

Safe Drinking Water at the Twist of a Wrist?

Understanding What Chlorine Can Do To Your Water

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During a public address in October 1999 Saskatchewan's Premier Mr. Roy Romanow made the following statement:

"Here in Saskatchewan we have always placed a high priority on meeting the challenges of adequate water and wastewater systems to our citizens, urban and rural alike."

Unfortunately, Mr. Romanow's "adequate" does not necessarily mean "safe" in rural Saskatchewan. What a high priority means for rural Saskatchewan is difficult to understand as the two agencies with the mandate for safe drinking water, Saskatchewan Environment and Saskatchewan Health, have not during the past 10 years supported efforts to find solutions to unsafe drinking water supplies.

Mr. Romanow continued:

"Here at home of course, we often take the water supply for granted. We seldom pray for ever flowing springs because we are raised in the knowledge that fresh water is just a twist of the wrist away."

It would seem Mr. Romanow believes that Saskatchewan residents enjoy safer drinking water than other areas in Canada. Unfortunately, the converse may be true.

While I write this I am on contract by the Danish International Development Agency working in Thailand. By the time my trip to Thailand is complete, I will have talked with government people and scientists about safe drinking water and I will have visited rural areas with challenging ground and surface water supplies. There is one major difference between Saskatchewan and Thailand: in Thailand everybody (including politicians) acknowledges that virtually all rural drinking water is unsafe, even when some treatment has been used.

The recent fuss about unsafe drinking water in Canada has centered around high levels of trihalomethanes,

especially in Eastern Canada. What are trihalomethanes and why worry about them? Trihalomethanes may cause cancer and birth defects, which is why the current Canadian Guideline gives a limit of 100 microgram per liter in distributed water.

Trihalomethanes are disinfection by-products and are formed when we add chlorine to water. When chlorine is poured into water it will kill bacteria and viruses, but it will also react with organic material that is dissolved in the water. Organic material can make the water coloured and give it a poor taste and smell. The chlorine chemically reacts with the organic material and forms trihalomethanes. The longer the chlorine and organic material are in contact with each other, the greater the levels of trihalomethanes formed. Trihalomethanes belong to one group of disinfection by-products that we happen to have guidelines for in Canada.

Are trihalomethanes a problem in Saskatchewan? Saskatchewan Environment has released very little public information, but at the Fifth National Conference on Drinking Water in Winnipeg, 1992, they presented a poster on the subject. Comparing the levels presented in this poster with those presented by other provinces at the meeting, Saskatchewan trihalomethane levels were the highest, commonly well above the present Canadian Guideline.

We were very interested in discovering why the trihalomethane levels were so high in rural Saskatchewan – at that time Saskatchewan Environment was unwilling to share data with us so we sought information from other sources.

Alberta Environment shared its entire water treatment database with us. In addition, we needed scientific collaborators that could help in the design of experiments and

interpretation of the data. We received such collaboration from the Faculty of Medicine at the University of Alberta and Napier University in Scotland. Indeed, Napier University placed a doctorate student and University of Alberta placed a technician in Saskatoon to work with us. Napier University paid for the student and the Natural Sciences and Engineering Research Council paid for the technician.

Experiments with Saskatchewan water showed that there was a direct relationship between the amount of

Are trihalomethanes a problem in Saskatchewan?

dissolved organic material and the amount of trihalomethanes formed. This also held true for the information in Alberta Environment's water treatment database with one exception. There was a cluster of communities that had far lower trihalomethane levels than what they ought to have based on the dissolved organic material in their distributed water.

Alberta Environment promptly investigated this and found several communities that added smaller amounts of chlorine to the water; this lowered the trihalomethanes, as there was not enough chlorine to react with the organic material. Unfortunately, those communities did not produce safe drinking water.

Our conclusion: reduce the level of dissolved organic carbon in the water before disinfection to less than 5 mg/L (half the Saskatchewan average of 10 mg/L for rural surface water reservoirs). As chlorine appears to be the

disinfectant of choice - it is cheap, reliable and readily available, the simplest and only viable solution appears to be to deal with the organic content of the water. The U.S. Environmental Protection Agency reached similar conclusions around the same time. Unfortunately, most rural communities can remove only small parts of the dissolved organic matter with existing treatments systems.

We wrote up our work so that it could be shared with the scientific community and the public, allowing us to start building a foundation for solving this problem in Saskatchewan's rural water supplies. The scientific paper was called "Trihalomethanes in finished drinking water in relation to dissolved organic carbon and treatment process for Alberta surface waters" with the following authors: H. Peterson, J. Milos and D. Spink (Alberta Environment), S.E. Hrudey (Faculty of Medicine, University of Alberta), and J. Sketchell (Napier University, Scotland). It was published in an international scientific journal called Environmental Technology, volume 14, pages 877-884, 1993. Since that time we have published many more scientific papers

with help from agencies outside of Saskatchewan.

Today the popular press and the Canadian Guidelines are embracing trihalomethanes as the issue of greatest concern. It is, however, only one of many concerns in drinking water. Indeed, we only have an understanding of about 50% of the disinfection by-products that are from chlorine. The other 50% unknown and scientists have no idea what effects they may have on humans.

Removing the dissolved organic material to levels below 5 mg/L will result in reducing most of the disinfection by-product problems to acceptable levels. This is one of the priorities for the Safe Drinking Water Foundation, which is working with scientists, industry and government agencies from around the world to find solutions for rural drinking water. The Safe Drinking Water Foundation is centered on science and we are trying hard to educate the public that addressing these problems will have positive impacts on the health and well-being of rural people. The goal should indeed be to have "safe drinking water at the twist of a wrist" not only for people in larger cities, but also for rural people.

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