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## Summary of Results

# Perfluorochemicals in Homes and Gardens Study

### 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-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 twenty 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.



A total of 3 water samples, 6 soil samples, and 47 produce “reference” samples were collected from three homes in areas of the Twin Cities that are not affected by the PFC contamination.

MDH also collected two house dust samples from each home. The purpose of collecting the dust samples was to determine whether PFC-contaminated water used to water yards and gardens contributes to indoor PFC contamination of house dust when it is “tracked-in” from the outside.

All samples have been analyzed and results have been provided to study participants.

### 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 µg/L. No sample exceeded the Health Risk Limit (HRL) set by MDH of 7 µg/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 µg/kg respectively. These levels are well below health-based guidelines for PFCs in soil. There was no evidence that the

amount of PFBA in water or the amount of garden watering significantly contributed 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 contribute the most to the amount of PFBA in produce. PFOS and PFOA were found in very few of the produce samples.

**House Dust:** In each home, MDH collected a dust sample from both a living/family room and an entryway to the yard. Higher detections and concentrations were found in living room dust compared to entryway dust for all PFCs. Entryway dust levels were strongly related to living room levels, but not soil levels. These findings suggest interior sources of PFCs (e.g., consumer products) contribute most to PFCs in house dust. The one exception was PFOA, where the entryway dust level was more strongly associated with the soil concentration than the living area dust level.

### Health Risk Assessment

MDH conducted a risk assessment that evaluated exposure to the five PFCs for which safe dose levels have been established. The five PFCs evaluated were PFBA, PFBS, PFOA, PFOS, and PFHxS. 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 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 five PFCs in drinking water, soil, homegrown produce and house dust.
- ✓ 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.
- ✓ “Track-in” of PFCs in soil and dust from the outside is not the main contributor to dust levels in the living spaces of homes.

This “real world” study was conducted at homes in the East Metro with historically high 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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[Information about PFCs in Minnesota](http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html)  
(<http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html>)