Managing Parasite Resistance Using A Whole Farm Approach

Module 3. Equine Parasites In The Environment - Non-Chemical Management Strategies

Quiz – True or False?

1. Parasites will be eliminated from PA pastures in winter.
2. It is generally safe to harrow pastures if horses are removed from the pasture for 3 weeks.
3. Horses should be dewormed before rotating them into a clean pasture.
4. The largest concentration of parasites is found in the “rough” areas of the pasture.
5. Horses should always be dewormed 6 weeks after the grass turns green in the spring.
6. If horses are rigorously dewormed with ivermectin for an entire year and placed into a pasture that has never been grazed, the pasture and horses will remain parasite free.

Important Considerations

- Parasites in the environment represent over 99% of the entire population.
- Offspring of parasites must spend time in the environment before infecting new hosts.
- Parasites have many extraordinary adaptations that make them highly effective at surviving.
- Misconception - all worms are bad and no worms should be tolerated in a horse.
- Misconception - all horses are susceptible to worms and should be treated the same.

Note: For this short course, "parasites" refer to small strongyle or cyathostomes

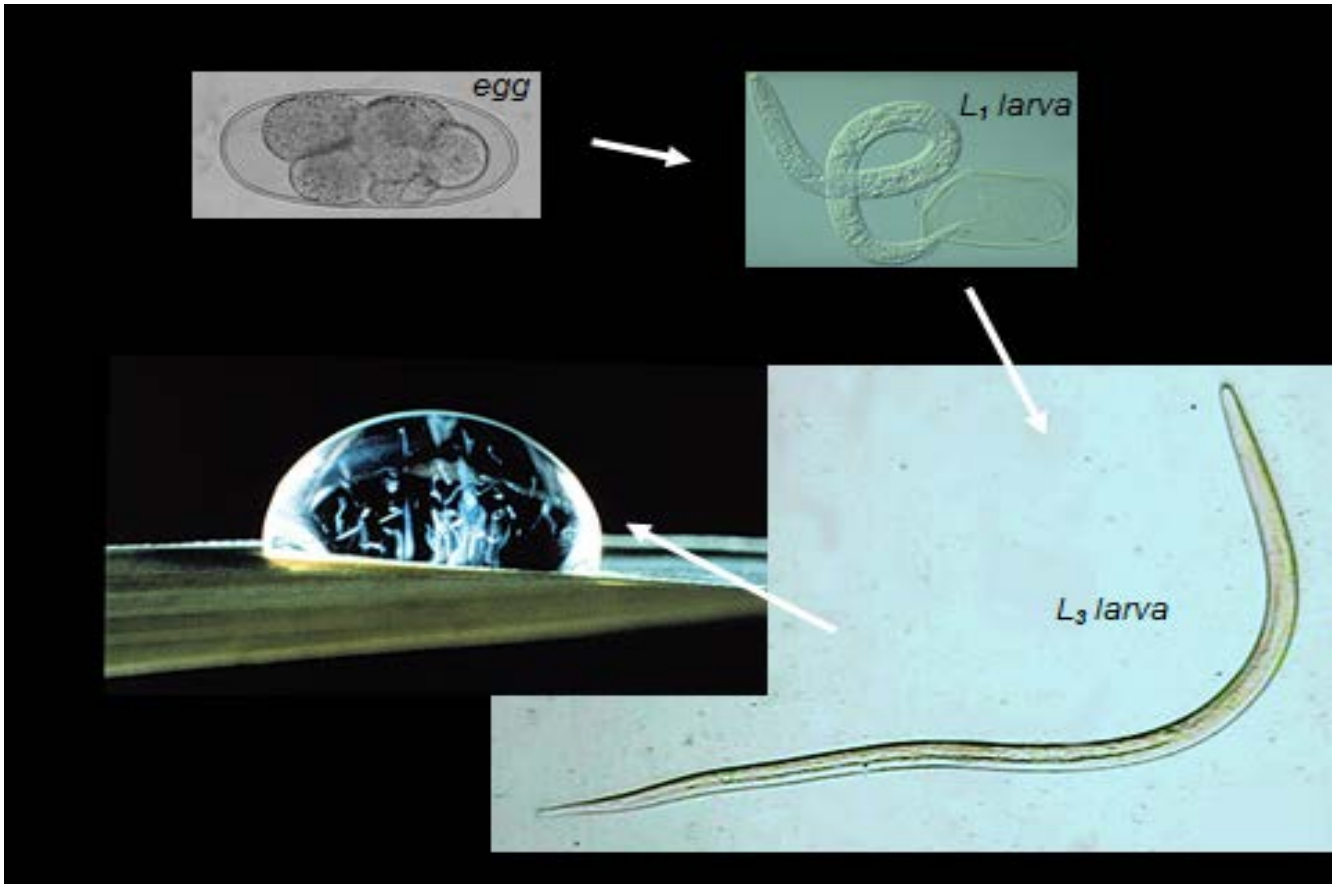
Factors Effecting Farm Parasite Levels

1. Manure removal/management
2. Pasture management
3. Horse density
4. Stability of horse population
5. Deworming program
6. Personal opinions
7. Horse age and health
8. Egg shedding of individual horses
9. Dewormer efficacy – does it work on the farm?

Small Strongyles (Cyathostomes)

- Present in all horses
- Are relatively mild pathogens
- Generally only migrate into the intestinal lining
- Only produce disease when the parasites are present at very high levels.
- Frequent deworming treatments are not needed to keep most adult horses healthy.

