Pesticide 101

Pesticides are, by their very nature, poisons.

During the World War II era, biocides were created through chemical warfare research. After the war, the chemical industry sought to recoup the money spent on research and development. It was found that these chemicals worked effectively against insects, weeds and fungal pathogens. The new chemicals were first marketed to the agricultural sector, and then to homeowners.

The United States Environmental Protection Agency (US EPA) began operation at the end of 1970. The mission of the EPA is to protect human health and the environment and we count on the EPA to regulate pesticides to do just that. Some are under the assumption if a pesticide is on the market then it must be safe, however EPA registration does not signify pesticide safety.

Pesticide law defines a pesticide as "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest; any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant; and any nitrogen stabilizer." "Pesticide" is an umbrella term that includes any chemical that kills plants (herbicides), insects (insecticides), rodents (rodenticides) and fungus (fungicides).

The American Academy of Pediatrics' (AAP) 2012 report, Pesticide Exposure in Children, describes pesticides as "inherently toxic," stating, "Epidemiologic evidence demonstrates associations between early life exposure to pesticides and pediatric cancers, decreased cognitive function, and behavioral problems." The AAP report recommends that government decision-makers create policies that, "Advance less toxic pesticide alternatives," and "Support research to expand and improve IPM in agriculture and nonagricultural pest control."

The U.S. General Accounting Office (GAO) found that lawn care pesticide risks remain uncertain and the "EPA had taken few formal enforcement actions against safety claims. GAO concluded that EPA had made limited use of its authority over unacceptable advertising safety claims and recommended that EPA take steps to strengthen and improve its program for regulating such claims." Additionally, the New York and Pennsylvania Attorneys General have charged various pesticide manufacturers with misleading advertising and prohibited safety claims.

If these products aren't safe, why are they available for use?

Registration of synthetic pesticides

The US EPA is responsible for pesticide registration. This registration does not constitute an approval rating or safety claim of any sort – nor does it guarantee that the chemicals have been fully tested for environmental and human health effects. In fact, of the 36 most commonly used lawn care pesticides registered before 1984, only one has been fully tested and evaluated - sulfur. Health effects of these 36 lawn pesticides show that: 14 are probable or possible carcinogens, 15 are linked with birth defects, 21 with reproductive effects, 24 with neurotoxicity, 22 with liver or kidney damage, and 34 are sensitizers and/or irritants.

The total pesticide formulation consists of the active ingredient(s) and "other ingredients" called inert ingredients. Only the active ingredient is required to be listed on the product label. Inert ingredients are not required to be listed on the label, and in most cases, the content percentage of the inert ingredients is much higher than the active ingredient(s). Additionally, a single inert ingredient may have a higher toxicity level than the active ingredient(s) and because of the lack of disclosure, there is simply no way to know what is in the synthetic pesticide.

To register a synthetic pesticide, the EPA only

requires a 90-day scientific study from the manufacturer of the new active ingredient(s) alone, not the total formulation. In other words, the toxicity of a synthetic pesticide is not studied for all the ingredients combined. Peer-reviewed independent science has shown the toxicity of the total formulation can be up to 1,000 times more than the active ingredient alone. Furthermore, the EPA does not conduct any scientific studies of their own, nor do they consider independent peer-reviewed toxicity scientific studies of the active ingredient or the total formulation.

A synthetic pesticide is allowed to be sold to the public without studying long-term exposure to humans and environment. Historically, this has had disastrous end results as made evident by the widespread use of DDT in the 1960s, and more recently glyphosate, the most commonly used synthetic herbicide in the world and the active ingredient in Roundup®. The FDA, EPA and Department of Agriculture's priority is to prevent acute poisoning within a few days, but they do not consider the long-term effects of pesticide exposure. They do not consider what will happen to a child in 20 years after pesticide exposure. In fact, they ignore those long-term effects.

While the US EPA does not conduct their own studies or require independent peer reviewed studies on a pesticide's total formulation, they also do not require any studies on pesticides used in combination. Frequently, more than one pesticide product is applied on a given area at one time. For example, it is common to apply a pre-emergent, a non-selective and a selective herbicide on the same day at the same location. This combination of pesticide application is often a recommended protocol by the chemical industry, yet the impacts on human and environmental health of pesticides used in combination are not regulated.

