

Fluoride in Drinking Water: A Scientific Review of EPA's Standards

Comprehension Questions (for use with *Fluoride in Drinking Water: A Scientific Review of EPA's Standards* report brief):

1. The U.S. Environmental Protection Agency (EPA) sets three types of standards for environmental contaminants. What are the EPA standards for concentrations in drinking water of fluoride that comes from natural or industrial sources?
2. In your own words, paraphrase what the National Academies report states about the EPA's standards for fluoride concentrations in drinking water.
3. Why do the EPA standards differ from the recommendations of the Public Health Service for adding fluoride to drinking water?
4. Why is the amount of fluoride exposure from drinking water significant?

Answer Key

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1. The U.S. Environmental Protection Agency (EPA) sets three types of standards for environmental contaminants. What are the EPA standards for concentrations in drinking water of fluoride that comes from natural or industrial sources? (Identify) *[anno: The maximum contaminant level (MCL) and maximum contaminant level goals (MCLG) are the same at 4 milligrams per liter of water. The secondary maximum contaminant level (SMCL) is 2 milligrams per liter of water. MCLG and MCL are based on health effects, and the SMCL is based on cosmetic effects.]*
2. In your own words, paraphrase what the National Academies report states about the EPA's standards for fluoride concentrations in drinking water. (Paraphrase) *[anno: Possible response: The report says that EPA's standards do not protect people against adverse health effects from too much fluoride. Children who drink water with levels of fluoride at 4 mg/L or higher are at risk of getting severe tooth enamel fluorosis, and people drinking water at these levels for years may be at risk for increased bone fractures.]*
3. Why do the EPA standards differ from the recommendations of the Public Health Service for adding fluoride to drinking water? (Explain) *[anno: Possible response: The Public Health Service recommendations are designed to help prevent dental cavities. It recommends that fluoride be added to bring the concentrations in drinking water to 0.7-1.2 mg/L for this purpose. EPA's standards are designed to reduce fluoride concentrations in areas that have naturally high fluoride in drinking water. EPA's standards are designed to prevent adverse health effects that might be caused by exposure to high concentration of fluoride. EPA's standards are not intended to prevent dental cavities.]*
4. Why is the amount of fluoride exposure from drinking water significant? (Analyze) *[anno: Possible response: People get most of their exposure to fluoride from drinking water. Because adverse health effects can be caused by exposure to high concentrations of fluoride, it is important that EPA restrict the amount of fluoride allowed in drinking water.]*

Comprehension Questions Answer Key (for use with *Fluoride in Drinking Water: A Scientific Review of EPA's Standards* report brief), continued:

5. Two of the twelve members of the National Academies committee that prepared this report believed that fluorosis is an adverse cosmetic effect, not a health one. Yet these two committee members agreed that the EPA standards for fluoride concentrations still should be set to prevent this tooth condition. Do you agree or disagree with the committee's findings that the EPA standards should prevent fluorosis? Why? (Evaluate) *[anno: Possible response: I agree with the committee's findings because the research is inconclusive about whether fluorosis is a health problem or just a cosmetic one. Also, even if the condition is just a cosmetic problem, it can cause a person to have low self-esteem and social problems because of their appearance.]*
6. In brief, what did the committee find are the effects of high concentrations of fluoride on bones? (Summarize) *[anno: Possible response: The committee found that high concentrations of fluoride do not have a conclusive link to the occurrence of skeletal fluorosis, which is rare. The majority of the committee members also found that exposure to fluoride levels of 4 mg/L or higher over a lifetime increases the risk of bone fractures. Three members disagreed, saying only that the EPA standards might not protect people from increased bone fractures and that more research was needed. The committee could not draw any conclusion about bone risks at fluoride concentrations of 2 mg/L.]*
7. The report recommends that the EPA lower its recommended standards of fluoride concentrations in drinking water to prevent severe and moderate fluorosis and risk of bone fractures. Look again at the EPA's standards for environmental contaminants explained in the sidebar on page 1 of the report. What do you think the maximum contaminant level (MCL), the maximum contaminant level goal (MCLG), and the secondary maximum contaminant level (SMCL) should be for fluoride? Explain your answers. (Make Decisions) *[anno: Possible responses: The MCLG should be set at 2 mg/L, since fluorosis and risk of bone fractures increases at the current level of 4 mg/L. The MCLG is supposed to prevent adverse health effects, and the majority of the National Academies committee believed that fluorosis and bone fractures are adverse health effects. The MCL could be slightly higher than 2 mg/L but lower than 4 mg/L for a while to allow communities time to comply with the change. The SMCL should be something closer to 1.2 mg/L, the highest level of fluoride that is added to drinking water. At that level the risks of cosmetic effects from moderate fluorosis are small.]*
8. In the last section of the report, the committee recommends further studies that need to be conducted to assess the affects of fluoride concentrations in drinking water, especially at levels below 4 mg/L. Why do you think so little conclusive research has been done so far on the links between fluoride and possible adverse health effects? (Analyze) *[anno: Possible response: It is possible that scientists thought that the research that had already been done to set the earlier EPA standards was sufficient. It is also possible that they believed that severe fluorosis from consuming too much fluoride was not an adverse health effect but just a cosmetic one. Since fluoride has a positive health effect at lower levels, then maybe scientists thought that concentrations would have to be much higher than 4 mg/L to cause adverse health effects.]*