

## SILVER

Contaminant	In Water As	Maximum Contaminant Level
<b>Silver (Ag)</b>	Ag <sup>+</sup>	US EPA SMCL* = 0.1 mg/L WHO† Guideline = 0.1 mg/L
<b>Sources of Contaminant</b>	In soil as insoluble silver chloride (AgCl) and silver sulfide (Ag <sub>2</sub> S) Majority from use as a bacteriostat in water treatment devices	
<b>Potential Health Effects</b>	Argyria - discoloration of skin, hair, and various organs	
<b>Treatment Methods</b> <b>Point-of-Entry (POE)</b> <b>Point-of-Use (POU)</b>	Reverse osmosis Distillation Strong acid cation exchange (Na <sup>+</sup> )	
<p>*Secondary Maximum Contaminant Levels (SMCLs), or National Secondary Drinking Water Regulations (NSDWRs), are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.</p> <p>WHO† - World Health Organization</p>		

Biologically, silver is a nonessential, non-beneficial element to humans. There are no scientific studies to show adverse health due to its presence in drinking water from natural sources. However, because of its bactericidal abilities, silver is used as a water bacteriostat in carbon containing water filters. The silver is deposited onto the carbon granules to inhibit the growth of bacteria on the surfaces of these carbon particles. Such filters tend to leach out trace levels of silver into the effluent water. At anticipated concentrations, the ingestion of silver has no documented detrimental effect on humans.

## HEALTH EFFECTS

When ingested and absorbed, silver is held indefinitely within tissue, particularly skin, eyes, and mucous membranes. Skin discoloration is a cosmetic effect related to silver ingestion. This effect, called argyria, does not impair body function.

The U.S. Environmental Protection Agency has set a non-enforceable secondary standard for silver because of its ability to cause aesthetic discolorations of the skin or argyria. This mirrors the World

Health Organization set a guideline also at 0.1mg/L over a lifetime of exposure in drinking water. The Secondary Maximum Contaminant Level (SMCL) for silver is 0.10 (milligrams per liter) mg/L.

## TREATMENT METHODS

<b>Residential</b> <b>Point-of-Entry</b> <b>Point-of-Use</b>	Devices based on strong acid cation exchange, reverse osmosis and distillation either as POU or POE devices.
<b>Municipal</b>	Since silver is a non-enforceable secondary drinking water contaminant, it is rarely treated at the Municipal level.

Current technology suggests that several techniques may be used for removing the silver ion from drinking water including reverse osmosis, distillation, and cation exchange.

Reverse osmosis is capable of reducing the silver cation concentration by up to 90 percent of the influent water levels.

Distillation is capable of reducing the silver concentration by greater than 98 percent.

The treatment methods listed herein are generally recognized as techniques that can effectively reduce the listed contaminants sufficiently to meet or exceed the relevant MCL. However, this list does not reflect the fact that point-of-use/point-of-entry (POU/POE) devices and systems currently on the market may differ widely in their effectiveness in treating specific contaminants, and performance may vary from application to application. Therefore, selection of a particular device or system for health contaminant reduction should be made only after careful investigation of its' performance capabilities based on results from competent equipment validation testing for the specific contaminant to be reduced.

As part of point-of-entry treatment system installation procedures, system performance characteristics should be verified by tests conducted under established test procedures and water analysis. Thereafter, the resulting water should be monitored periodically to verify continued performance. The application of the water treatment equipment must be controlled diligently to ensure that acceptable feed water conditions and equipment capacity are not exceeded.

## REGULATIONS

The U.S. EPA sets unregulated Secondary Maximum Contaminant Levels (SMCLs) for contaminants that affect the aesthetics of drinking water but do not pose a risk to human health. Because SMCLs are federally non-enforceable, public water treatment facilities are not required to monitor them unless regulations at the state level require it. The federal SMCL for silver is 0.1 mg/L (or ppm), which means at or above these levels certain aesthetic effects could occur. Health Canada has not established any guidelines for silver due to the negligible health impacts from drinking water.

In the United States, water filters that make microbiological mitigation or reduction claims in product materials or marketing (including products that use silver) are regulated under the Federal Insecticide

## WQA Technical Fact Sheet

Fungicide Rodenticide Act (FIFRA). If the silver is protecting only the product itself, and does not make a public health claim, then the product may be exempted under the treated article exemption. Contact WQA for more information about this regulation.

## REFERENCES/SOURCES

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