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To: Cindy Sek, Drinking Water Section, Environmental Health & Drinking Water Branch

From: Meg Harvey, Toxic Hazards Health Assessment Unit *MH*

Thru: Jim Vannoy, Section Chief

Date: September 22, 2023

Subj: Elevated Copper at Valley Regional High School, Deep River, CT

Background

This letter health consultation is to document an evaluation provided to you via email on 8/7/23, regarding elevated copper concentrations in the water distribution system at the Valley Regional High School (Regional District #4) in Deep River, CT. The high school is a non-community, non-transient public water system, regulated by CT DPH's Drinking Water Section (DWS). Specifically, the DWS asked for an evaluation of copper levels and advice regarding whether the school should immediately use an alternative source of water for drinking and cooking while it worked to bring the water system into compliance with the EPA Lead and Copper Rule (EPA 2021). DWS further asked for a recommendation about public health messaging to be provided to school teachers, staff, students and parents.

Environmental Data and Exposure Assessment

Analytical results were provided by the DWS for lead and copper in five samples taken at different points in the school's water distribution system. The water testing was performed on 7/15/23 by the school's certified water operator for purposes of showing compliance with the EPA Lead and Copper Rule. Four out of the five copper results exceeded EPA's copper action level of 1.3 mg/L (range in the samples was 1.12 mg/L to 2.31 mg/L). The 95%ile copper concentration was reported as 2.22 mg/L, which also exceeds the EPA copper action level. Lead was also measured and all samples were below the EPA action level for lead of 0.15 mg/L.

Students, teachers and staff at the school could be exposed to elevated copper in the water via drinking (water fountains, sinks) or by eating food prepared with the water. The school was not open for students at the time the water testing was done, but teachers and staff were in the school preparing for the new school year and the school was scheduled to open for students in late August 2023.



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Public Health Implications

To answer the question posed by the DWS regarding whether an alternative source of water should be provided immediately, we evaluated whether consuming the drinking water at the school could pose an acute health risk to staff, teachers or students at the school. To evaluate the potential for acute risks, we compared the 95th percentile concentration of copper in the water (2.2 mg/L) with comparison values appropriate for acute exposures, as shown in the Table below. EPA states that its action level of 1.3 mg/L is protective for acute symptoms associated with copper exposure in water (gastrointestinal distress) (EPA 2009). The World Health Organization states that its drinking water guideline for copper of 2 mg/L is protective for acute exposures (WHO 2004). ATSDR has an acute Environmental Media Evaluation Goal for copper of 0.14 mg/L (ATSDR PHAST) and an acute and intermediate Minimal Risk Level (MRL) of 0.02 mg/kg-day (ATSDR 2022). The MRL equates to a water concentration of 1 mg/L (assuming a 2 to <6 year old child water ingestion rate of 0.337 L/d and 17.4 kg body weight) and a water concentration of 1.2 mg/L (assuming an adult water ingestion rate of 1.313 L/d and 80 kg body weight) (ATSDR 2023). See Appendix A for details of these calculations.

Table 1. Copper Acute Comparison Values in Drinking Water

Comparison Value (mg/L)	Source	Note
1.3	EPA Copper Action Level (EPA 2009)	
2	WHO Copper Guideline (WHO 2004)	
0.14	ATSDR EMEG (ATSR PFAST)	
1	ATSDR MRL (ATSDR 2022)	Water concentration associated with MRL assuming child water ingestion rate and body weight
1.2	ATSDR MRL (ATSDR 2022)	Water concentration associated with MRL assuming adult water ingestion rate and body weight

mg/L: milligrams per liter, EPA: Environmental Protection Agency, WHO: World Health Organization, ATSDR: Agency for Toxic Substances and Disease Registry, EMEG: Environmental Media Evaluation Guide, MRL: Minimal Risk Level.

The 95th percentile copper concentration in the school's drinking water is 2.2 mg/L, which exceeds all of the comparison values shown in Table 1.

Conclusions and Recommendations

Based on these comparisons, we concluded that we could not rule out the possibility of acute health impacts (gastrointestinal distress) in students, staff or teachers exposed (via water ingestion) to copper in the school's drinking water. Of particular concern is anyone with Wilson's disease or another genetic copper intolerance. The other population of concern is infants, if formula is made with the water. This would only be an issue if the school has a child care.

We communicated the results of our evaluation with the DWS and stated that based on our evaluation, the course of action most protective of public health is for the school to use an alternative source of water for cooking and drinking until they take action to reduce the concentration of copper in their water.

With regard to messaging, we recommended that the school notify their staff, teachers, students and parents that there are elevated concentrations of copper in the water and that consuming water with

elevated copper levels can cause gastrointestinal distress such as nausea and vomiting. We also advised that the school communicate to staff, teachers, students and parents that it is especially important that anyone with Wilson's disease or any other genetic intolerance to copper should not drink the water. If the school has a child care facility with infants, we advised that the school inform the child care that it is particularly important that infant formula not be made with the water.

References:

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Appendix A

Water Copper Concentration that results in the MRL Dose, using adult and child exposure assumptions

$$[\text{MRL (mg/kg-d)} * \text{BW (kg)}] / \text{IR (L/d)} = \text{Water Conc (mg/L)}$$

Adult:

$$(0.02 \text{ mg/kg-d} * 80 \text{ kg}) / 1.313 \text{ L/day} = 1.2 \text{ mg/L}$$

Child:

$$(0.02 \text{ mg/kg-d} * 17.4 \text{ kg}) / 0.337 \text{ L/day} = 1 \text{ mg/L}$$

Where:

MRL = ATSDR acute and intermediate MRL for copper of 0.02 mg/kg-d (ATSDR 2022)

BW = adult body weight: 80 kg and child 2<6 years old body weight of 17.4 kg (ATSDR 2023)

IR = water ingestion rate: child 2<6 years old rate of 0.337 L/d; adult rate of 1.313 L/d (ATSDR 2023)

Water Conc. = copper concentration in water that results in the MRL dose