Data Drives the Label:
Understanding Restricted Entry & Harvest Intervals

***Kristy Grigg-McGuffin**, OMAFA Horticulture IPM Specialist*

I'm sure every grower has experienced the brain teaser of a product label: a 12-hour restricted entry interval (REI) paired with a 7-day preharvest interval (PHI). Or even more confusing, a 3-day REI alongside a 1-day PHI.

At first glance, that can feel inconsistent. If residues are low enough for harvest, why can't workers re-enter sooner? And in other cases, why can workers safely re-enter well before fruit can be picked?

The answer lies in the science behind pest control product regulation. These intervals aren't meant to match – they're derived from **fundamentally different risk assessments** to address distinct exposure scenarios and toxicological endpoints.

Two Intervals, Two Risks

Restricted Entry Interval (REI)

The REI is the minimum time that must pass before workers can re-enter a treated orchard without personal protective equipment (PPE).

Its purpose is to mitigate **occupational exposure** – people pruning, thinning, scouting, fixing irrigation, or other routine tasks where exposure to a chemical could occur through skin contact (dermal exposure) or breathing in residues (inhalation).

Preharvest Interval (PHI)

The PHI is the minimum time between the last application and harvest.

Its purpose is to protect **consumers**, ensuring that pesticide residues on fruit are below legally established limits, or Maximum Residue Limit (MRL) at the time of harvest.

REIs and PHIs are established for different populations, different exposure routes, and different risk scenarios.

What's Behind the Label?

In Canada, pest control products are regulated federally by Health Canada's Pest Management Regulatory Agency (PMRA).

> A **pest control product** is defined under the *Pest Control Products Act* as any product, substance, or organism – whether naturally occurring or manufactured – that is used directly or indirectly to **control, suppress, or alter a biological process** in a way that manages a pest or modifies plant physiology.
>
> This includes – but is not limited to – conventional and organic insecticides, fungicides, herbicides, rodenticides, biological control agents, plant growth regulators, pheromones, mating disruption.

Before a pest control product is registered, registrants (e.g., chemical companies) must submit extensive data packages to PMRA, which include:

- Toxicology studies
- Residue chemistry data
- Occupational exposure studies
- Environmental fate and ecotoxicology studies

From there, PMRA conducts independent risk assessments using conservative assumptions and built-in safety factors – often 100-fold or greater – to account for variability between species and among a population (e.g., at risk members such as children or pregnant women). These assessments determine whether risks to human health and the environment are acceptable when products are used according to label directions.

Toxicology – *How Harmful Is It?*

Toxicology studies determine what the product can do to human health and at what exposure level effects begin to occur.

This includes:

- Acute toxicity
- Short- and long-term studies
- Chronic effects
- Specialized endpoints – neurotoxicity, carcinogenicity, endocrine effects

Residue Chemistry – *How Much Is On The Crop… And How Fast Does It Decline?*

Residue studies track how pesticide residues behave on and in the crop over time following application, including field trials/sampling, processing (e.g., washing, storage), and storage stability.

Occupational Exposure – *How Much Are Workers Exposed To?*

These studies estimate how much pesticide workers are exposed to during and after application, from handling (mixing, loading, spraying) to post-application activities.

Environmental Fate – *Where Does It Go After It's Applied?*

Environmental fate studies examine how the product behaves in soil, water and air, including how quickly it breaks down, leaching potential, persistence in different conditions, and run off or drift potential.

This determines potential risks to surface and ground water, as well as non-target organisms (e.g., beneficial insects, aquatic species) and used to inform label directions related to environmental protection, such as buffer zones, application timing and use restrictions.

How PHIs Are Determined

Preharvest intervals are driven by residue decline studies.

Assessments apply the product under defined use patterns and measure how much residue remains on fruit over time. These data are used to:

- Establish Maximum Residue Limits (MRLs)
- Model dietary exposure across the population
- Compare exposure to toxicological thresholds (like acceptable daily intake)

The PHI is then set at the point where residues are expected to fall below the MRL – with a margin of safety – under worst-case conditions. This includes maximum application rates, minimum intervals between applications, and environmental conditions that may slow degradation.

