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## The Studies that Shaped a Science-Based Profession

Christopher J. Smiley

Michigan Dental Association, [csmiley@michigandental.org](mailto:csmiley@michigandental.org)

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By Christopher J. Smiley DDS  
Editor-in-Chief

# The Studies that Shaped a Science-Based Profession

**A**s we celebrate the 75th anniversary of the Grand Rapids Study, it impresses me that the foundation for dentistry's position as a science-based profession

owes much to the investigations into water fluoridation.

What began with observational studies unlocked the door to advances in oral health and promoted a process that has established an expectation for evidence-based dentistry.

Traditionally, observational studies and case reports are considered to be a lower level of evidence, yet it would be a mistake to dismiss them. A well-done cohort study may provide better evidence than a poorly done randomized controlled trial. Although RCTs are the method of choice for evaluating therapeutic interventions, they can be problematic for assessing programs occurring on a community level due to high costs and challenges with both recruitment and time needed for outcomes to occur.

Observational studies are a steppingstone for critical progress. Likely, readers are familiar with the story of the discovery of antibiotics, where researchers observed a piece of bread mold that created a zone of inhibition in a petri dish of bacteria. Or, in the 1980s, awareness of the emerging HIV/AIDS epidemic came from early case reports of a trend of young men presenting to the hospital with the rare Kaposi's Sarcoma.

The story of community water fluoridation exemplifies the application of the scientific process. In the early 1900s case reports from Dr. Frederick McKay, a dentist from Colorado Springs who was curious about the presence of brown spots on his patient's teeth, resulted in an awareness of the association between fluoride in drinking water and lower rates of tooth decay. His observations launched more intensive research by the National Institutes of Health to determine the optimal level of fluoridation to achieve dental health and minimize cosmetic concerns.

The U.S. Public Health Service, the Michigan Department of Health, and researchers from the University of Michigan School of Dentistry then set out to conduct a clinical trial exploring what happens with the presence of dental decay

when fluoride is introduced into communities with suboptimal levels of fluoride. Their research is fascinating on many levels, including the evolution of science-based health care.

Their study design was flexible and creative, enlisting neighboring cities that used the same water source, Lake Michigan, which had only trace levels of naturally occurring fluoride. Muskegon, Mich., served as a control, and Grand Rapids, Mich., was the trial-city with its water fluoride level adjusted to 1ppm. Another innovative feature of the study's design was the use of Aurora, Ill., as a baseline city with naturally fluoridated water at a concentration of 1.2ppm. Researchers were then able to contrast outcomes and expectations between a naturally fluoridated water source from one with optimally adjusted fluoride levels and the control that remained unchanged.

The public health impact of this study cannot be understated. By adjusting the fluoride concentration in community water supplies to optimal levels, a dramatic decrease in the presence of decay of 40-60% was achieved. Today, we find that fluoride is ubiquitous, with research producing its presence in toothpaste, mouth rinses, varnishes, and a whole host of products. Yet, even in this environment, the CDC reports that community water fluoridation continues to provide a 25% reduction in dental caries.

Another lasting impact of this story is that it created an awareness of the importance of dental research. By the third year of the Grand Rapids Study, that realization resulted in the creation of the National Institute of Dental Research within the National Institutes of Health. The NIH assigned the fluoridation studies to the NIDR, and many of those investigators grew into leadership roles that guided dental research for decades.

Science-based public health policy is a potentially fragile legacy resulting from the story of fluoridation. Elected officials serve as policy decision-makers, and they are subject to emotional or ill-founded pressures that may cause them to reject the best evidence in favor of the sensational. Thus, it is incumbent on each of us to serve as advocates to promote health literacy and champion sound, evidence-based decision-making. ●