Small Strongyle Life Cycle – *a review*



Natural Immunity - *A Review*

- **Adult horses vary greatly in immunity to parasites and shedding of small strongyle eggs.**
- **Most adult horses have good immunity against small strongyles**
- **Adult horses tend to shed roughly the same number of eggs throughout their life time; low shedders will often remain low and high shedders have a tendency to remain high.**
  - **40-60% of adults are low shedders**
  - **20 to 30% are moderate shedders**
  - **10 to 30% are high shedders**
  - **80% of eggs come from 20% of the horses on a farm.**

Arrested Development – *A Review*

- Some ingested larvae encyst in the gut mucosa and may reside in the horse for over two years.
- Eventually emerge from cysts, reproduce and produce eggs - usually at the on-set of the grazing season.
- Great adaptation - if you are a parasite – Why?
- Encysted small strongyles are not uniformly susceptible to any deworming regime.
- Eradication is not possible or desirable.

Environmental Factors Affecting L_3 Development and Persistence

What happens to parasites during PA winters?

- Freezing has limited killing effect – damages eggs but L_3 larvae are very resistant to cold – survive longer at 23^oF than 88^oF
- Eggs that survive will hatch at 43^o F.
- Alternating freeze and thaw cycles is harmful to all stages.
- What protects them in winter?




Environmental Factors Affecting L_3 Development and Persistence

Hot moist summers – perfect for L_3 development

- Need to be moist – what helps parasites stay moist?
- L_1 larvae only survive a few days in manure that rapidly dries out.
- But if manure dries slowly L_2 larvae will become L_3 larvae when moisture returns.
- *Manure is great stuff if you are a parasite.*
- Temperatures of 77 ^{0}F to 91 ^{0}F are perfect for development (all larvae will be infectious in 3 to 4 days)