How REIs Are Determined

Restricted entry intervals are based on worker exposure, not what ends up on the fruit at harvest.

Assessments consider:

- Transferable residues on leaves and fruit
- Worker activities (e.g., thinning vs scouting vs harvest)
- Duration and frequency of contact (e.g., time spent in a treated area, frequency of re-entry events, frequency of contact with treated surface)
- Dermal absorption and inhalation potential

Because these assessments often focus on short-term exposure risks, they tend to use conservative assumptions about how much residue a worker might contact during a workday.

Why REIs & PHIs Don't Match

Different Exposure Pathways

PHIs deal with ingestion – what consumers eat, whereas REIs deal with contact and inhalation – what workers touch and breathe.

A pesticide can break down quickly enough to be safe to eat, but still remain on leaf surfaces long enough to pose a risk through skin contact.

Different Safety Assumptions

Worker exposure models often assume:

- Repeated contact with treated surfaces (i.e., hand picking many fruits over a workday)
- Extended work periods in the canopy

Dietary exposure models assume:

- Low-level intake spread across many foods (i.e., a person eats an apple a day)
- Intermittent exposure over time

These differences can push REIs longer than PHIs – or vice versa depending on the residue characteristics.

Different Data Availability

Not all products have detailed, crop-specific worker exposure data.

When data is limited, regulators rely on standardized assumptions. These are intentionally conservative, and they can result in longer REIs than might be necessary under real orchard conditions.

Orchard Practices Matter

Restricted entry intervals are highly sensitive to what actually happens in the field:

- Nature of the task (e.g. high-contact vs low-contact activities)
- Canopy density and architecture (e.g., dense canopy vs 2D fruiting wall)
- Frequency of worker entry after application
- Crop stage at application (e.g., bud break vs harvest)

Preharvest intervals, on the other hand, are less influenced by these factors because they focus on residue levels at harvest – not worker behaviour.

Old Labels vs New Science

Some products on the market today were registered under older assessment frameworks.

Newer registrations or product re-evaluations often include:

- More refined exposure data
- Improved modelling approaches
- Activity-specific adjustments

This can lead to shorter – or more tailored – REIs compared to legacy products or what labels had prior to a re-evaluation.

Grower Input Matters

This is where science meets reality – and where growers play a critical role.

Risk assessments are **only as good as the assumptions behind them** about how products are actually used:

- When applications are made
- How dense the canopy is
- What spray volumes are used
- How often workers enter treated blocks
- What tasks they perform – and for how long
- What PPE is used

If those assumptions don't reflect real-world practices, the result is often overly conservative restrictions.

Providing accurate use information helps:

- Refine exposure models
- Support activity-specific REIs
- Defend important used during PMRA re-evaluations

Without that input, regulators default to "worst-case" scenarios – which can limit flexibility on the label.

How Can You Help?

Document Real Practices

Track what actually happens after an application from how soon workers need to go back into a block, what tasks they are doing (scouting, thinning, pruning, etc), and how long are they in the canopy during the task.

Even informal records help build a more accurate picture of task-specific exposure, which is a major driver of REIs.

Also report to your industry rep or your friendly OMAFA extension specialist 😊 if a label requirement is difficult to implement. Consistent, evidence-based feedback helps identify where risk assessments may need refinement.

Participate in Surveys & Generating Crop-Specific Data

When opportunities come up through grower organizations, extension, or industry groups – participate! This could include pesticide use surveys, Cost of Production survey, residue or efficacy trials, work activity studies, or observational field research.

Make sure researchers, extension, regulatory and industry groups are aware of new training systems, mechanization trends, and changes in labour practices.

Again, without crop-specific and activity-specific data, regulators default to conservative assumptions that may not be reflective of real-world practices.

Engage with Grower Organizations

Work through groups like the Ontario Apple Growers or commodity boards that:

- Submit input during PMRA consultations
- Support minor use registrations
- Advocate during re-evaluations

Regulatory decisions are often influenced by the quality and quantity of real-world use information submitted during these processes. The more voices at the table, the better!

