

**HERBICIDE DEGRADATES PROVIDE INSIGHT TO SPATIAL AND TEMPORAL DISTRIBUTION OF HERBICIDES IN GROUND WATER**

\*Kolpin, Dana, W.<sup>1</sup> Schnoebelen, D.J.<sup>1</sup>, Thurman, E.M.<sup>2</sup>

<sup>1</sup>*U.S. Geological Survey, 400 S. Clinton Street, Iowa City, Iowa 52244*

<sup>2</sup>*U. S. Geological Survey, 4821 Quail Crest Place, Lawrence, Kansas 66049*

**ABSTRACT**

Research has shown that herbicide degradates are prevalent in ground water, often being more frequently detected than their parent compounds. Thus, obtaining data on both herbicide parent compounds and their primary degradates is important for understanding the fate of herbicides in the hydrologic system. Since 1995, a network of Iowa municipal wells, representing all major aquifer types (alluvial, glacial drift, bedrock/karst region, bedrock/nonkarst region), have been repeatedly sampled for a broad suite of herbicide compounds. This dataset is ideal for documenting the insight that herbicide degradates provide to the spatial and temporal distribution of herbicides in ground water. During 2001, 86 municipal wells in Iowa, were sampled and analyzed for 21 herbicide parent compounds and 24 herbicide degradates. A significant difference in the results among the major aquifer types was determined only when both herbicide parent compounds and their degradates were considered. In addition, including herbicide degradates greatly improved the statistical relation to the age of the water being sampled. When herbicide parent compounds are considered, only 40% of the wells lacking a detection could be explained by the age of the water pre-dating herbicide use. When herbicide degradates were also considered, however, 80% of the wells lacking a detection could be explained by the age of the water pre-dating herbicide. A temporal pattern in acetochlor and alachlor concentrations in ground water (comparing samples collected from 1995 and 2001) could only be identified when their degradates were considered. These concentration patterns corresponded to the dramatic changes that have occurred in the annual use of acetochlor (increase) and alachlor (decrease) over the past decade.

**KEYWORDS:** Herbicides, ground water