

# The concept of refugia



**Refugia**  
Deworming  
Monitoring  
Pasture  
Resistance  
Resilience

Refugia is one of the most important concepts in integrated parasite management

## What is refugia?

A refugia is a reservoir of parasites that remain susceptible to dewormers (non-resistant). In other words, these are parasites that have not been exposed to anthelmintic treatment and can be found inside animals or on pastures (see diagram on reverse for an illustration of the concept).



## Why is it important?

The importance of refugia is related to the notion of dilution.

Initially, in an untreated parasite population, there is always a small percentage of resistant parasites and a large percentage of susceptible parasites. As long as susceptible parasites dominate, dewormers can be used effectively as part of an integrated parasite management program.

By maintaining a refugia on pastures and inside untreated animals, we ensure that parasites that have resisted deworming are diluted with refugia parasites that have not been exposed (including a large percentage of susceptible parasites).

Without a refugia, the percentage of parasites resistant to deworming continues to increase over time, and parasite treatments become less and less effective.

## What must be taken into consideration to maintain a refugia?

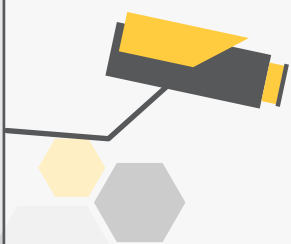
**1. Principal parasites present:** The refugia strategy is particularly appropriate for parasites that cause **subclinical** and **chronic problems**, namely *Teladorsagia* and *Trichostrongylus*.

It is also possible for parasites that cause acute and subacute clinical problems, namely *Haemonchus*; as such, daily observation of animals is important to quickly detect the appearance of clinical signs and to treat clinical animals immediately.

**2. Choice of animals constituting the refugia:** It is beneficial to choose animals and **groups of animals** that are **most capable of tolerating parasites**, such as adult ewes in good body condition.

It could be dangerous to apply the refugia strategy to a group of lambs in their first grazing season, to animals showing clinical signs of parasitism, or to ewes nursing 3 or 4 lambs.

**3. Monitoring:** Since a portion of the animals are not dewormed, monitoring for clinical signs and conducting fecal egg counts obtained through pooled samples makes it possible to ensure that parasitism remains under control.



**4. Environmental conditions:** Climate and environmental variability, which affects the **development** and **survival of parasites** on pastures, must be considered.

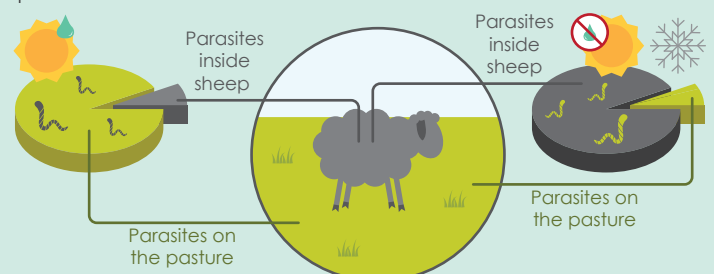
For example, *Haemonchus* rarely survives a Quebec winter, and the only refugia possible during this season is inside animals.

If all animals are dewormed during this period, only the *Haemonchus* that have resisted treatment will be deposited on pastures the following spring and, since winter will have destroyed all parasites from the previous year, the parasite population will very quickly become resistant to the dewormer in use. As such, not all animals in a herd should be dewormed over the winter if we want to maintain a susceptible *Haemonchus* refugia.

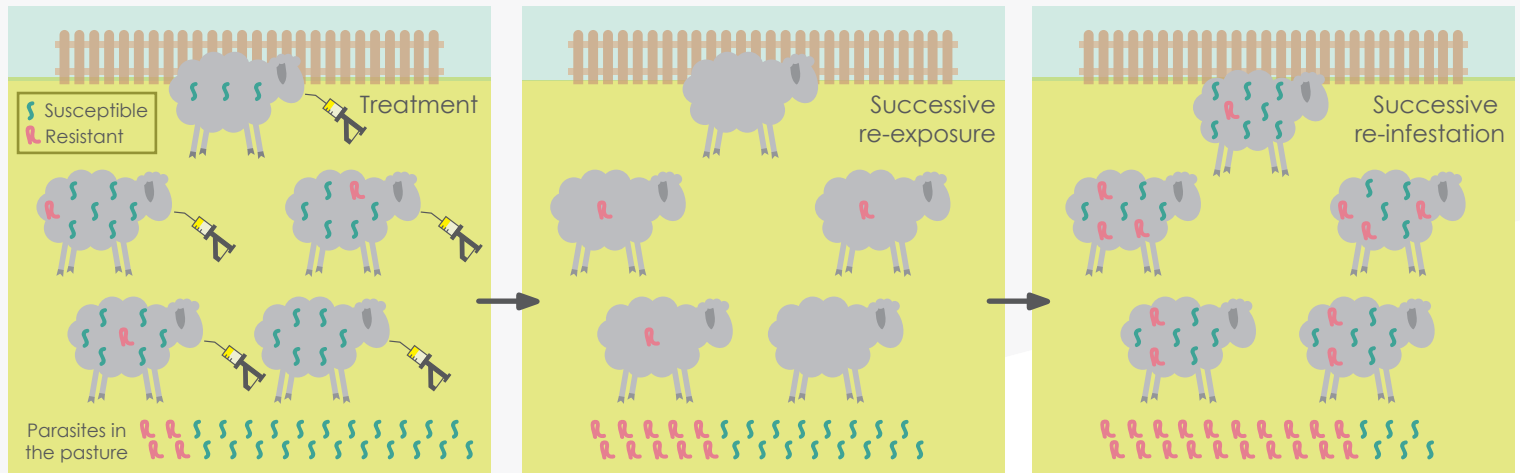
### Where are parasites found?