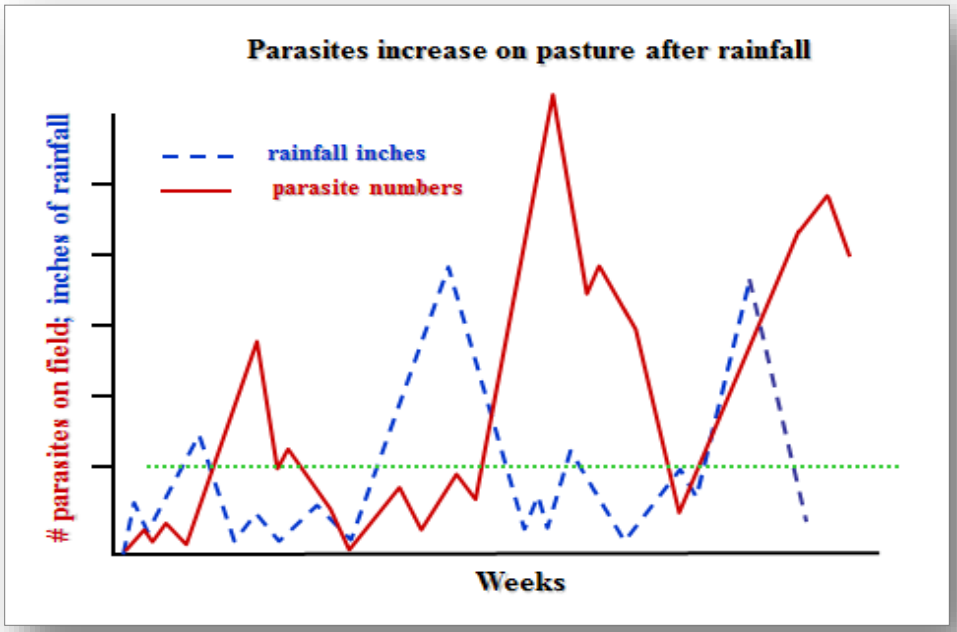
Environmental Factors Affecting L_3 Development and Persistence

Persistence in hot moist summer

- Persistence – how long L_3 larvae survive in the environment.
- L_3 larvae are surrounded by double protective membrane.
- Cannot eat – survive on energy reserves (fats and carbs).
- If active – use up reserves quickly.
- Hot, moist, conditions – may be many infectious larvae but they use energy reserves quickly and don't survive long.

Environmental Factors Affecting L_3 Larvae Transmission to the Horse

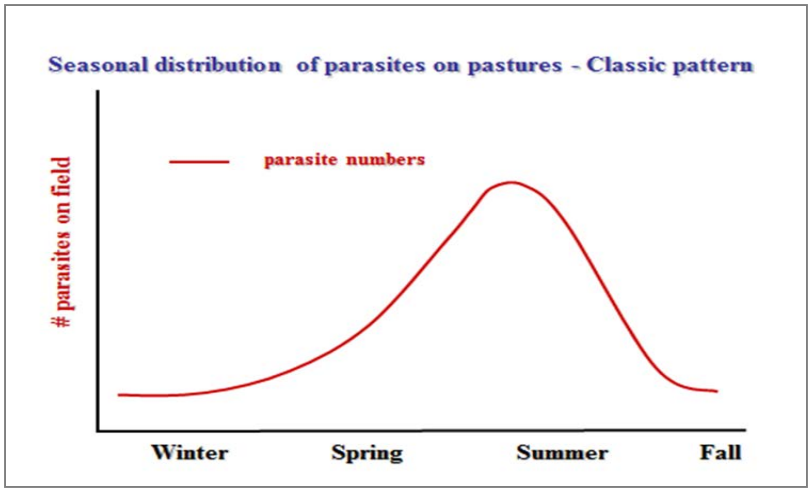
Pastures are most infective after heavy rains when temperatures are conducive to larval development.



Environmental Factors Affecting L_3 Transmission to the Horse

Seasonality of parasites on pastures

- Short reproductive cycle. Horses consume infectious larvae in spring. Larvae mature and quickly begin producing eggs during the same grazing season.
- Summer rise in infectious larvae – with peak in late summer.
- Eggs shed when environmental conditions are best for survival.

