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Community Health Concerns about Sulfolane

Introduction

We, at the Alaska Division of Public Health (ADPH), have been responding to community concerns about sulfolane and its health effects ever since the chemical was first detected in North Pole area wells in October 2009. This fact sheet addresses the more common questions that have come up about the ways people have used their well water, including growing food crops. The last question addresses the issue of doing health studies of affected residents.

Information about the health effects of sulfolane is limited because no studies have looked for health effects in people who have been exposed to (come in contact with) this chemical. Most of what we know about how sulfolane might affect human health comes from studies where laboratory animals were exposed to *very high* levels of sulfolane for short periods of time (the longest one was six months). As far as we know, no studies have looked at longer-term exposure to sulfolane.

While we can't answer all your questions with complete certainty, we're confident that using your well water for many everyday activities, such as showering and washing dishes, poses very little to no health risk (see below). The levels of sulfolane in your well water are far below the levels that have been found to cause health problems in laboratory studies. Protecting public health is our top priority, so our advice errs on the side of caution.

We'll be preparing a more thorough report that discusses the public health implications of sulfolane in North Pole drinking water. It should be available in the late summer or early fall of this year, after we have some preliminary gardening data (see "Next Steps" below).

Public health action levels for sulfolane in drinking water

In February 2010, the Agency for Toxic Substances and Disease Registry (ATSDR), a federal public health agency, made recommendations (called "action levels") for sulfolane in drinking water in response to the situation in North Pole.

ATSDR's recommended action levels for sulfolane in drinking water

Population group	Sulfolane in drinking water ($\mu\text{g}/\text{l}$ or ppb)	Water intake per day	Body weight
Infants	25	1 liter	10 kg (22 lb)
Children	40	1 liter	16 kg (35 lb)
Adults	87.5	2 liters	70 kg (154 lb)

ATSDR recommended levels for three groups of people, based on an average weight and daily water intake for each group. The most protective level is 25 parts per billion (ppb) for infants, which means that a sulfolane concentration in drinking water below 25 ppb is not harmful for infants. A companion guide to ATSDR's report is available to help you understand what these action levels mean for you (see last page).

Community questions about their well water use

Is it safe to shower and bathe with my well water?

Yes. Using your well water to shower and bathe, or to wash clothes and dishes, is highly unlikely to pose a health risk because:

- Studies have shown that sulfolane is not readily absorbed through human skin because of its low permeability (less able to go through the skin). (Ursin et al., 1995).
- Sulfolane has low volatility, which means that it doesn't readily go from a liquid to a gas (vapor) that you could breathe in.
- Studies have shown that sulfolane causes little to no long-term skin or eye irritation, even at very high concentrations. For example, a study by Brown et al. (1966) repeatedly applied *pure* sulfolane to the bare skin of rabbits and guinea pigs almost daily for over four weeks and found no skin irritation. This study also put *pure* sulfolane into rabbits' eyes, which caused mild conjunctivitis (pinkeye) that cleared up within a few hours.
- It's unlikely that a residue of sulfolane might remain on clothes or dishes after washing. We don't know for sure though, because we don't think that has ever been tested. If any sulfolane did remain on clothes or dishes, the amount would be so small that it would be of no consequence.

Is it safe to cook with my well water?

That depends on the level of sulfolane in your well water and how you're using it.

- If you're making foods like soup, treat it like drinking water and compare the sulfolane level in your well water with ATSDR's recommended levels (for example, 87.5 ppb for adults) .
- Cooking foods in well water and then tossing it out (for example, pasta) poses very little health risk, regardless of the sulfolane level in your well water.

Is it safe to wash or rinse foods with my well water?

Yes. Any trace residue of sulfolane that might remain on the foods after washing would be so small that it would be of no consequence.

Is it safe to give my pets or other animals my well water?

Like people, that depends on the size of your pet and level of sulfolane in your well water. Use ASTDR's recommendations as a guide.

- For example, if your pet is small, like a cat or dog weighing less than 22 pounds, and the sulfolane in your well water is *over* 25 ppb, then you may want to use an alternative water source.
- If you want more advice about whether your well water is safe for your pet, you're welcome to contact us.

Is it safe to water my vegetable garden with my well water?

