Evaluation of Perfluorochemical Removal by a Small, In-home Filter

Background:
On behalf of the Minnesota Pollution Control Agency (MPCA) and Minnesota Department of Health (MDH), West Central Environmental Consulting (WCEC) tested an inexpensive and easy to install carbon filter to determine how well it removes perfluorochemicals (PFCs) from drinking water.

Method:
WCEC tested a PUR faucet mount water filter (model FM-2000B, FM-3333B), which is intended for home use to treat water from a single faucet. The filter contains a proprietary carbon formulation that, according to the manufacturer, meets ANSI/NSF standards 53 and 401 for removal of a wide range of contaminants (metals, pesticides, volatile organic compounds, and emerging contaminants). The manufacturer makes no claims about PFC removal.

Water containing all seven PFCs typically detected in south Washington County groundwater was used to test the filter. The amount of PFCs in the water was at or above what is commonly detected in residential wells. The water was run through the filter and samples of treated water were taken after 25, 50, 75, and 100 gallons had passed through the filter. This corresponds to 25, 50, 75 and 100 percent of the manufacturer's recommended capacity for the filter to treat 100 gallons.

Tests were conducted on non-chlorinated and chlorinated water to determine if the presence of chlorine would affect the filter's performance. The Minnesota Public Health Laboratory analyzed the non-chlorinated samples; AXYS Analytical Services Ltd. analyzed the chlorinated samples.

Results:
All values in the tables below are in parts per billion (ppb).

Non-chlorinated Water

Chemical	Untreated water	25% of filter capacity	50% of filter capacity	75% of filter capacity	100% of filter capacity	MDH drinking water advice	Reporting Limit	Method Detection Limit
PFBS	0.021	ND	ND	ND	ND	7	0.05	0.009
PFBA	1.0	ND	ND	0.013*	0.024*	7	0.05	0.008
PFHxS	0.03	ND	ND	ND	ND	0.07	0.025	0.005
PFHxA	0.075	ND	ND	ND	ND	NE	0.05	0.01
PFOS	0.25	ND	ND	ND	ND	0.07	0.025	0.007
PFOA	0.24	ND	ND	ND	ND	0.07	0.035	0.01
PFPeA	0.043	ND	ND	ND	ND	NE	0.05	0.009

ND = not detected above Reporting Limit
NE = no criteria established
* These are estimated concentrations, detected below Reporting Limit but above Method Detection Limit

Chlorinated Water

Chemical	Untreated water	25% of filter capacity	50% of filter capacity	75% of filter capacity	100% of filter capacity	MDH or EPA drinking water criteria	Reporting Limit*
PFBS	ND	ND	ND	ND	ND	7	0.01
PFBA	0.361	0.0134	0.0315	0.0635	0.0954	7	0.005
PFHxS	ND	ND	ND	ND	ND	0.07	0.01
PFHxA	0.0263	ND	ND	ND	ND	NE	0.005
PFOS	0.0798	ND	ND	ND	ND	0.07	0.01
PFOA	0.0658	ND	ND	ND	ND	0.07	0.005
PFPeA	0.0112	ND	ND	ND	ND	NE	0.005

ND = not detected above Reporting Limit (RL)
NE = no criteria established
*Reporting limits varied slightly for each sample (RLs for PFBS, PFHxS, PFOS: 0.00899 – 0.00967 ppb; RLs for PFBA, PFHxA, PFOA, PFPeA: 0.0045 – 0.00484 ppb)

The filter removed six of the seven PFCs to below the Reporting Limit and Method Detection Limit in all samples. In the non-chlorinated water, PFBA was removed to below the Reporting Limit in all samples; only small amounts were seen above the Method Detection Limit after 75 gallons of water were treated. In the chlorinated water, small amounts of PFBA were detected in all samples, but the filter removed most of the PFBA. In all samples, the filter reduced PFBA to far below MDH's Health Risk Limit of 7 ppb.

Conclusion:
The test results suggest that this type of filter unit, when installed and maintained according to manufacturer's instructions, can effectively remove nearly all of the PFCs typically found in south Washington County groundwater to below detectable levels and MDH health recommendations. This was observed in non-chlorinated and chlorinated (city) water. Although PFBA did break through the filter, the amounts in treated water never exceeded (or even approached) levels of health concern.

Disclaimer:
MDH and MPCA make no endorsement of this product. This was one test of one filter from one manufacturer. Although the results are consistent with those from a similar test by MDH in 2007, the test isn't a comprehensive evaluation of the model tested or other similar filters. Results may vary between individual filter units and between different models or brands. We simply offer this information to people who may be considering buying a filter to reduce exposure to PFCs.

Please note, **carbon filters do not remove bacteria or nitrate, a common contaminant in Minnesota groundwater.** MDH advises well owners to test their water annually for bacteria and nitrate, and provide treatment to address these problems if needed. Contact Washington County for sampling kits at 651-430-6655 or www.co.washington.mn.us/637/Water-Tests.

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