Pesticide bioaccumulation: half-life defined

The more pesticides are applied, bioaccumulation of the toxic substance occurs and the longer it takes for the pesticide to be removed from the environment. How long a pesticide stays in the environment is described by the half-life. The definition of a half-life is the time it takes for the pesticide to decay to half its original concentration. The half-life for a pesticide is a range of time and varies depending on environmental conditions. An average of these various conditions is used for the manufacturer to determine a pesticide's half-life. As an example, a pesticide label indicates the product has an average half-life is 40 days. After 40 days, one-half of the pesticide is present in the environment, after another 40 days, one half of that amount is present and so on. In this example, with only one application, it takes a little over 200 days for the pesticide to be eliminated from the environment. If the pesticide is continuously applied in the same location before the 200-day complete breakdown, we can make the deduction that their persistence in soil will be permanent.

Pesticide label and signal word

According to federal law, the labeling requirements for a registered pesticide "establishes four Toxicity Categories for acute hazards of pesticide products" and is identified as the signal word. It's important to emphasize that the signal word category is based on acute (short-term), not chronic (long-term) exposure. The four categories are Danger, Warning, Caution and Caution (lower toxicity rating than caution requirements must default to caution). Because the EPA does not require scientific testing past 90-days, chronic exposure risks are not considered, which is why the signal word only signifies immediate and direct impact with pesticide contact.

Certified organic and 25b exempt pesticides

Organic pesticides have much stricter guidelines. Certified organic pesticide ingredients, active and inert, must be on the Minimal Risk Inert Ingredient list. The ingredients on the list are not new to the market and have been deemed low toxicity risk. The USDA defines who governs the ingredients on the list as, "The National Organic Standards Board (NOSB) is designed by law to advise the

National Organic Program (NOP) on which substances should be allowed or prohibited. Made up of dedicated public volunteers appointed by the Secretary of Agriculture, board members include organic growers, handlers, retailers, environmentalists, scientists, USDA-accredited certifying agents and consumer advocates."While an organic pesticide may have a higher signal word category, most likely the active ingredient will not cause long-term adverse health and environmental effects.

25b exempt pesticides pose an even lesser threat to human and environmental health.The EPA allowed ingredients are considered minimum risk. Minimum risk 25b exempt products do not require EPA registration and all active and inert ingredients must be disclosed on the label.

While it is ideal to not apply any chemical, we understand the complete elimination of all pesticides is not a reality. However, elimination of synthetic pesticides is both reasonable and achievable. If the EPA registration process is loose at best, how do we protect ourselves, our pets and the environment from toxic exposure? The easiest solution is for us as individuals to avoid synthetic pesticides by implementing the precautionary principal.

Definition of the Precautionary Principle

The Precautionary Principle is a strategy to cope with possible risks where scientific understanding is yet incomplete, such as the risks of systemic insecticides and the synergistic toxicity of pesticide mixtures.

The Precautionary Principle is defined as follows:

When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. Morally unacceptable harm refers to harm to humans or the environment that is

- ***threatening** to human life or health, or*
- ***serious** and effectively irreversible, or*
- ***inequitable** to present or future generations, or*
- ***imposed** without adequate consideration of the human rights of those affected.*

The judgement of plausibility should be grounded in scientific analysis. Analysis should be ongoing so that chosen actions are subject to review. Uncertainty may apply to, but need not be limited to, causality or the bounds of the possible harm.

Actions are interventions that are undertaken before harm occurs that seek to avoid or diminish the harm. Actions should be chosen that are proportional to the seriousness of the potential harm, with consideration of their positive and negative consequences, and with an assessment of the moral implications of both action and inaction. The choice of action should be the result of a participatory process.

Informed stakeholders have created an increasing demand for practices that are sustainable and protective of public health and the environment.The goal to eliminate synthetic pesticides from the landscape can be reached with knowledge and proper training in organic land care.