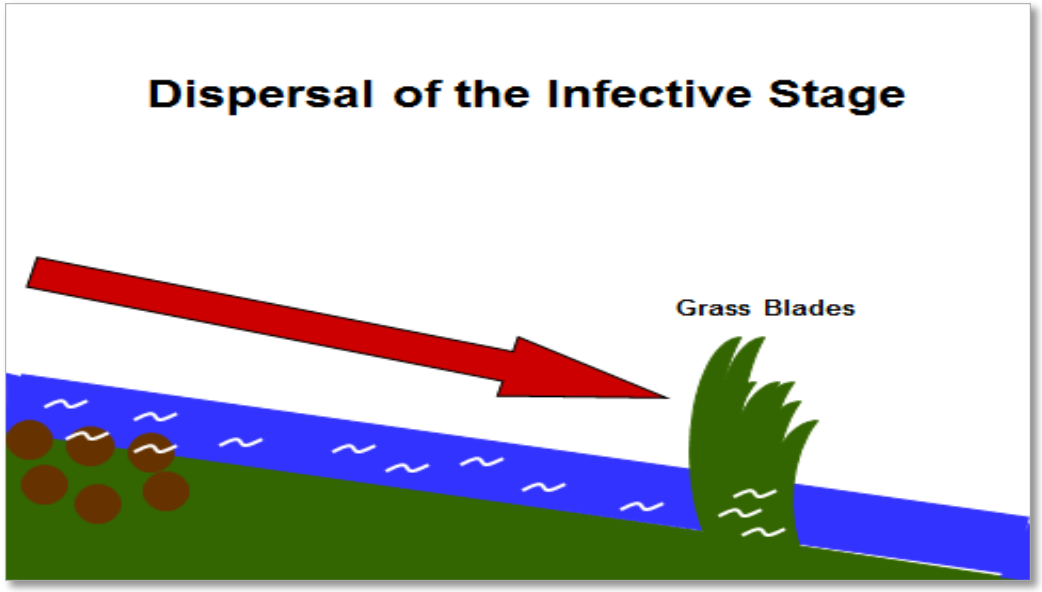


Environmental Factors Affecting L_3 Transmission to the Horse

- Small strongyles are 10-15 x higher in roughs.
- Where do horses normally graze?
- How do larvae get to the lawn areas so that horses consume them?

Environmental Factors Affecting L_3 Larvae Transmission to the Horse

- Larvae can move from roughs to lawns in sheets of rainfall.
- Carried to areas in pastures below the roughs where forage quality is usually high. Why?



Decreasing Transmission of Parasites by Non-Chemical Means

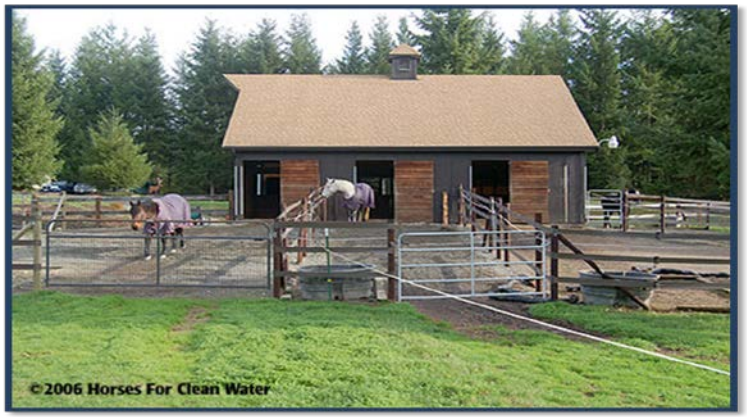
1. **Improve pastures and increase desirable forage so that fewer horses need to graze near the roughs.**

- ✓ Limit horse density so that pasture grasses are not overgrazed - generally 2-4 acres per horse with unlimited turnout.
- ✓ Maintain permanent vegetation that provides a dense cover with a minimum if 2-3 inches in height
- ✓ Fertilize based on soil tests
- ✓ Rotate pastures
- ✓ Use sacrifice areas to rest pastures
- ✓ Reseed when necessary

