Parasite Control on Organic Sheep Farms in Ontario

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(some slides courtesy of **Dr. Andrew Peregrine** and **Dr. Paula Menzies**, University of Guelph)

Gastro-Intestinal Nematodes

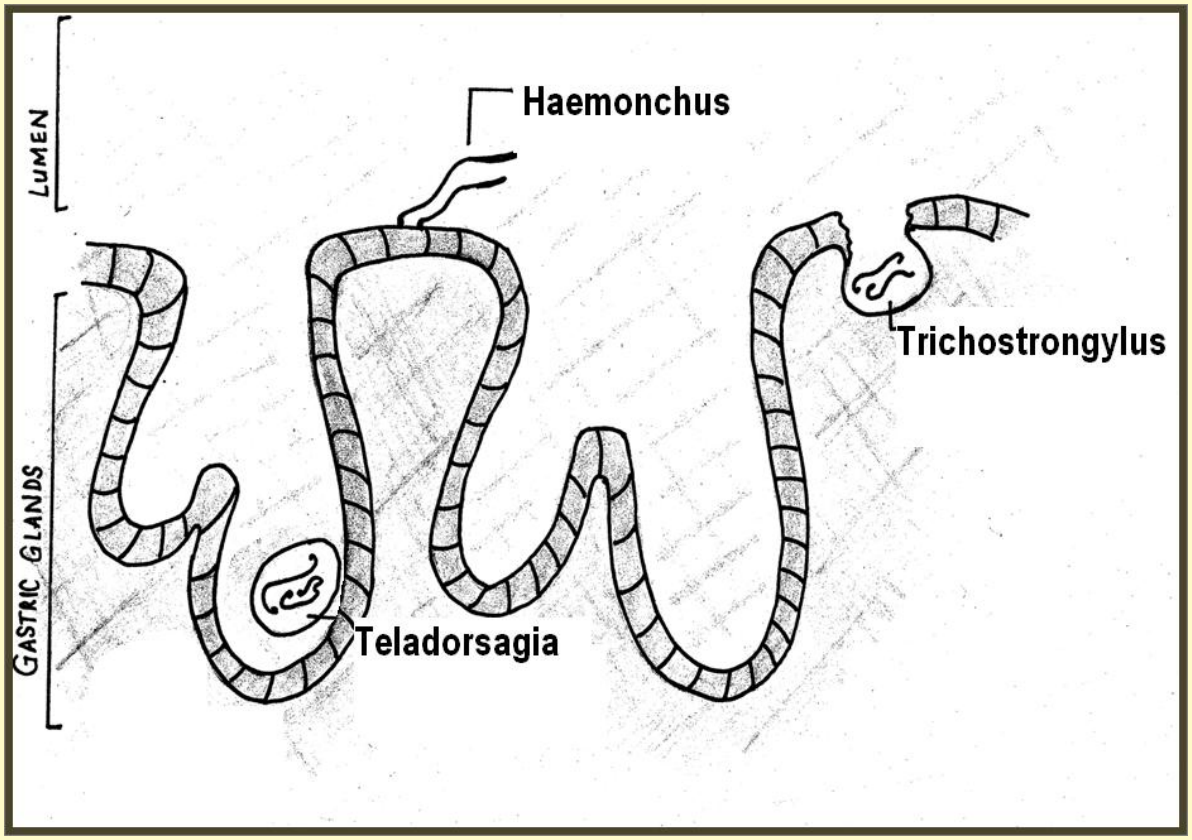
- Parasites inhabiting the alimentary tract of small ruminants

- Responsible for severe economic losses caused by:
  - Decreased production
  - Death of infected animals
  - Cost of prevention
  - Cost of treatment

  (Barger, 1982; Donald and Waller, 1982)

Gastro-intestinal Nematodes

- ***Haemonchus***
- ***Teladorsagia***
- ***Trichostrongylus***



Haemonchus contortus

- *H. contortus* is the most pathogenic – the adult female worm feeds on blood
- Causes:
  - Loss of blood – **Anaemia**
  - Loss of protein - **Oedema**

