MONSANTO

Backgrounder
Glyphosate and Water Quality
Updated November 2014

Although glyphosate and its major metabolite aminomethylphosphonic acid (AMPA) have occasionally been detected in surface waters, glyphosate historically has not been included among herbicides that cause concern in water supplies. Since glyphosate and AMPA can readily be removed from water by conventional drinking water treatment methods (which include sand filtration and chlorination), it is highly unlikely that it would be detected in finished drinking water (Jönsson et al., 2013; Speth 1994). Because glyphosate binds tightly to most soils, it has a low potential to move through soil to contaminate groundwater (U.S. EPA 1993).

The World Health Organization reviewed water quality data for glyphosate and AMPA and stated:

> "Because of their low toxicity, the health-based value derived for AMPA alone or in combination with glyphosate is orders of magnitude higher than concentrations of glyphosate or AMPA normally found in drinking-water. Under usual conditions, therefore, the presence of glyphosate and AMPA in drinking-water does not represent a hazard to human health. For this reason, the establishment of a guideline value for glyphosate and AMPA is not deemed necessary.." (WHO 2005).

How glyphosate can enter surface water

Glyphosate can enter surface waters through three routes – direct application to aquatic vegetation, binding to soil that washes off treated terrestrial sites, or through drift from treated areas that are near water.

Specific glyphosate herbicides are used throughout the world to control emerged and floating vegetation in water. In the United States, Roundup Custom™ herbicide is registered for application to emerged vegetation in water; in other countries, other glyphosate brands have approval for aquatic uses. Only a very few herbicides have the environmental and toxicological properties that make them suitable for application over water. Because glyphosate is approved for the control of unwanted vegetation in aquatic environments, including sources used for drinking water, it is expected that the glyphosate might occasionally be detected in surface water.

From terrestrial applications of glyphosate herbicide, it is expected that a small amount of the applied glyphosate may enter surface waters through runoff or attached to soil particles that wash off treated fields. Glyphosate residues in water resulting from such wash-off are typically seasonal and dissipate over time. In lakes or streams, glyphosate will remain attached to soil and sediment particles, which either are filtered out by drinking water treatment plants or settle to the bottom of waterbodies. In sediment, glyphosate is degraded over time by microorganisms.

When glyphosate applications are made near water, it also is possible that a small percentage of the sprayed material may reach the water during application. Once in contact with surface water, glyphosate is removed via several mechanisms, include binding to sediment and microbial degradation (U.S. EPA 1993).

Glyphosate effects on the aquatic environment

Roundup Custom™ and other glyphosate herbicides approved for aquatic uses are designed for application to the exposed surfaces of emerged undesirable aquatic vegetation. Under normal use conditions, there is little likelihood that aquatic application would result in concentrations in the water that would adversely affect sensitive non-target vegetation (Perkins 1997). There also is little likelihood under normal use conditions that concentrations in the water would exceed levels that would result in unreasonable adverse effects to fish and other species of aquatic wildlife (including sediment-dwelling organisms) (Giesy *et al*., 2000).

In 2000, three internationally recognized experts in environmental toxicology published an ecotoxicological assessment of glyphosate (Giesy *et al.*, 2000). The authors wrote: "Glyphosate has been used extensively to control aquatic weeds and restore ecosystems affected by introduction of exotic weeds. During this period of use, there have been no documented cases of adverse effects on fish or aquatic invertebrates associated with glyphosate use for this purpose." Many wildlife organizations and state departments of conservation have used glyphosate herbicides to restore aquatic habitats (for example, in the Florida Everglades to remove invasive melaluca).

Drinking water standards

In the United States, the Environmental Protection Agency (EPA) has established a federal drinking water standard known as the Maximum Contaminant Level (MCL) for selected pesticides. This is the dose that is deemed protective of public health if people were to consume that dose every day of their life. The establishment of an MCL for a pesticide does not imply that detections in drinking water are expected. Even though drinking water standards are in place, glyphosate detections in drinking water are not expected. Glyphosate binds to soil particles, including particles suspended in water which can be removed readily by filtration during water treatment processes. In addition, routine water disinfection processes such as ozonation and chlorination effectively remove glyphosate from water. Therefore, surface water that is used as a source for drinking water can be effectively treated to remove any glyphosate that may be present (Speth 1994; Jönsson et al., 2013). For glyphosate, the MCL is 700 parts per billion (ppb, or micrograms/L) (U.S. EPA Office of Ground Water and Drinking Water 2002). The California Environmental Protection Agency has established a higher glyphosate standard of 9000 ppb (California EPA 2007). The EPA MCL, which is very high compared to most other pesticides, was set at a high level based on laboratory tests that demonstrated that glyphosate has very low acute and chronic toxicity to mammals and is not carcinogenic.

In Europe, the drinking water standard for any pesticide has been set at 0.1 ppb. This is not based on scientific toxicological testing, but instead is a regulatory standard for all pesticides, regardless of the toxicological profile. Even with such a low limit (9,000 times more restrictive than the California standard), there have been no confirmed instances of glyphosate in excess of the standard in finished drinking water.

References

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