National Association of Environmental Medicine

ENVmedicine.org

WATER FILTRATION GUIDE

EVERYONE SHOULD FILTER THEIR DRINKING AND COOKING WATER! (And your refrigerator filter does NOT count)

While local water utilities test the water for contaminants, **legal does not necessarily equal safe**. It has been almost 20 years since the legal limits for contaminants have been updated. Less than 100 contaminants are tested, yet there are 1000s of other contaminants that are not regulated.

- Overall, **NAEM recommends using REVERSE OSMOSIS (RO) water filters,** if possible.
  - It is the only filter that clears **nanoplastics** which are accumulating in our bodies.
  - It fully filters out **chromium-6**, a carcinogenic toxin found in all 50 states' drinking water.
  - Newer tankless RO technology is very effective AND more efficient on water waste.
- For renters, pitchers and countertop filters are good options, but replace filters often.

Toxin	Why You Need to Be Concerned	Filtration Needed
Nanoplastics & Microplastics	**94% of US tap water is contaminated** with microplastics, and **93% of water bottles had microplastics** - with an estimated 90% being nanoplastics. They impact our hormone/endocrine, cardiovascular, neurological, and immune systems. Nanoplastics are about 0.02 microns and only RO membranes (0.0001 micron) captures them.	Nanoplastics: **reverse osmosis** Microplastics: **carbon block**
PFAS/PFOS (forever chemicals)	Found in **nearly half** of America's tap water according to a US Geological Survey study. They are neurotoxic and linked to immune suppression and cancer.	PFAS/PFOS: **carbon block**
Chromium-6 (hexavalent)	Found in drinking water for all 50 states, **exposing up to 250 million people** (EWG). There is no safe legal limit and utilities are not required to test for it. It is linked to lung cancer and reproductive and developmental dysfunction.	Chromium-6: **reverse osmosis** or **ion exchange**
Metals: Lead & Arsenic	Arsenic, a known carcinogen, is from natural and agricultural runoff. Lead, a known neurotoxin, is found in old plumbing and water service lines.	Arsenic: **reverse osmosis** or **ion exchange**; Lead: **carbon**
Pesticides, Herbicides & Nitrates	Agricultural runoff includes atrazine, 2,4-D, and nitrates. They are neurotoxic, carcinogenic, and harmful to fetal/child development.	Pesticides**: carbon** Nitrates: **reverse osmosis**
Radiological Toxicants	Unstable radioactive elements like radium, radon, and uranium break down and get into our ground and tap water. Health effects include neurotoxicity, organ damage, cancer risk.	**Carbon** helps but **reverse osmosis** is best

UNDERSTANDING YOUR RISK

The Environmental Working Group (EWG.org) has an excellent resource to check the safety of your local water with their TAP WATER DATABASE. Their analysis uses safety standards based on the most up-to-date independent studies and flags contaminants that exceed their guidelines. It also includes recommendations for type of filtration.

INDEPENDENT TESTING FOR HOME WATER

Depending on contaminants identified above, or if you have well water, you may want to test your home drinking water before you determine the best water filtration option. NOTE: Well water

SimpleLab TapScore mytapscore.com	National Testing Laboratories watercheck.com	Cyclopure cyclopure.com
Municipal: From $180; Well: From $199; PFAS: From $299	Municipal: From $159; Well: From $159	PFAS: From $79 (tests for 55 PFAS analytes, more than other tests available)

PRIMARY WATER FILTRATION TYPES

ACTIVATED CARBON FILTRATION

- **TECHNOLOGY:** Activated carbon filters trap and remove contaminants as the water flows through it. It consists of activated carbon materials heated to create a porous structure.
- **PROS**: Effective filtration of many contaminants, including PFAS and larger microplastics.
- **CONS**: Effectiveness varies significantly based on flow rate and amount of carbon present.
- **TYPES:** Carbon filters are used in pitchers, under-the-sink and whole-house filter systems.

 **Block Activated Carbon**	 **Granular Activated Carbon**
• Used in more expensive filter systems • Compressed carbon increases filter effectiveness. Slower flow/greater surface area = **more trapped toxins** • Typically larger and longer lasting	• Used in less expensive filter systems • Spaces between granules decreases filter effectiveness. Faster flow/less surface area = **fewer trapped toxins** • Typically needs frequent replacement

REVERSE OSMOSIS (RO)

- **TECHNOLOGY**: Uses at least one block activated carbon filter, then it pushes tap water under pressure through a semipermeable membrane that blocks micro particles or contaminants.
- **PROS**: This is the **most effective filtration system at removing contaminants,** INCLUDING arsenic, hexavalent chromium, nitrates, fluoride, and nanoplastics.
- **CONS**: **It wastes water**. It can require 1 to 4 times the amount of water than it produces, and the extra water flows down the drain. **Newer, tankless models are much more efficient** with significantly less water waste**.** Minerals are removed and need to be added back to water for health. Standard RO systems need annual sanitization of the tank to prevent mold buildup.