Clinical Signs of *Haemonchus* infection

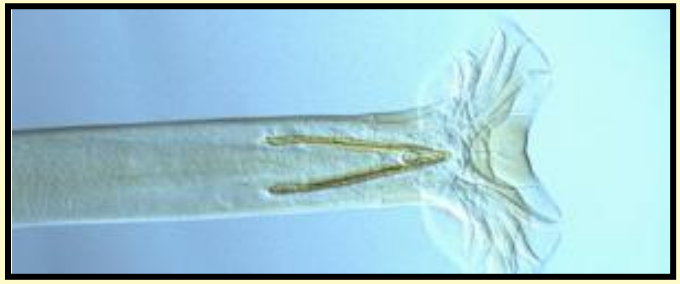
Pale mucous membranes - **Anaemia**

Bottle-jaw - **Oedema**

(Courtesy, Dr. Paula Menzies, University of Guelph)

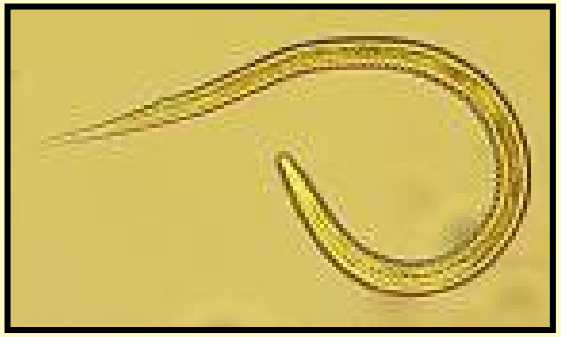
Teladorsagia circumcincta

- Adult localized in **gastric glands**
- Disruption of abomasal mucosa results in increased pH and reduced pepsin production

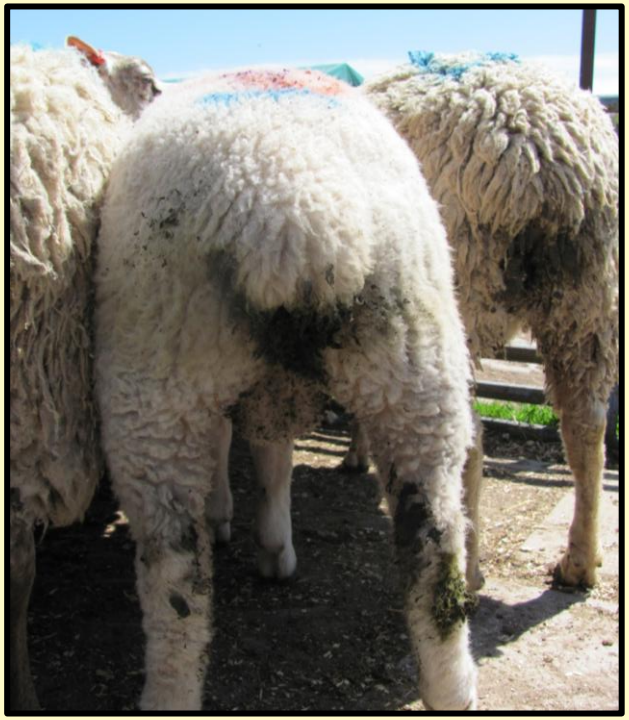


Trichostrongylus axei

- Adult embedded in **abomasal mucosa**
- Disruption of abomasal permeability alters pH and nutrient absorption



