



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002NE12B

Title: Assessment of Source of Variation in Copper Concentrations in Nebraska Drinking Water Systems

Project Type: Research

Focus Categories: Water Quality, Treatment, Water Supply

Keywords: copper corrosion, drinking water

Start Date: 03/01/2002

End Date: 02/28/2003

Federal Funds: \$16,669

Non-Federal Matching Funds: \$33,372

Congressional District: 1

Principal Investigators:

Bruce Irvin Dvorak
University of Nebraska - Lincoln

Matthew C. Morley
University of Nebraska - Lincoln

Abstract

Copper is a commonly used material for water distribution piping. Although it is fairly resistant to corrosion, copper piping may corrode under some conditions, resulting in elevated copper concentrations in drinking water. In response to potential for adverse health effects at high concentrations, the EPA has established an action level of 1.3 mg/L for copper in drinking water. The action level is the 90% percentile value for the samples collected. Because the primary source of copper in drinking water is corrosion of plumbing materials, the EPA requires treatment for corrosion control as a method for reducing copper concentrations. As of August 2001, a total of 49 drinking water systems in Nebraska exceeded the U.S. EPA's action level for copper in drinking water (NDHHS, 2001). A total of 19 of the systems in violation of the copper standard were below the copper action level in several rounds of samples between 1992 and 1999, but exceeded the action level in a round of testing in the past year. Implementation of the EPA-mandated corrosion control methods will be a significant financial impact on many of these communities.

Many of Nebraska water systems that have excessive copper levels utilize groundwater that has high alkalinity, neutral pH, and low dissolved oxygen. There is little scientific information concerning corrosion of copper by this type of water chemistry. This research seeks to develop an understanding of this corrosion phenomenon by building on previous Nebraska copper corrosion research.

A USEPA lab recently analyzed the scale layers from Hallam study. This scale was unlike other scales reported in the technical literature. It contained more silica and iron than usual deposits and it appeared that there were some corrosion cells under the mechanically unstable surface. If a breakage occurred in the surface, then non-uniform corrosion could occur and could possibly lead to periodic spikes in the dissolved copper concentration like the spikes observed in the Hallam study. If this type of scale is common in

Nebraska, typical corrosion control methods (pH adjustment) may not be effective if the source of corrosion lies within the existing scale layer.

Although there are many contributing causes for copper corrosion (e.g., microbial, chemical, physical), this research will focus on gathering data concerning water quality and scale composition in Nebraska communities with the greatest variation in copper data. This data can advance the understanding of some of the sources of variation in copper concentrations in drinking water systems. This proposal represents the formation of a research partnership between the Nebraska Section of the American Water Works Association (NSAWWA), University of Nebraska, and Nebraska Department of Health and Human Services.