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Symons J M, Bellar T A, Carswell J K, DeMarco J, Kropp K L, Robeck G G, Seeger D R, Slocum C J, Smith B L & Stevens A A. National Organics Reconnaissance Survey for halogenated organics. *J. Amer. Water Work. Assn.* 67:634-47, 1975.
[Water Supply Res. Lab and Methods Development and Quality Assurance Res. Lab, US Environmental Protection Agency, Cincinnati, OH]

Samples of source and finished drinking water at 80 locations throughout the US showed, for the first time, that the formation of trihalomethanes during the disinfection of drinking water with free chlorine was a widespread phenomenon. [The *SCI*® indicates that this paper has been cited in over 250 publications.]

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I first heard of the problem of chloroform in drinking water at the 1973 Christmas party in the US Environmental Protection Agency (EPA) building in Cincinnati. I was standing at the punch bowl with Gordon Robeck and Lee McCabe when Tom Bellar came over and said that he had found chloroform in Cincinnati tap water. Our response was that this was not surprising as the Ohio River was well known for containing industrial contaminants at that time. Then he said that the chloroform was not in the river and that the concentrations were higher in the finished water than in the raw water. We thought that this was more interesting, so we asked Bellar what reaction in the water-treatment plant was producing the chloroform. He said he thought that the chlorine might be reacting with compounds such as acetone to produce the chloroform. We dismissed the issue as not having any importance on the basis that not many places in the country would have a source water with acetone in it.

During the summer of the following year, 1974, I visited the Rotterdam waterworks in The Netherlands and met J. Rook. I had sent him a copy of Bellar's report prior to my visit, and he told me that he too had found the same phenomenon, the production of chloroform during water treatment, and had known this for some time. He disputed Bellar's supposition that acetone was a major reactant, however; his studies showed that naturally occurring organic compounds, mostly fulvic and humic acids, were the primary precursors. I then realized that these reactions should be quite widespread as most source waters contain fulvic and humic acids.

In the fall of 1974 the topic of organics in drinking water was frequently in the popular press, fueled by a series of articles in *Consumer Reports* by Bob Harris, an interview with Robeck in the *Miami Herald*, and three TV spots on the "NBC Nightly News." In response to this publicity, EPA Administrator Russell Train announced that the EPA would conduct a nationwide survey to determine the extent of the trihalomethane (THM) problem in the nation's drinking water. Our research team in Cincinnati was selected to conduct the survey.

The *Classic* paper resulting from the survey had so many authors because many people contributed to completing such an effort in such a short time. The survey was announced in November 1974, started in January 1975, and the results announced in April 1975. The *Classic* paper was published in November 1975, and an update was published the following month.[1] What made this timeliness even more remarkable was that we were exploring largely uncharted territory, both analytically and in understanding the problem.

Two amusing incidents developed out of the data for Miami, Florida. When we selected the water utilities to be studied, we chose those with a variety of sources and placed them in the general categories of ground- and surface waters. Our *a priori* judgment was that groundwater should have lower concentrations of THMs because of expected lower precursor concentrations. By coincidence, the very first sample we tested was Miami, Florida, a groundwater source. When the results were in, Al Stevens came into my office and said, "Miami has 311 μg/L of chloroform [much higher than any of Bellar's data]. If this is supposed to be one of the lower ones, we're going to have a real mess on our hands." As the remainder of the data came in, however, the chloroform concentration in the Miami system was the highest in the study, because the groundwater they used as a source was very shallow and contained much precursor. This leads to the second amusing aspect. When the study results were released in April 1978, the reporters all wanted to file stories from the location with the most chloroform, Miami. Miami had a chloroform concentration of 311 μg/L and Huron, South Dakota, had a chloroform concentration of 309 μg/L, concentrations we now know are the same within experimental error. If the Huron result had been 3 μg/L higher, Miami might have escaped some of the adverse publicity it received.

The paper, which won the American Water Works Association Publication Award, is often cited because it was the first to document that the THM problem was widespread in the country. It spawned several follow-up surveys[2,3] and literally millions of dollars of research effort to understand and control the problem and led to federal regulations for THMs in drinking water in 1978. The research continues today, and the EPA is considering making the THM regulations stricter and broadening them to include other disinfection by-products on a timetable to be completed in 1991. Although a little mishandling of some of the correlations occurred, none of the basic conclusions in the paper have been refuted, just refined. I am justifiably proud of the team, which was awarded the Bronze Medal for this achievement by the EPA. They made a contribution that has stood the test of time, in spite of searching in the dark.

1. Symons J M. Polyelectrolyte update—EPA. *J. Amer. Water Work. Assn.* 67:708-9, 1975. (Cited 5 times.)
2. Craun G F. *The risks and benefits of disinfection of drinking water: epidemiologic perspective.* Paper presented at the Annual Conference and Exposition of the American Water Works Association, 19-23 June 1988. Orlando, FL.
3. Kavanaugh M C, Trussell A R, Cromer J & Trussell R R. An empirical kinetic model of trihalomethane formation: applications to meet the proposed THM standard. *J. Amer. Water Work. Assn.* 72:578-82, 1980. (Cited 5 times.)