

## **IMIDACLOPRID**

### **1-((6-chloro-3-pyridinyl)methyl)-N-nitro-2-imidazolidinimine**

#### **General**

Imidacloprid is a relatively new insecticide which is the first insecticide of its chemical family, nicotinoids, which are modelled after nicotine, to be registered for use. Common trade names include Merit™, Admire™, Premise™, Pre-Empt™ and Advantage™.

#### **How It Works**

Imidacloprid because of its shape fits into the receptors meant to receive acetylcholine, which carries nerve impulses from one nerve cell to another. By blocking these acetylcholine receptors an excess of acetylcholine accumulates causing paralysis and eventual death.

#### **Acute Health Effects**

Effects of exposure to imidacloprid include apathy, difficulty breathing, loss of the ability to move, staggering, trembling and spasms. Studies on rats indicate that the thyroid is particularly sensitive to exposure of imidacloprid causing thyroid lesions.<sup>1</sup>

#### **Chronic Health Effects**

There are no publicly available chronic studies of commercial imidacloprid products. This is of concern because the absence of proof by no means indicates the absence of harm. Long term studies should be completed on a pesticide before it comes onto the market and such studies if they exist, they should be publicly available.

We do however know that imidacloprid affects reproduction in a variety of ways. In pregnant rabbits, imidacloprid fed between the sixth and eighteenth days of pregnancy caused an increase in the number of miscarriages and an increase in the number of offspring with abnormal skeletons.<sup>2</sup> Imidacloprid exposed rats gave birth to smaller offspring.

#### **Environmental Effects - Wildlife**

Imidacloprid is toxic to birds and wildlife and mildly toxic to fish. Imidacloprid use has been linked to eggshell thinning in birds<sup>3</sup>, reduced egg production and reduced hatching success at exposures of 234ppm in food.<sup>4</sup> It is highly toxic to certain species including the house sparrow<sup>5</sup>, pigeon, canary and Japanese quail<sup>6</sup>.

#### **Environmental Effects – Beneficial Insects**

Imidacloprid is an insecticide, so it is not surprising that it is toxic to many beneficial insects such as honey bees to which imidacloprid is highly toxic.<sup>7</sup> Imidacloprid is acutely toxic to earthworms with an LD50 of between 2 and four parts per million in soil.<sup>8</sup> While extremely low doses of 0.2ppm and 0.5ppm have been shown to cause deformed sperm<sup>9</sup> and DNA damage respectively.

Imidacloprid has shown to severely limit the mobility of lady beetles,<sup>10</sup> as well as other predatory insects such as marid bugs and lacewings.<sup>11</sup> After marigolds were treated with the imidacloprid insecticide Admire, to kill spider mites, spider mite damage increased because the insect natural enemies of the spider mites were killed off by the imidacloprid.<sup>12</sup>

## Environmental Effects – Water Contamination

Imidacloprid has a high potential of leaching into groundwater. Although its persistence varies from the shortest half life of 107 days to concentrations which didn't begin to decline until over a year after use,<sup>13</sup> there is little question about imidacloprid's tremendous ability to move through soil.<sup>14</sup> Compared with 11 other popular pesticides Imidacloprid moved more quickly through soil than any of the other pesticides tested.<sup>15</sup> The other 10 pesticides tested included diazinon, chlorpyrifos and diuron which are widespread water contaminants.<sup>16</sup> It is classified by the EPA in category I as having the highest leaching potential.

## Inerts

Commercial imidacloprid, and many other pesticides have inert ingredients that do not undergo toxicity studies prior to the regulation of the product, and little information is available. However, additives that have been shown to be found in imidacloprid including: two proven carcinogens crystalline quartz silica and naphthalene.<sup>17,18</sup>

## Conclusions

Imidacloprid has been shown to cause acute health effects, including spasms, and thyroid lesions. No chronic toxicity tests have been made available to the public, but we do know that it has effects on mammalian reproduction. The reproductive health of birds is also affected with reduced egg production, and egg thinning. It affects a multitude of beneficial insects, as well as earthworms.

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## Reference

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- <sup>14</sup> U.S EPA Environmental Fate and Groundwater Branch. 1993. EFGWB review of imidacloprid. Washington, D.C. Jun 11, p. 3.
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- <sup>16</sup> U.S. Geological Survey. 1999. The quality of our nation's waters-nutrients and pesticides. Circular 1225. Reston, VA:USGS. P. 60.
- <sup>17</sup> International Agency for Research on Cancer. 1997. Silica. <http://193.51.164.11/htdocs/Monographs/Vol68/SILICA.HTM>
- <sup>18</sup> National Toxicology Program. Undated. Toxicology and carcinogenesis studies of naphthalene (CAS No. 91-20-3) in F344/N rats (inhalation studies). TR-500.