Unfortunately, we don't have enough data yet to say either way, but we're working on it (see "Next Steps" below). We hope to have some answers during the growing season, and we'll know even more as time goes on. This is what we know now:

- Plants can absorb (take up) sulfolane from water; how much depends on the type of plant and the parts within a plant. Other factors, such as humidity, rainfall and sunlight, may also affect sulfolane uptake.
- Studies have found a wide range of sulfolane levels for different parts of the same plant, for example roots versus leaves. They show that sulfolane is taken up with the water by the roots and then "translocated" to (moved from one area into another area) other parts of the plant, like the shoots and flowers (Headley et al., 1999; Dettenmaier et al., 2009). Sulfolane does not concentrate within the roots, but in some situations it can build up in those parts of a plant that grow above the ground.
- Therefore, root vegetables, like carrots and potatoes, and other "below-the-ground" vegetables are not likely to have concentrations of sulfolane that would pose a health risk.
- On the other hand, leafy vegetables and those with high water content, like lettuce and tomatoes, may concentrate sulfolane in the shoots and fruit (the parts we eat). Whether or not the amount of sulfolane in these types of food plants would be high enough to pose a health risk would depend on many factors, such as the level of sulfolane in your well water, how much you watered your garden, what levels of sulfolane are in the parts of the plant that you eat, and how much and how often you eat them.
- A technical project team that includes the ADPH will be overseeing gardening studies with sulfolane this summer to provide you with more definitive information and advice (see "Next Steps" below).

Why isn't the health department planning to do any health studies of North Pole area residents?

Some people have asked us if we plan to monitor disease outcomes in North Pole area residents. Our reasons for not doing a health study are:

- Cause and effect relationships are often difficult, if not impossible, to prove when people are exposed to toxic substances. Establishing a link between an exposure and a health effect is very challenging, due to all the potential sources of uncertainty.
- We know very little about the health effects of sulfolane exposure in people. Any health effects we might see would be subtle (hard to find) and might take a long time to develop; this is because the sulfolane levels that people had been exposed to from their well water were very low compared to those used in animal studies.
- If we were to find people with health problems (e.g. damaged kidneys, livers or spleens), it would be very difficult to know whether sulfolane was the cause, because other factors can have similar health effects. These include exposure to other contaminants; lifestyle factors like diet, alcohol use, and smoking; genetics, and so forth.
- If we decided to do a health study of North Pole residents, we'd inappropriately raise expectations that we could answer questions about sulfolane exposure and how it may have affected their health by monitoring everyone in the North Pole area. In fact, as epidemiologists we know that such a study would not be scientifically sound, because we already know we

wouldn't have enough statistical power to find a health-sulfolane exposure connection if there were one.

If, in the end, we didn't see any health effects, we wouldn't know if there weren't any or whether we just weren't able to find them. Therefore, conducting a health study would be neither scientifically sound nor answer community concerns.

Next steps

Many of you are wondering what to do about your vegetable gardens, now that the growing season is here. **Our advice for now is to water your gardens using your well water.** We're in the process of planning "gardening" studies to measure sulfolane levels in different types of food plants grown locally so that we have concrete data we can use to give you sound advice. What's most likely to happen once we have the data is that we'll say that eating your food crops is okay, or advise you to eat certain ones less often. Although it's highly unlikely that you won't be able to eat your garden foods *at all*, we can't say for sure until we have the data.

One study may involve sampling a fast-growing crop like lettuce from a select number of gardens in the North Pole area. This would allow us to get some data sooner rather than later to benefit you this year. This may not answer all your questions, but it will help. Another study may be a more formal research study that will take longer to complete. It may involve different types of food plants and various growing conditions that could affect sulfolane uptake in plants. The data from this study probably wouldn't be ready until next year. We'll let you know the details of these studies once we've finalized them.

Please contact us with your questions and concerns

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Additional resources

Copies of previous fact sheets and other resources are available online, or you can call us for a copy:

- ATSDR health consultation on sulfolane:
<http://www.epi.alaska.gov/eh/sulfolane/ATSDRSulfolaneHC.pdf>
- DHSS companion guide to the ATSDR health consultation on sulfolane:
<http://www.epi.hss.state.ak.us/eh/sulfolane/DHSSSulfolaneHCCompanion.pdf>
- DHSS sulfolane health fact sheet:
<http://www.epi.alaska.gov/eh/sulfolane/SulfolaneHealthFactSheet.pdf>
- State North Pole refinery/sulfolane Web site and FAQs:
<http://www.dec.state.ak.us/spar/csp/sites/npolerefinery.htm>