FILTRATION SUMMARY BY TYPE

	GOOD	GOOD	BETTER	BEST
				
Type	Pitchers filters	Countertop filters	Under-the-counter filters (Not RO)	Under-the-counter or whole-house reverse osmosis (RO)
Filter Medium	Small filter, often carbon granules.	Medium filter, mix of carbon and micro/ultra filtration.	Typically 3 large multi-stage units with carbon block and other mediums	Multistage system with membrane to further reduce toxicants
Pros	Convenient for renters; effective for many toxins.	Convenient for renters; effective for many toxins.	**More effective** due to multiple types of filtration	**Most effective** at removing toxicants, including nanoplastics
Cons	**Most do NOT filter** chromium-6, arsenic, fluoride, nitrates, perchlorate OR nanoplastics.			**Wastes water** (newer models = more efficient).
	Filters $$$ Replace monthly	Filters $$ Replace 3 months	Filters $-$$ Replace 6-12 months	Filters $-$$ Replace 6-12 months

FILTER CERTIFICATION

Given the wide variety of water filtration options, **NAEM strongly recommends using a water filter that is certified by one of the following 3rd-party organizations**. Some companies say they are '3rd party tested to the NSF standards' - but are not actually certified. NSF certification requires extended use testing beyond the stated life of the filter. So 3rd party testing alone may not be as rigorous.

	Database	Certifications
NSF	NSF/ ANSI	• 42: **reduce** chlorine, odor and other **aesthetic** impurities • 53: **reduce** contaminants with a **health effect,** including metals, PFAS, and an extensive list of pesticides, herbicides and solvents. • 58: **specific to reverse osmosis**, effectively **reduce contaminants 96%+,** including arsenic, chromium-6, nitrates, radium, fluoride and perchlorate. • 177: specific to shower filters that **reduce** free available chlorine • 401: **reduce** emerging contaminants: microplastics, BPA and pharmaceuticals (note: does not require testing for nanoplastics)
	WQA	• Gold Seal: 3rd party verified to meet rigorous NSF industry standards • Note: Database also includes products that are NSF 53 certified
	IAPMO	• 3rd party testing to NSF 53 certification standards, focused on overseas production and plumbing and mechanical systems

PUBLISHED RESULTS FOR SOME HARMFUL TOXICANTS FOR SOME LEADING BRANDS

Click here to a summary chart of published results by toxicants for all recommended brands.

		GOOD	GOOD	BETTER	BEST
Note: Limited list, see full list at link above					
Based on 3rd Party Certification		Epic Pure Pitcher	Boroux Countertop	Aquasana Under Sink (not RO)	Waterdrop Tankless RO (under-sink)
Certification (link to data)	NSF Std	Certified NSF 42, 53, 401	Certified NSF 42, 401.	Certified NSF 42, 53, 401	Certified NSF 42 58.
Chlorine	42	98%	99%	97%	>98%
Chloramine	42	99%	98%	91%	>95%
PFOA & PFOS	53	98%	99%	99%	>99%
Lead pH6.5 & 8.5	53	>99%	99%	99%	99%
Mercury pH6.5 & 8.5	53	>91%	93%	95%	not tested
VOCs (includes long list)	53	>85%	>98%	99%	>98%
Pesticides & Herbicides	53	>98%	>98%	>98%	>98%
Atrazine	53	99%	99%	97%	97%
2,4-D	53	99%	99%	98%	98%
Trichloroethylene (TCE)	53	99%	99%	99%	99%
Arsenic	58	94%	does not remove		**99%**
Barium	58	93%			99%
Cadmium	58	97%			92%
Chromium Hexavalent	58	may reduce, but does not remove			**96%**
Copper	58	96%			91%
Fluoride	58	98%	*with added filter		88%
Nitrates/Nitrites	58	may reduce, but does not remove			**98%**
Radium	58	99%	99%		>94%
TDS	58		96%		>99%
Perchlorate	58	does not remove			99%
Microplastics (not nano)	401	99%	99%	99%	99%
Nanoplastics	NA	does not remove			**99%**
Bisphenol A - BPA	401	99%	96%	98%	91%
DEET	401			98%	94%
Ibuprofen	401	95%	96%	94%	92%