Decreasing Transmission of Parasites by Non-Chemical Means

2. Identify high contaminators (20% of horses shed 80% of the eggs).

- ✓ **Restrict "high shedder's" access to pastures during periods when environmental conditions are favorable for pasture contamination.**
- ✓ **Use dry lots – minimal risk of transmission since they have no vegetation to provide protective habitat for larvae.**



Decreasing Transmission of Parasites by Non-Chemical Means

3. Target deworming to high shedders and eliminate or reduce deworming of low shedders to high infection periods.

Low shedders:

- ✓ **Horses with "good" genes/ high immunity**
- ✓ **Horses historically exposed to low levels of parasites**
- ✓ **Horses had effective recent treatment**
- ✓ **Will probably have low fecal egg counts for a lifetime even without treatment**
- ✓ **Less than 100-200 eggs per gram has little impact on pasture infectivity**

More information in module 4

Decreasing Transmission of Parasites by Non-Chemical Means

3. Practice Pasture Hygiene – It's All About the Poop……

- ✓ Removing manure from pastures on a regular basis can reduce need for deworming.
- ✓ During warm months, remove every 7 to 10 days (time it take for eggs to become L_3s.) Especially important before heavy rainfall.
- ✓ Completely compost all manure used on pastures.

Decreasing Transmission of Parasites by Non-Chemical Means

Practice Pasture Hygiene – It's All About the Poop…… continued

- ✓ Vacuuming and sweeping pastures is very effective.
- ✓ In one study "Vacuuming twice weekly produced a reduction in parasites that was 18 times greater than an untreated control group and 4 times more effective than the group that was treated with anthelmintics.

Decreasing Transmission of Parasites by Non-Chemical Means

4. Harrowing ?????

- ✓ Believed to reduce parasite transmission because it breaks up fecal balls and exposes parasites to dry conditions and UV light.
- ✓ BUT….. Harrowing spreads infectious larvae over lawn areas of pastures and disrupts selective grazing pattern of horses.
- ✓ Infectious larvae are very resistant to desiccation.
- ✓ In northern pastures infectious larvae can survive for months.
- ✓ Recommendation: If pastures are harrowed - remove horses from pastures and do not graze the rest of the growing season.
- ✓ Harrowing at the end of the grazing season reduces winter survival of L_3 larvae when winters are cold.

Decreasing Transmission of Parasites by Non-Chemical Means

5. Rotating Pastures to Break Parasite Cycles

- ✓ Goal – Break parasite life cycle and reduce transmission.
- ✓ In northern climates it is unlikely that pasture infectivity will diminish significantly during the same grazing season
- ✓ Rotating back to a pasture that had been previously grazed that season will not serve to reduce parasite transmission.
- ✓ Northern pastures need to be rested until the beginning of the next summer.

Decreasing Transmission of Parasites by Non-Chemical Means

6. **Quarantine new individuals to minimize introduction of resistant parasites**

- ✓ If positive fecal egg count – quarantine and deworm horse with anthelmintic commonly used on the farm.
- ✓ Recheck in 14 days, if successful reduction - turn out.
- ✓ If not successful reduction - deworm with another class of dewormer and recheck
- ✓ Not perfect – why?

Decreasing Transmission of Parasites by Non-Chemical Means

7. Mixed Species Grazing

- ✓ Alternating species in pastures that do not share common parasites can effectively reduce parasite numbers.
- ✓ More efficient use of pasture.
- ✓ Termination of life cycle when larvae are consumed by a non suitable host (cows, sheep, goats).
- ✓ Consumption of forage in the roughs by the alternate species removes the moist, warm conditions in the tall grass areas.

Next Module - The Penn State Parasite Project
The New Protocol in Parasite Management

- ✓ What is the status of parasite resistance on PA farms?
- ✓ What changes have PA farm partners made to their parasite management program in order to reduce the overuse of dewormers that leads to product resistance?

This project is partially funded by:

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