Review of the Use of Atrazine and Its Occurrence and Control in Drinking Water

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Atrazine, a chloro-*s*-triazine, is one of the most frequently applied herbicides in the agricultural sector. In the United States, it is the most widely used pesticide in crop production with an annual usage of 30,000 metric tonnes. It is a selective herbicide used predominantly on corn crops for the control of broadleaf weeds. It is also widely applied for total weed control on non-crop areas. Due to its widespread use, atrazine is ubiquitous in surface and groundwaters. The European Commission has labelled atrazine as one of the 33 priority substances of major concern in European waters to be monitored under the Water Framework Directive (2000/60/EC). Detections of atrazine in drinking water systems range from trace levels to as high as 40μg/L.

Atrazine has been implicated as an endocrine disrupting chemical. It has been observed that male frogs have developed female reproductive organs from atrazine exposure. Furthermore, it has also been linked to other abnormalities: in salmonids, it affects the olfactory neurons. The USEPA has classified atrazine as not likely to be carcinogenic to humans with the International Agency for Research on Cancer determining that atrazine is not classifiable as to its carcinogenicity to humans. Nevertheless, in humans, atrazine has been linked to cancers, such as ovarian and non-Hodgkins Lymphoma and reproductive and developmental health effects, such as the interruption of regular hormone function, reproductive tumors, birth defects and weight loss in mothers and embryos (Donna et al., 1989, Zhou et al., 2006).

The maximum acceptable concentration for atrazine in drinking water varies significantly from agency to agency ranging from the European Union's standard of 0.1μg/L for individual pesticides to Health Canada's Interim Maximum Acceptable Concentration of 5μg/L.

Conventional drinking water treatment processes do not remove atrazine from water. Although granular activated carbon (GAC) is designated as the best available technology (BAT) for removing atrazine from water, tertiary treatment systems such as GAC, ozone, powdered activated carbon, membranes and biofiltration were found to be only partially effective in removing the herbicide.

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This paper provides a review of the use of atrazine, the relationship between its application and detection in drinking water, guidelines and standards governing maximum acceptable concentrations and the underlying principles defining the different standards and guidelines. A discussion on the efficiencies of various treatment technologies for the removal of atrazine from water is provided.

Author Biography

Suzanne Lazorko-Connon owns her own environmental consulting firm where she works as an independent consultant. She holds Bachelor degrees in French and Engineering and is currently completing her thesis for a Masters in Environmental Engineering. Suzanne's passion for protecting the environment is reflected in her interests which include pollution prevention, the fate of contaminants in water and wastewater treatment plants and the use of innovative technologies for contaminated site remediation.