WATER FILTRATION RECOMMENDATIONS

BEST FOR HOMEOWNERS WHO CAN INSTALL A FILTRATION SYSTEM

UNDER THE COUNTER/REVERSE OSMOSIS

	Brand	Certified Removal	Benefits	Limitations	Cost
	Waterdrop G3P600 (tankless)	NSF 42, 58 &372 Certified:	Excellent filtration; less water waste (2:1 or 2 clean, 1 dirty)	Higher initial cost. Needs mineral attachment	$430 Ongoing: $145/yr
	Cloud RO (tankless)	NSF 58 Certified, 42, 53 tested not certified	Excellent filtration; less water waste (1:1 or 1 clean, 1 dirty)	High initial cost. Needs mineral attachment	$749 Ongoing: $200/yr
	Aquasana Smartflow RO	NSF 42, 53, 58, 401 Certified	Excellent filtration and remineralization, more affordable	High water waste - 1:4 (1 clean, 4 dirty); weak on nitrates (78%)	Initial: $180 Ongoing: $280/yr
	iSpring 5-stage RO	NSF 58 Certified	Excellent filtration, more affordable	High water waste: 1:4 (1 clean, 4 dirty); certified but results unposted	$229 Ongoing $160/yr

UNDER THE COUNTER/FILTRATION (Not Reverse Osmosis)

	Brand	Certified Removal	Benefits	Limitations	Cost
	Aquasana Claryum 3-Stage Max Flow	NSF 42, 53 and 401 Certified	Very good filtration. Retains healthy minerals, fast flow	Does not remove arsenic, fluoride, nitrates, radon, chromium-6, or nanoplastics	$225 Ongoing: $90/yr
Under the Counter - Uses Existing Faucet/Cold Water Only					
	Clearly Filtered with Affinity Filtration	Complies with NSF 42, 53, 401 and 473	Very good filtration. Reduces arsenic, fluoride, radon and chromium-6	NOT certified, but 3rd party tested. Does not remove nanoplastics	$495 Ongoing: $396/yr
	EpicWater Smart Shield	NSF 42, 53 and 401 Certified	Very good filtration. Uses existing faucet. 650 gallon capacity	Does not remove arsenic, fluoride, nitrates, radon, chromium-6, or nanoplastics	$129 Ongoing: $115/yr

Note: Clearly Filtered posts very impressive results and is 3rd party tested but NOT certified. It also tests well in other independent reviews so we did add them to our recommended list but will monitor.

BEST FOR RENTERS OR THOSE UNABLE TO INSTALL A FILTRATION SYSTEM

COUNTERTOP

	Brand	Certified Removal	Benefits	Limitations	Cost
	Boroux Legacy Water Filter Systems	NSF/ANSI 42, 401, 372 Certified	Very good filtration. Reduces fluoride, chromium-6, radium, and microplastics	Does not remove arsenic, barium, nitrates/nitrites, or nanoplastics	$349 Ongoing $166/yr
	AquaTru Carafe: 4-Stage Reverse Osmosis	NSF 42, 53, 58, 401 Certified	Excellent filtration (RO). Easy to use. 64 ounce capacity. glass pitcher	Wastes some water as it cleans (typical of reverse osmosis systems)	$400 Ongoing: $75/year
	Aquasana Clean Water Machine	NSF 42, 53, 401 Certified	Very good filtration. Plug and go. 64 ounce capacity	Does not remove arsenic, fluoride, nitrates, radon, chromium-6, or nanoplastics	$199 Ongoing: $140/yr
Note: NAEM does not recommend Berkey water filter units as their filters ARE NOT NSF CERTIFIED via a 3rd party lab. It also does not remove nitrates, arsenic, fluoride or hard minerals. See Tap Score Review.					

PITCHER

	Brand	Certified Removal	Benefits	Limitations	Annual Cost
	EpicWater Pure Pitcher	Exceed NSF 42, 53 & 401, (some, not all toxins tested)	Very good filtration. Good reduction of PFAS, arsenic, fluoride - although 3rd party testing is not certified for all toxin removal claims. Easy to use; good for renters	Does not remove chromium-6, nanoplastics, perchlorate, nitrates. **Filters need frequent replacement to maintain effectiveness**. This adds significant ongoing cost.	$79 Ongoing: $159/yr
	Zero Water 23 cup dispenser	NSF 42, 53 certified (some, not all toxins tested)			$38 Ongoing: $200/yr
	Clearly Filtered Water Pitcher	3rd party tested to NSF 42, 53 stds (some, not all toxins tested)			$100 Ongoing: $200/yr
Note: The Pitcher filters noted above are 3rd party tested and certified to exceed the NSF standards 42 and 53. **Importantly, most popular pitcher/dispenser filters (i.e. Brita and Pur) may be certified to NSF 42 and 53 for some contaminants but do not remove as many as the options recommended.** EWG has a review of Pitcher effectiveness on removing PFAS (GenX/PFAS) and 6 other contaminants.					