Provide Feedback During PMRA Consultations

When the PMRA opens consultations, especially during re-evaluations, growers can:

- Submit comments on feasibility of proposed REIs/PHIs
- Highlight mismatches with actual orchard practices
- Provide context on labour and timing constraints

This is one of the few formal pathways where real-world constraints can directly influence regulatory outcomes.

The Bottom Line

Intervals like REIs and PHIs aren't arbitrary – and they're not supposed to match.

They are the result of two separate risk assessments designed to protect workers in the orchard (REIs) and consumers at the table (PHIs). When the numbers don't align, it's not a contradiction – as illogical as it may seem sometimes. There's science behind it.

And the more accurately real-world orchard practices are reflected in that science, the more practical labels become. Exposure models are only as current as the systems they're based on. Outdated assumptions can lead to outdated labels.

To learn more about Restricted Entry Intervals and Preharvest Intervals, read the Pest Management Regulatory Agency's Understanding Restricted-Entry Intervals for Pesticides (Figure 1).

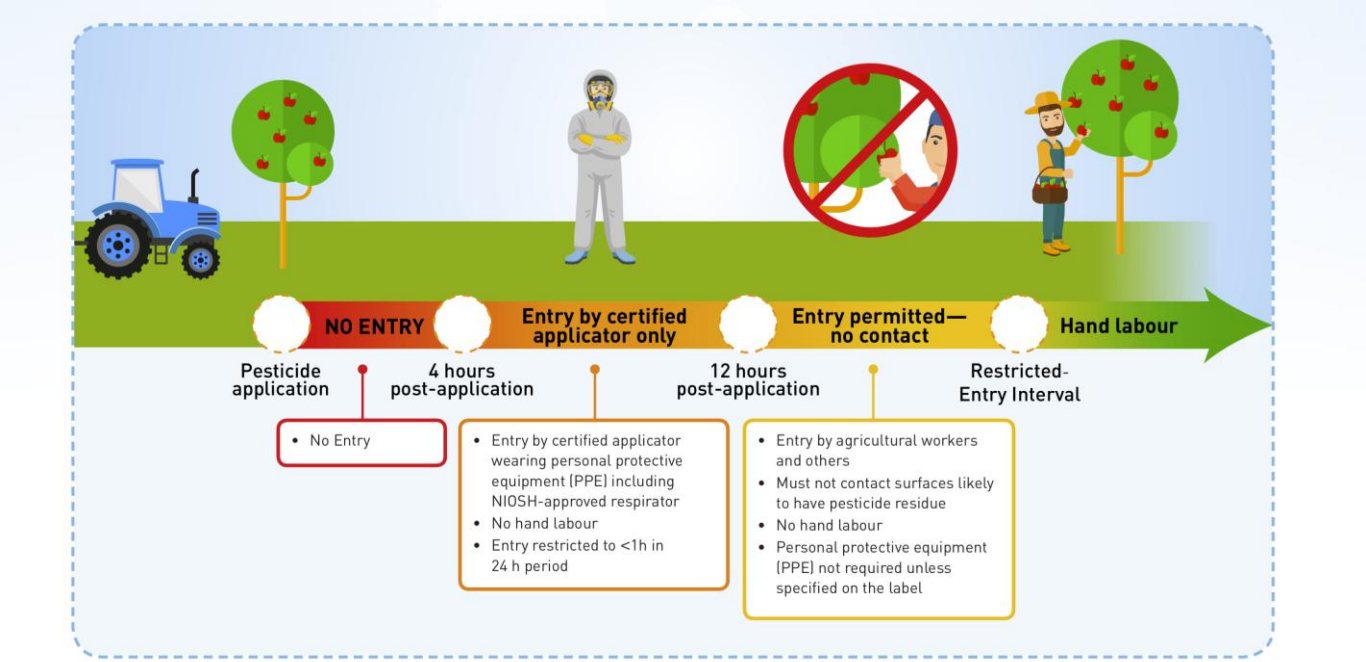

Figure 1. *A restricted-entry interval (REI) is the period of time that a person must not do hand labour in treated areas after a pesticide has been applied. Complying with REI directions is a legal requirement and part of pesticide safety (Pest Management Regulatory Agency, Understanding Restricted-Entry Intervals for Pesticides)*