Safeguards and Science: What we can learn from Canada's process for unpacking new pesticides

By David Pinzon

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David Pinzon grew up in Bogota, Colombia and moved to Canada in 2009 with his wife to study for a PhD at the University of Alberta. David dedicated 12 years of his life to becoming a scientist. "I have the pleasure to see the huge amount of scientific support needed to prove GMOs and pesticides are safe for humans and the environment, so I can pass along my knowledge to those that are eager to learn."

Every day, with virtually everything we do, we are exposed to risk.

Crossing the street, brushing our teeth and drinking coffee, all come with varying degrees of hazard. This is why we wait for cars, spit out our toothpaste and limit our caffeine intake. In fact, managing our exposure to activities and substances that are potentially harmful is simply part of life.

And yet, virtually all substances have the potential to cause harm. Even water, in certain amounts, is lethal. The dose dictates the poison!

So, when a system classifies substances based exclusively on their hazard or risk, that system ignores the most important factor – the degree to which we are exposed. The International Agency for Research on Cancer (IARC) cancer classification, for example, virtually disregards exposure amounts or limits when labeling carcinogenic substances or activities.

On the other hand, the Canadian Government regulates medications and pesticides with the understanding that everything comes with associated risk. The Pest Management Regulatory Agency (PMRA), an entity within Health Canada, determines whether a pesticide product can be used safely, based on the amount that is necessary to control the pests. They then establish limitations on how the product should be used, so that both humans and the environment are thoroughly protected.

As a PhD scientist, my role is to understand 'the science behind the agricultural practices.' So, joining the regulatory team at Corteva Agriscience in 2014 was a great fit for me.

Of course, as a scientist, I was also very curious how a big corporation operates. Is their science reliable? Who works there? Do farmers have a choice, or are they being forced to use their technologies?

The good news is that scientists like me at Corteva are held to the same ethical standards as the scientists I worked with at the university-research level. Remember, to earn a PhD, it takes at least 11 years of university studies.

There is nothing more valuable to scientific advancement than a scientist's integrity, which can only be achieved by conducting studies in the most ethical and transparent manner.

The public wants to know more about the food they eat. Where does it come from? Who's growing it? How is it being grown? And they are exposed to multiple sources of information that are driving their eating habits. This is an incredible opportunity for farmers who want to help the public understand what they do, how they do it and why. To help inform the public, you must understand how PMRA assesses the safety of pesticides.

It takes approximately 10 years to come up with a new pesticide that's unique, beneficial to farmers, safe to humans and safe to the environment. This is not an easy task. Especially when you consider that our chemistry and biology scientists begin the process choosing from more than 100,000 possible chemicals to end up with one or two that meet or surpass the criteria.

Once the thoroughly researched chemical candidates are chosen to become products, further studies are conducted to determine the pest it controls. Tests are also conducted to assess the optimal application rates

and its safety to humans and the environment, based on the proposed application patterns and volumes.

Overall, it takes nearly 150 separate studies to assess the safety and efficacy of a chemical product. This is a huge investment for innovator companies.

PMRA, as other agencies around the world, evaluates the safety and integrity of a chemical pesticide product by several types of studies in the scientific areas of:

- **Chemistry.** Farmers can be reassured that what's in the package will work as expected.
- **Toxicology.** Any chemical – even water or coffee – has the potential to cause negative effects if a person is overexposed. For pesticides, PMRA wants to know the safe amounts everyone in the population can be exposed to in the short and the long term.
- **Occupational exposure.** Based on the proposed label uses, PMRA assesses exposure to the applicators and bystanders. Then, the personal protective equipment and the re-entry time are established, which provide instructions on how to apply the product safely.
- **Environmental toxicology.** Crops are not isolated environments. There may be animals visiting the field, or a natural forest may be near. To assess the potential effect of the pesticide to non-target species, PMRA uses worst-case scenarios to test environmental toxicology (for example, a bird feeding exclusively from a field that has been treated).

- **Residues.** Once a pesticide is sprayed, it acts on the pest and then starts to degrade. PMRA assesses studies that show how much pesticide residues there are on the crop at different times after spraying and up to harvest. PMRA then establishes the maximum residue limit (MRL) – the amount of pesticide residue that is acceptable and expected when the label is followed.
- **Environmental fate.** PMRA needs to understand how long it will take for the product to dissipate or breakdown and how the product moves in soil, water and air. Considering the physical and chemical characteristics of the compound, PMRA can establish the fate of the product once it is sprayed.
- **Value.** Any label claim (such as this product controls unwanted pests) must be demonstrated through field trials before it can be approved by PMRA. The rate that is used to control a pest must be enough for consistent control but cannot be more than is needed.

Pesticides are one of the most regulated chemicals on the planet. Many studies from several different scientific areas are reviewed by regulatory agencies before a pesticide is considered for registration. We can be confident that registered pesticides can be used safely, while bringing tremendous benefits to the environment, producing more on less land. Pesticides also make good economic sense, keeping food prices low, and ensure that farmers have the right tools to grow their crops.