OTHER FILTRATION OPTIONS

FRIDGE: IN-LINE FILTERS BEFORE REACHING FRIDGE

	Brand	Certified Removal	Benefits	Limitations	Cost
	Clearly Filtered In-Line Fridge Filter	Certified to remove up to 99.99% of 232+ contaminants without removing minerals	Filters water BEFORE it reaches the fridge so used for ice and drinking; 365 gallon filter life	May be difficult to install. High ongoing cost.	$165 Ongoing: $150/yr
NOTE: Replacement filters used in most refrigerators are minimally effective. NAEM recommends using a 3rd party tested under-the-sink, counter, or pitcher filtration system. You can also tap your refrigerator water line to some under the sink RO systems with an adaptor (see Waterdrop RO)					

FAUCET-MOUNTED FILTERS

	Brand	Certified Removal	Benefits	Limitations	Cost
	PUR	NSF 42, 53, 401 Certified (some, not all toxins tested)	Uses existing faucet, filters up to 100 gallons or lasts 3 months. Affordable and good for renters.	Does not remove arsenic, fluoride, nitrates, radon, chromium-6, perchlorate or nanoplastics	$27 Ongoing: $50/yr
	Brita Elite	NSF 42, 53, 401 Certified (some, not all toxins tested)			$33 Ongoing: $60/yr
NOTE: Wingsol says it is NSF 42 & 53 certified but we could not find any specific results. Waterdrop is certified for NSF 42 (taste) but not 3rd party tested or certified for NSF 32 (health benefits)					

SHOWER & BATH

	Brand	Certified Removal	Benefits	Limitations	Cost
	Weddell Duo	NSF 42, 53, 177 & 372	Removes PFAS, microplastics, and chlorine	Shower filters focus primarily on removing chlorine and disinfectants (NSF 177 criteria) Some remove additional toxicants although benefits are not fully understood.	$90 Ongoing: $60/yr
	Aquasana Shower Filter	NSF 177	Reduces 90%+ of chlorine. Improves skin and hair feel.		$120 Ongoing: $120/yr
	Sante Bathtub Filter with KDF-85 Filter	Formulated with KDF-85 and catalytic carbon	Reduces hard disinfectants, heavy metals, algae, and bacteria		$70 Ongoing: $100/yr
Some shower and bath filters will use Vitamin C filters to remove chlorine and reduce chloramine.					

REPLACEMENT FILTERS:

Replace filters regularly, based on manufacturer's recommended timing for your water usage. IMPORTANTLY, **only purchase and use replacement filters certified by 3rd parties to be effective.** Aftermarket filters can save you money but they typically are not 3rd party tested and could be using less effective filtration materials. See the quality brands above and use their filters.

WATER DELIVERY OR BOTTLE WATER RECOMMENDATION

The challenge for water bottles and home delivery water is that you do not filter it any more, so any toxins that are in the water are consumed. Especially concerning is micro & nanoplastics.

- **Home/office water delivery:** Check the suppliers testing standards to make sure the water delivered is as clean as possible. Ideally, water should be cleaned with reverse osmosis prior to delivery. If able to get glass bottles, that is preferred over plastic bottles which can release micro and nano plastics into the drinking water.
- **Water bottles (single serve)**: Do not drink out of plastic bottles if possible - they have a lot of micro and nanoplastics in them. Use a stainless steel water bottle that you can refill with filtered water where you can trust the source.

NAEM RECOMMENDATION: While water delivery and single serve water bottles are convenient, it is best to use a reverse osmosis filter for your drinking and cooking water if possible. Our drinking and cooking water is one of the largest points of toxin exposure for most of us. The more you can reduce your exposure to toxins, the better your long term health.

RESOURCES

Environmental Working Group (EWG) Tap Water Database

- EWG Water Filter Guide
- EWG Standards by Toxicant

EPA Consumer Confidence Report - search for your local water utility's annual report

What you need to know about PFAS - by Water Quality Association

CANADIAN RESOURCES

Unfortunately the EWG Tap Water Database does not include Canadian locations. While there are national guidelines, standards are set by the Provinces. You can check your local water test results from the local government websites and compare the results to the EWG Standards by Toxicant.

- Per the 2006 report: ***The Water We Drink. An International Comparison of Drinking Water Quality Standards and Guideline*** by the David Suzuki Foundation, Canadian water quality standards are typically less stringent than Europe and the U.S.
- Similar to the U.S., many of the most concerning toxins are not even being tested. Micro & nanoplastics, PFAS, Chromium-6, pharmaceuticals are often found in our drinking water, so it is best to err on the safe side and **ALWAYS FILTER YOUR DRINKING & COOKING WATER**.