



# Chlorpyrifos Factsheet

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## What is chlorpyrifos?

Chlorpyrifos is an organophosphate insecticide used in agriculture primarily on cotton, oranges, corn, and almonds, among many other crops. Also known as Lorsban (agricultural use products), among other trade names, and manufactured predominantly by Dow AgroSciences, chlorpyrifos is one of the most widely used insecticides in the U.S. Nationwide in 2001 (prior to the cancellation of residential uses) US EPA estimated that 11–16 million pounds of the insecticide were used, second only to malathion for insecticide use.<sup>1</sup>

Chlorpyrifos was widely used in homes as a residential insecticide (under the trade name Dorsban) through 2005 when its phaseout for those uses was completed—the result of a U.S. Environmental Protection Agency regulatory decision based primarily on its hazards for children.<sup>2</sup> Although some agricultural uses were altered by this phaseout agreement—to reduce residue levels in harvested produce, agricultural use remains high. In California in 2004, 2.3 million pounds of chlorpyrifos were reported sold.<sup>3</sup>

## Exposure to chlorpyrifos

People can be exposed to chlorpyrifos by direct dermal contact, contact with treated surfaces, ingestion of chlorpyrifos contaminated dust, and by breathing air inside or outside treated buildings or near fields where it was applied. Exposures also result from eating food contaminated with chlorpyrifos residues.<sup>4,5</sup> Contact with flea collars containing chlorpyrifos can also lead to exposure.

Chlorpyrifos is found in particularly high levels in children. Data from the Center for Disease Control and Prevention (CDC) showed that 93% of U.S. residents sampled between 1999 and 2000 had chlorpyrifos in their bodies. Children (6–11 years) showed levels almost twice as high as those of adults. Chronic exposure levels were 4.6 times the “acceptable” level for children and 3.0 times the “acceptable” level for youth (12–19 years).<sup>6</sup>

## Health Effects

Organophosphate pesticides’ most well-known and documented effects are their inhibition of an enzyme (acetyl cholinesterase), necessary for proper transmission of nerve impulses.<sup>7</sup> Symptoms of low-dose exposure may include headaches, agitation, inability to concentrate, weakness, tiredness, nausea,

diarrhea and blurred vision. At higher doses, abdominal cramps, vomiting, sweating, tearing, muscular tremors, pinpoint pupils, low blood pressure, slow heartbeat and difficulty breathing may be observed.<sup>8</sup>

The Association of Occupational and Environmental Clinics (AOEC) lists all organophosphates generally and chlorpyrifos specifically as capable of causing asthma in previously unaffected individuals.<sup>9</sup> Exposure can also exacerbate asthmatic symptoms in individuals who already have the disease.

In addition to acute symptoms, many recent studies indicate that low-level exposure to chlorpyrifos interferes with the development of the mammalian nervous system.<sup>10</sup> Neural cell replication and differentiation are both affected, with a reduction in the number of neural connections observed in exposed rats.<sup>11</sup>

Human epidemiological studies on pregnant women exposed to chlorpyrifos through involuntary home pesticide use demonstrate a link between *in utero* exposure to chlorpyrifos and low birth weights and reduced head circumference of newborns. These effects were most significant for individuals whose genetic makeup is such that they produce low levels of PON1, the enzyme responsible for detoxifying chlorpyrifos in the body.<sup>12</sup> Chlorpyrifos is also a suspected endocrine disrupting compound; moderate doses have been shown to alter hormone levels in animal studies.<sup>13</sup>

In addition to heightened vulnerability to chlorpyrifos because of their developing nervous systems, children are likely to be exposed to higher levels of chlorpyrifos than adults for several reasons. Children eat, breathe, and drink more per pound of body weight than adults. Children also play on the floor and in the grass where pesticide residues collect; and they exhibit hand-to-mouth behaviors that increase their potential for exposure.

While the U.S. EPA lists chlorpyrifos as providing evidence of no carcinogenicity, recent studies suggest possible links to both lung<sup>14</sup> and prostate<sup>15</sup> cancer.

## Chlorpyrifos is a significant air pollutant

Chlorpyrifos is a semi-volatile chemical that readily leaves in gas form from leaf and soil surfaces to

become airborne, especially when outdoor temperatures are high. A study done in July and August 2004 and 2005 in Lindsay, California, demonstrated the presence of chlorpyrifos in the air near homes in this agricultural community. Over 100 air samples were collected near homes and three-quarters of the samples had detectable levels. Eleven percent of the samples were above the levels determined to be “acceptable” for a 24-hour exposure by children. The highest concentration observed was nearly eight times the allowable level.<sup>16</sup> Air monitoring studies conducted by the California Air Resources Board also indicated the potential for high exposures in areas near application sites.<sup>17</sup>

## Ecological Effects

Chlorpyrifos is moderately to very highly toxic to birds, honeybees, fish, and aquatic organisms. According to the EPA, just a single application of chlorpyrifos poses a risk to small mammals as well.<sup>18</sup> It is a persistent chemical that accumulates in the tissue of aquatic organisms and has a half-life in soil ranging from 60 days to one year depending on climate and soil type.<sup>19</sup>

*Revised October 2006*

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