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Perfluorochemicals in Homes and Gardens Study: Summary of Results

Background

Since 2004, local and state agencies have been responding to the presence of perfluorochemicals (PFCs) in drinking water supplies in several eastern Twin Cities communities. Wells with levels of PFCs exceeding Minnesota Department of Health (MDH) health-based criteria have been identified and addressed through installation of granular activated carbon (GAC) filtration systems, or hooked up to city water. Residents now drink water with no to low levels of PFCs.

Drinking water is safe, but homeowners have expressed concerns about eating fruits and vegetables that have been grown in soil that contains PFCs. PFCs have been released to the environment by watering lawns and gardens using water sources that contain PFCs. PFCs stay in the environment for a long time after they have been released. Water sources used in gardening may still contain PFCs if the outdoor taps used to water yards and gardens are left unfiltered at homes with private wells. Some PFCs may also "break through" GAC filters used in private or public water systems.

Laboratory studies show that PFCs in soil or water can be taken up by edible plants. These studies consistently show that PFCs with short fluorocarbon-chains - such as perfluorobutanoic acid (PFBA) - are more readily taken up into plants compared to long-chain PFCs – such as perfluorooctane sulfonate (PFOS) or perfluorooctanoic acid (PFOA).

MDH responds to community concerns

MDH started a study of PFC levels in homegrown produce, garden soil, and outdoor tap water from the eastern Twin Cities area in 2010.

MDH collected samples from 20 homes in Lake Elmo, Oakdale, and Cottage Grove that have a history of PFCs in the water. A total of 20 water samples, 34 soil samples, and 232 produce samples were analyzed for seven different PFCs.

All samples have been analyzed by the MDH lab and results have been provided to study participants. Data analyses of the results for dust are still in process. The study report will be completed and posted on the MDH website in the summer of 2014.

Study Results

Water: PFBA was found in 85% of outdoor tap water samples and found at higher levels than other PFCs. The median PFBA concentration was 0.98 micrograms per liter (µg/L). No sample exceeded the Health Risk Limit (HRL) set by MDH of 7 ug/L. PFBA is the most widespread PFC in East Metro groundwater. It is also difficult to completely remove PFBA with standard water treatment methods.

Soil: PFCs were detected at low levels in most soil samples. PFOS, PFOA, and PFBA were found in every sample and at the highest levels. Median concentrations of PFOS, PFOA, and PFBA were

2.65, 0.73, and 0.99 microgram per kilogram (µg/kg) respectively. These levels are well below health-based guidelines for PFCs in soil. The amount of PFBA in water and the amount of garden watering were found to significantly contribute to the soil concentration of PFBA.

Produce: In produce, PFBA was detected in 98% of samples and found at higher levels than other PFCs. The median PFBA produce concentration was 0.68 µg/kg. The amount of PFBA in the water, the amount of garden watering, and the type of produce grown were found to influencethe amount of PFBA in produce. PFOS and PFOA were found in very few of the produce samples.

Health Risk Assessment

MDH conducted a risk assessment that evaluated exposure to the three PFCs for which safe dose levels have been established. The three PFCs evaluated were PFOS, PFOA, and PFBA. The safe levels used in the assessment provide protection for even the most sensitive people who may be exposed to PFCs. Three age categories were considered: adults, small children, and infants. Exposure was combined across four sources (drinking water, homegrown produce, soil, and house dust).

Conclusions

No health risks of concern were found for anyone living in these communities when considering combined risk from all exposure pathways.

Therefore, MDH has determined that the health benefits provided by growing and eating homegrown produce greatly outweigh any potential risk from low levels of PFBA or other PFCs in produce.

Findings include:

- ✓ The presence of PFBA in water contributes to elevated levels of PFBA in soil and garden produce in the East Metro.
- ✓ PFBA concentrations in produce are low and no health risks of concern were found for infants, children or adults living in the study area from exposure to PFBA, PFOS, and PFOA in drinking water, soil, homegrown produce and house dust.
- ✓ The results of this study are consistent with experimental plant studies. Although PFOS and PFOA were present in soil at higher or similar levels to PFBA, the results demonstrate that plant uptake of PFCs is chain-length dependent with highest uptake and movement of short-chain PFCs by edible plants.

This study was conducted at homes in the East Metro with historically the highest levels of PFCs in their drinking water, a long history of home gardening, and generally extensive varieties of fruits and vegetables grown and consumed. Other residents or gardeners in the area – with lower levels of PFCs or no PFCs in water used for watering lawns and gardens - can expect to have even less exposure to PFCs through soil and home garden produce.

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For more information on PFCs in Minnesota:
http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html