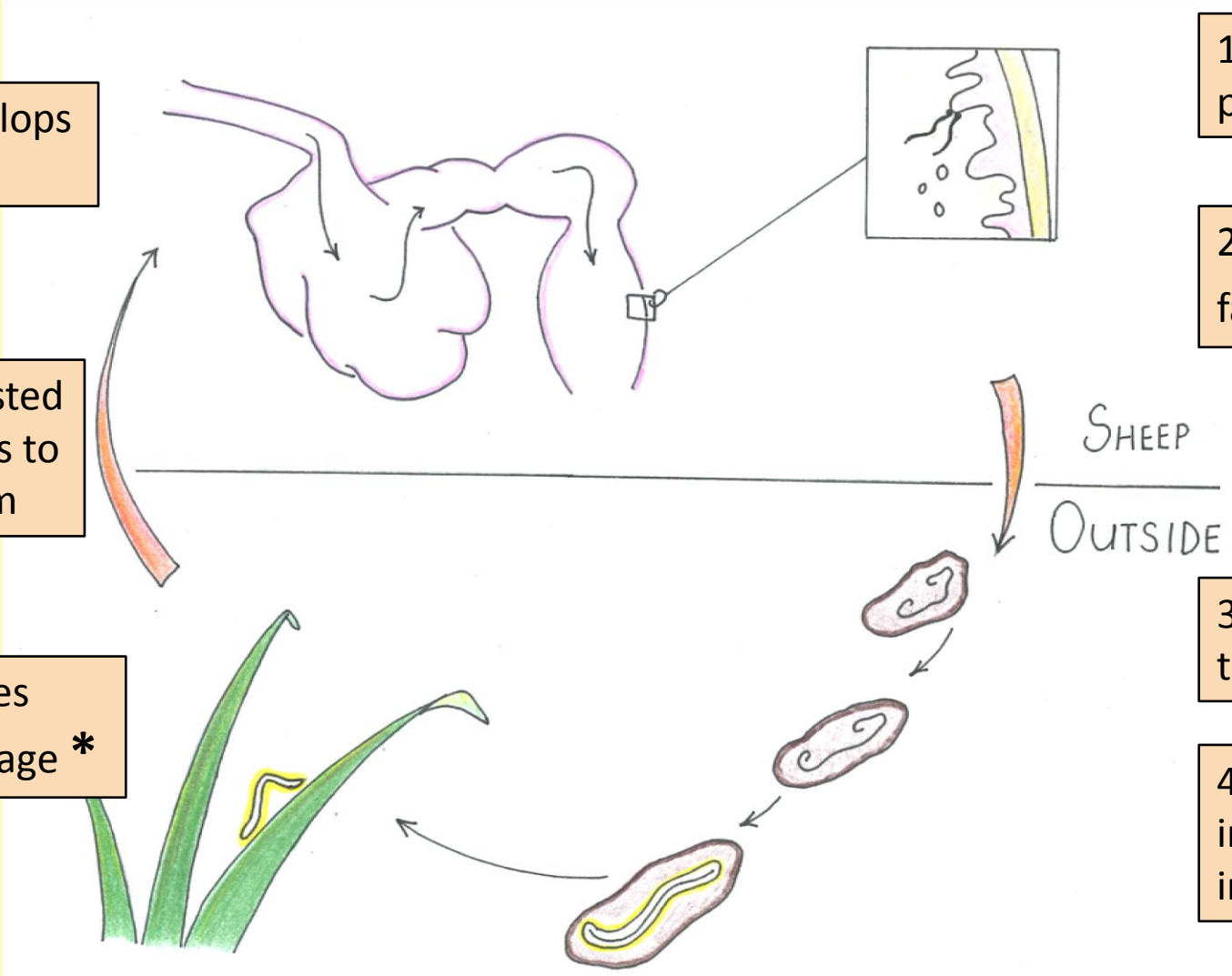
Clinical Signs of *Trichostrongylus* and *Teladorsagia* infection



Diarrhea - scouring

Poor weight gain

GIN Life Cycle



1. Adult worm produces eggs

2. Eggs in faeces *

3. Eggs hatch to L1

4. Develop into L2 and infective L3

5. L3 moves onto herbage *

6. L3 ingested and moves to abomasum

7. L4 develops in mucosa

Epidemiology of GIN

- A three-year epidemiological study was conducted in Ontario and Quebec (2006-2009)

- The objectives were:
  - To determine the levels of GIN in both organic and conventional flocks throughout the year
  - To identify farm management practices that can be used to minimise parasite burdens

Epidemiology of GIN

- A total of **31** farms were visited over the 3 years (23 ON + 8 QB)
- Farms were visited monthly (Apr – Oct) and twice in the winter:
  - Questionnaires about management practices
  - Random selection of 10 adults + 10 ewe-lambs
    - **Fecal samples**
    - **Blood samples**
    - **Clinical Parameters**
  - Pasture samples
  - Necropsy of lambs

Epidemiology of GIN

	AVERAGE (min-max)		
	Certified Organic	**Non Certified Organic**	**Conventional**
EWES	**118**	**286**	**235**
	(1 - 4660)	(1 -18940)	(1 -9840)
LAMBS	**319**	**424**	**417**
	(1 - 7060)	(1-25020)	(1-14080)

