The United States is privileged to have some of the safest and most reliable supplies of drinking water on Earth. Despite the fact that our nation’s drinking water is protected through legislation and the diligent efforts of water agencies across the country, we must cope with the irrefutable fact that all chemicals synthesized by man have the propensity to contaminate our drinking water sources. Recently, a tremendous amount of media coverage has focused on the occurrence of trace pharmaceuticals in drinking water. While the concentrations of pharmaceuticals detected in drinking water are unfathomably minute, the idea of unintentional human consumption of them is understandably alarming to the public.

Compounding this concern are reports of reproductive disorders in fish exposed to domestic wastewater effluents. While the evidence for potential impacts to human health from pharmaceuticals in water is tenuous, substantial data exist regarding the potential for adverse impacts to aquatic organisms. The first documented report of wastewater impacts to fish reproductive health occurred in Lake Mead, Nevada, in 1996. Subsequent studies have indicated that both natural and synthetic estrogenic hormones are the likely causative agents, and in fact concentrations of natural estrogen hormones are far greater than those of the synthetic estrogen hormone used as an oral birth control pharmaceutical. But aquatic organisms experience a far greater exposure to contaminants in water than do people; we can not simply extrapolate impacts seen in fish to potential impacts to human health. Consider that common chemicals used to disinfect drinking water—such as chlorine—are quite toxic to fish, yet we regularly use these chemicals to protect human health.

Despite the recent media attention, the occurrence of pharmaceuticals in U.S. waters is not new. In fact, pharmaceuticals have been in water as long as people have used them. The first known scientific report of pharmaceuticals in wastewater outfalls was published by the U.S. Environmental Protection Agency in 1975. Since then, many more pharmaceuticals have been detected. This does not simply mean our rivers, streams, and groundwaters are becoming increasingly contaminated; rather it is also direct reflection of vastly improved analytical technologies. We now can identify and quantify substances in water at infinitesimally minute concentrations. As the sensitivity of analytical techniques increases and scientists are able to detect ever smaller concentrations, more contaminants will continue to be discovered.

**Does Detection Merit Treatment?**

The detection of pharmaceuticals in our water should not be dismissed as insignificant, nor is it cause for alarm. Some compounds are indeed toxic at extremely low levels. But other compounds can be consumed safely at concentrations thousands—in some cases millions—of times greater than found in water supplies. The point is that we can neither rule in, nor rule out, the health risk of a particular contaminant based solely upon its detection.

Therefore, when considering the extent to which water must be treated, we must not simply react to what we can detect, but use science to guide decisions that optimize our limited supplies of water and energy while protecting public health. It would be neither feasible nor prudent to treat all water to the degree that all potential contaminants are undetectable. Consider that if analytical technologies had been limited to parts-per-billion sensitivity instead of parts-per-trillion, essentially no pharmaceuticals would be detected in U.S. drinking waters. The corollary is that as analytical sensitivity reaches parts per quadrillion levels and lower, removing trace contaminants to the threshold of nondetection will be increasingly difficult. No barrier will be capable of reducing concentrations of every known constituent dissolved in water to levels undetectable by the most powerful analytical techniques.

But how we respond to increased detection of contaminants has the potential to impact even more than
human health. We are facing severe challenges related to energy consumption and increased carbon emissions, and treatment methods known to remove trace contaminants—such as reverse osmosis and ozonation—are for the most part energy-intensive as well as expensive. It would be unwise to dramatically increase energy consumption for water treatment in the absence of a legitimate threat to public health. Water treatment processes that minimize the concentrations of trace contaminants in water and have the fewest environmental impacts deserve our attention and resources.

The Regulatory Process
Under the Safe Drinking Water Act (SDWA), the EPA established rigorous mechanisms to address contaminants in water. While these processes can at times seem quite slow and tedious, it is important that all contaminants be evaluated thoroughly and with equivalent scrutiny. The SDWA sets forth a process by which levels of contaminants in water are assessed; the criteria for this process include providing a margin of safety for human exposure. Detection of any new contaminant in drinking water should trigger an EPA investigation to determine the “safe” level of pharmaceuticals in water than they do for the vast majority of synthetic organic chemicals.

Federal Guidelines Needed
U.S. water providers and the public urgently need definitive information on the levels at which pharmaceuticals in drinking water could potentially affect human health. I strongly entreat the new administration and Congress to direct EPA to quickly develop health advisory levels for commonly detected pharmaceuticals in drinking water based on protection of public health. Water suppliers need this information in order to provide efficient, effective water treatment that minimizes cost and energy consumption; the public must have confidence that their water supply is safe. The water-quality goals must be scientifically sound and based on the protection of human and ecosystem health, not simply detection and perception. Such federal guidance will allow us to better utilize our water resources in ways that provide the greatest public benefit.

Population growth and subsequent urban density increases are elevating demands for fresh water. With this growth comes more agricultural development and escalated wastewater flows, and an associated increase in contamination of fresh water. This is especially true in the arid Southwest, where high growth rates coupled with decreasing freshwater flows due to climate change threaten already-fragile water systems. While water reuse for irrigation and indirect potable use continues to expand, the perception raised from the occurrence of pharmaceuticals and other emerging contaminants threatens to undermine greater use of this valuable asset. Wastewater is becoming a more important part of our water resources portfolio. By concentrating our attention on real health impacts of changes in the water chemistry, we can reassure the public that recycled water is a viable, valuable, and essential resource.

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