

# Clothianidin and Drinking Water

*Clothianidin is a pesticide that has been found in groundwater in Minnesota. The Minnesota Department of Health (MDH) has developed a health-based guidance value for clothianidin in drinking water. Based on this new guidance, compared to levels currently found in drinking water, MDH does not expect clothianidin in drinking water to harm the health of Minnesotans.*

## Summary

Clothianidin is a neonicotinoid that is primarily used as a treatment on corn and soybean seeds. Clothianidin has been detected in Minnesota groundwater and surface water at levels below the guidance value developed by MDH. Drinking water is unlikely to be a main source of exposure to clothianidin. In animal studies, high levels of clothianidin caused changes in weight, development, and the reproductive system. Minnesotans are not likely to experience health effects from the levels of clothianidin found in the environment.

## Clothianidin

Clothianidin is a pesticide used on food and non-food crops, including corn, soybeans, leafy greens, and fruits, as well as on turf and residential areas. Clothianidin controls sucking and some chewing insects, such as aphids, thrips, and beetles. Clothianidin may be applied to plant leaves, soil, or seeds. Over the last decade, the use of clothianidin has increased dramatically throughout the Midwest.

Clothianidin is also a breakdown product of another neonicotinoid insecticide, thiamethoxam. Thiamethoxam is registered for use against a broad range of insects in agricultural crops and residential areas.

## Clothianidin in Minnesota Waters

The Minnesota Department of Agriculture (MDA) monitors surface water, groundwater, drinking water, and monitoring wells for many pesticides, including clothianidin. In 2014, the maximum concentration of clothianidin detected in groundwater was 0.51 parts per billion (ppb).<sup>1</sup> Clothianidin was detected in 11% of groundwater samples analyzed by the MDA. In surface water, clothianidin was detected at a maximum concentration of 0.26 ppb<sup>1</sup>. Concentrations and the frequencies of detection of clothianidin appear to be increasing slightly in Minnesota.

## MDH Guidance Value

Based on available information, MDH developed a guidance value of 200 ppb for clothianidin in drinking water.<sup>2</sup> A person drinking water at or below the guidance value would have little or no risk for health effects.

## Potential Exposure to Clothianidin

The most common exposure to clothianidin is through eating foods that contain small amounts of residues. The EPA has set limits on the amount of clothianidin residue allowed in various food products to reduce this exposure. Exposure can also occur through drinking water contaminated with clothianidin. Inhalation and skin exposures may occur after applying clothianidin, or after entering an agricultural field within 24 hours of clothianidin use on crops. In addition, seeds can be coated with clothianidin for agricultural use. These seeds can be toxic to mammals and may pose a health risk to humans if ingested directly.<sup>3</sup>

## Potential Health Effects

Drinking water containing clothianidin at levels higher than the guidance value may result in adverse health effects. Animal studies indicate that exposure to clothianidin at levels approximately 100 fold above MDH's water guidance affects body weight in pregnant rats and their offspring. At even higher doses, the female reproductive system can be affected.

## Using Clothianidin Safely

People who use clothianidin should follow product label directions and wear long-sleeved shirts, long pants, protective eyewear, and chemical-resistant gloves and shoes during spray application in order to reduce skin and inhalation exposure.

## Clothianidin in the Environment

Clothianidin enters the environment through regular agricultural use including coated seeds, spraying, and aerial application. Clothianidin may also enter the environment as a breakdown product of another neonicotinoid insecticide, thiamethoxam. Clothianidin may be present in or on plant tissues after any method of application. In soil, clothianidin may take months or years to break down.<sup>4</sup>

Clothianidin can be carried into surface water by storm water runoff, soil erosion, or spray drift. When exposed to sunlight, clothianidin breaks down quickly in surface water.<sup>4</sup> In groundwater, clothianidin can take several months to degrade.<sup>4</sup>

## Potential Environmental Impacts of Clothianidin

Clothianidin is toxic to aquatic organisms; especially invertebrates, like insects. Monitoring of surface waters in the state have detected the presence of clothianidin but not in concentrations expected to cause harm based on aquatic life benchmark values. Clothianidin and other neonicotinoid insecticides are highly toxic to bees and other pollinators.<sup>5</sup> The USEPA and the MDA is reviewing clothianidin and other neonicotinoid insecticides for their potential concerns to pollinators.

## Health Risk Assessment Unit

The MDH Health Risk Assessment Unit evaluates the health risks from contaminants in groundwater. MDH works in collaboration with the Minnesota Pollution Control Agency and the Minnesota Department of Agriculture to understand the occurrence and environmental effects of contaminants in water.

## References

1. Minnesota Department of Agriculture. 2014 Water Quality Monitoring Report. Accessed July 2015. <http://www.mda.state.mn.us/chemicals/pesticides/~media/Files/chemicals/maace/wqm2014rpt.pdf>
2. Minnesota Department of Health. 2016. Toxicological Summary for Clothianidin. <http://www.health.state.mn.us/divs/eh/risk/guidance/gw/clothtoxsumm.pdf>
3. US Environmental Protection Agency. 2003. Clothianidin pesticide fact sheet. Accessed July 2015. [http://www3.epa.gov/pesticides/chem\\_search/reg\\_actions/registration/fs\\_PC-044309\\_30-May-03.pdf](http://www3.epa.gov/pesticides/chem_search/reg_actions/registration/fs_PC-044309_30-May-03.pdf)
4. US National Library of Medicine. Hazardous Substances Data Bank. Searched "clothianidin". Accessed July 2015. <http://toxnet.nlm.nih.gov>
5. Rundlof M, Anderson GK, Bommarco R, Fries I, Hederstrom V, Herbersson L, et al. Seed coating with neonicotinoid insecticide negatively affects wild bees. *Nature*. 2015 May;521:70-80. Accessed January 2016. <http://www.nature.com/nature/journal/v521/n7550/pdf/nature14420.pdf>.