

**Integrated Pest Management (IPM) Learning Module Fact Sheet**

**Introduction to Toxicology**

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Toxicology is the study of poisons and is one of the oldest of the sciences that man has studied, primarily because it involves people getting sick and people dying.

The Father of Toxicology is Theophrastus Phillipus Auroleus Bombastus von Hohenheim (1493–1541), or Paracelsus. It was Paracelsus who made the observation that all things can be poisonous, it is a matter of dose that determines if something is a poison.

**There are many ways that we can come in contact with a poison, but the three routes of exposure are:**

Penetration through the Skin (Dermal Entry)

Absorption through the Lungs (Inhalation)

Passage across the walls of the Gastrointestinal Tract (Oral)

**We also consider the duration of exposure, the two primary terms used are:**

Acute Toxicity, which is the ability of a substance to do systemic damage as a result of a one-time exposure of relatively short duration.

Chronic Toxicity, which is the harmful systemic effects, produced by long-term, low-level exposure to chemicals, chronic toxicity is a far more complex issue.

Pesticides are considered economic poisons, they are specifically designed to kill things, in this case a pest, so there is an optimal dose, or amount that when applied will effectively control (kill) the pest.

One of the primary ways to indicate how toxic a pesticide is, is the term LD<sub>50</sub>. LD stands for Lethal Dose, and the subscript <sub>50</sub> is a term that describes the dose that kills 50 percent of the population. The smaller the LD<sub>50</sub>, the fewer the mg of chemical/kg of body weight will be required to kill the animal. Conversely, the larger the LD<sub>50</sub>, the lower the acute toxicity. So we can look at an LD<sub>50</sub> level and use it to compare the relative toxicity between two compounds that we might be considering for pest control. We can say that LD<sub>50</sub> and acute toxicity are inversely related, meaning the smaller the LD<sub>50</sub>, the fewer the mg of chemical/kg of body weight will be required to kill the animal. Conversely, the larger the LD<sub>50</sub> the lower the acute toxicity.

The most common way to contact chemicals is dermally. But the skin is a highly effective barrier to chemicals. We have about 20 sq. ft. of skin. The second most common route is via inhalation. Lungs are a poor barrier to chemicals. We have about 750 sq. ft. of lung surface.

Pesticides and other toxins are evaluated on animal species to help determine their risk to humans, animal species include: mice, rats, dogs, monkeys, chickens, and fish. Because of the species differences and obvious life span difference we use safety factors to develop conservative (protective) risk numbers to apply to human health and safety.

The US EPA has a valuable resource on pesticide toxicity and safety, it can be found at:

<https://www.epa.gov/safepestcontrol>