**During the grazing season,** warm and especially humid weather provide conditions that are conducive to the survival of larvae on pastures: the refugia will mainly be on the pasture.

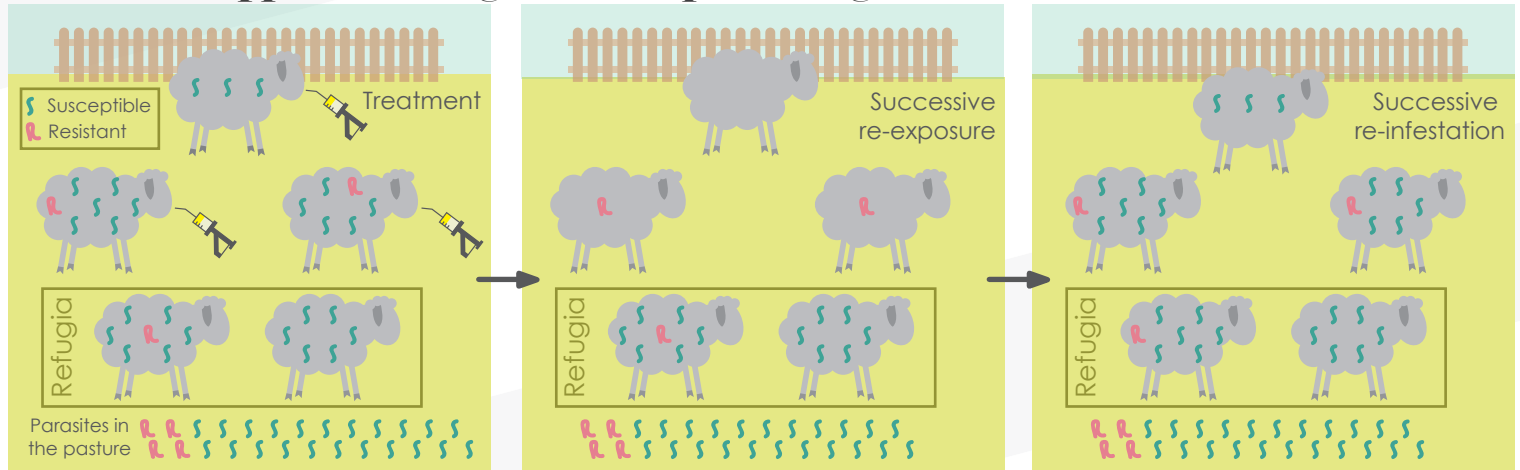
**In the winter or during long periods of very dry, hot weather,** most larvae in the fields will be destroyed: the refugia will mainly be inside animals.



## Treatment approach without refugia



## Treatment approach using the concept of refugia



Doc, I have a group of ewes in the pasture that I'll be bringing into the barn in November. Should I treat them when I bring them in?

Good question. There are two reasons for not treating the entire herd during the winter season (late fall and winter):

- 1) The larvae of a number of parasites are in hypobiosis (fecal monitoring sheet) and thus have low pathogenicity during this period; few dewormers can eliminate them.
- 2) If all the animals are treated in winter, when the larvae on pastures are nearly all destroyed (see coprological monitoring sheet), only the eggs of parasites resistant to the treatment will be found on pastures the following spring. As such, there will be no refugia.

The systematic treatment of all subjects is no longer an option: opt for the concept of refugia and integrated management.

**Maintaining a refugia (many susceptible parasites) to reduce development of resistance to dewormers may seem contradictory to a good parasite control plan. However, it is possible to effectively and sustainably manage parasites by using the concept of refugia appropriately and practicing an integrated management approach.**

## How to maintain a refugia

Note: The strategies implemented to maintain a refugia depend on pasture management practices, and must be adapted to each unique farm.

Here are a few examples:

- Use selective targeted deworming by treating a maximum of 80% to 85% of the animals in the group (see the deworming sheet for details).
- When a group is moved to a non-infested pasture, wait at least 1 week before deworming so animals have time to re-contaminate pastures with susceptible parasites.
- When a group must be treated, the group should be left on the same parcel of land for a week after treatment so that they can be re-contaminated with susceptible parasites before being moved.

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The strategies described in this pamphlet also largely apply to goats