisms and waterborne diseases was not made until 1855. In that year, epidemiologist Dr. John Snow found that cholera was a waterborne disease after he linked an outbreak to a sewage-contaminated public well. In the late 1800s, scientists like Louis Pasteur, Robert Koch and Joseph Lister were demonstrating the manner by which microscopic organisms could transmit disease through media like water.⁴

By the early 1900s, water treatment focused mainly on disease-causing microbes. Turbidity was linked not only to aesthetic problems, but also to pathogens. Most water systems used filtration, but chlorine disinfection soon became the primary weapon in the war against waterborne disease. Jersey City, N.J. is credited with the first use of chlorine as a primary disinfectant in 1908.⁵ Ozone was also being used in Europe at the time.

Domestic Standards

This brief history of public water and water treatment brings us forward to the establishment of drinking water standards. Let's start with the U.S. As a natural extension of the concern over waterborne pathogens, the U.S. Public Health Service established the first standards for bacteriological quality of drinking water in 1914.⁶ A maximum level of two coliforms per 100 milliliters was set as a standard.⁷ By 1962, the standard was expanded to include 28 substances including manganese, iron, sulfate, chloride, fluoride, nitrate and dissolved solids.

By 1974, drinking water standards were put under the authority of the recently established U.S. Environmental Protection Agency (EPA) with the passage of the Safe Drinking Water Act. The bill was amended in 1986 and again in 1996. There are two categories of drinking water standards in the U.S.: the National Primary Drinking Water Regulations and National Secondary Drinking Water Regulations. A complete list of the primary and secondary standards can be found at www.epa.gov/safewater/contaminants/index.html.

The WHO

The World Health Organization (WHO) has been active in the development of international standards. In fact, the Regional Office for Europe of the WHO released a study on water distribution for drinking purposes in 1956. The report was entitled “Standards of Drinking-Water Quality and Methods of Examination Applicable to European Countries.” The WHO published International Standards for Drinking-Water, 1st ed., in 1958 and European Standards for Drinking-Water in 1961. In the preface to the European standard,

A look at the ancient art of water treatment and its ever-evolving set of standards around the globe

an explanation as to why the WHO published both a European standard and an international standard was given, and reads as follows:

*“International Standards for Drinking-Water proposed minimal standards, which are considered to be within reach of all countries throughout the world at the present time. In view of the different economic and technological capabilities of various countries there will be some areas in which higher standards than those proposed for the world as a whole will be attainable—and these areas should be encouraged to attain such higher standards. It is believed that Europe is such an area and that there is, therefore nothing illogical in setting higher standards in Europe than internationally.”*⁹

The WHO’s international standards evolved through several editions and are currently documented in the Guidelines for Drinking-Water Quality, 3rd ed. This 500-plus page guideline is one of the most

comprehensive documents providing a management framework for safe drinking water.¹⁰ It includes five key components:

- Health-based targets
- System assessment
- Operational monitoring
- Management plan
- System of independent surveillance¹¹

Similar to the primary and secondary drinking water standards as established by the EPA, this drinking water guideline includes “guideline values” for specific contaminants. The full text can be found at www.who.int/water_sanitation_health/dwq/gdwq3/en/.

Many other countries publish standards for public drinking water, but clearly the WHO guidelines represent a starting point for the establishment of those standards.

A Long Way to Go

While conducting research for this series of articles, I was overwhelmed by the number of important organizations

around the world working to ensure access to clean drinking water. For as long as we have been at it and as far as we have come, it seems like we still have a long way to go before everyone has access to clean, safe drinking water. *wqp*

Author’s Note: If you are interested in the state of water quality globally, check out the publication Water Quality Outlook, prepared and published by the United Nations Environment Programme Global Environment Monitoring System (GEMS)/Water Programme. You can find it at www.gemswater.org/common/pdfs/water_quality_outlook.pdf.

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