Table 1. Average fecal egg counts for all ewes and grazing lambs for the total period, by operation type

Note: min = minimum; max = maximum

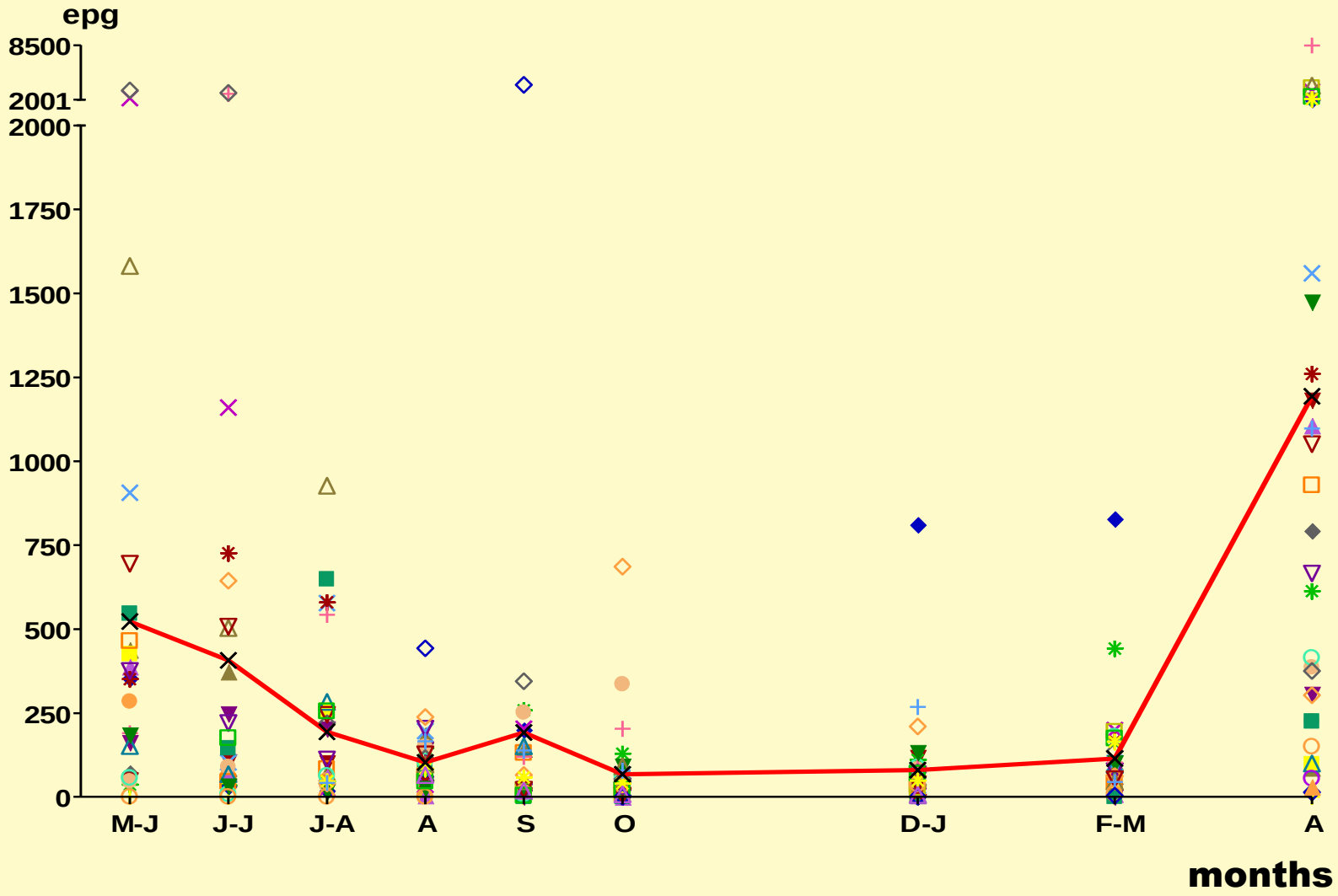


Fig. 1. Average EWE faecal egg counts (epg) in 32 sheep flocks in Canada (May 2006 – April 2007)

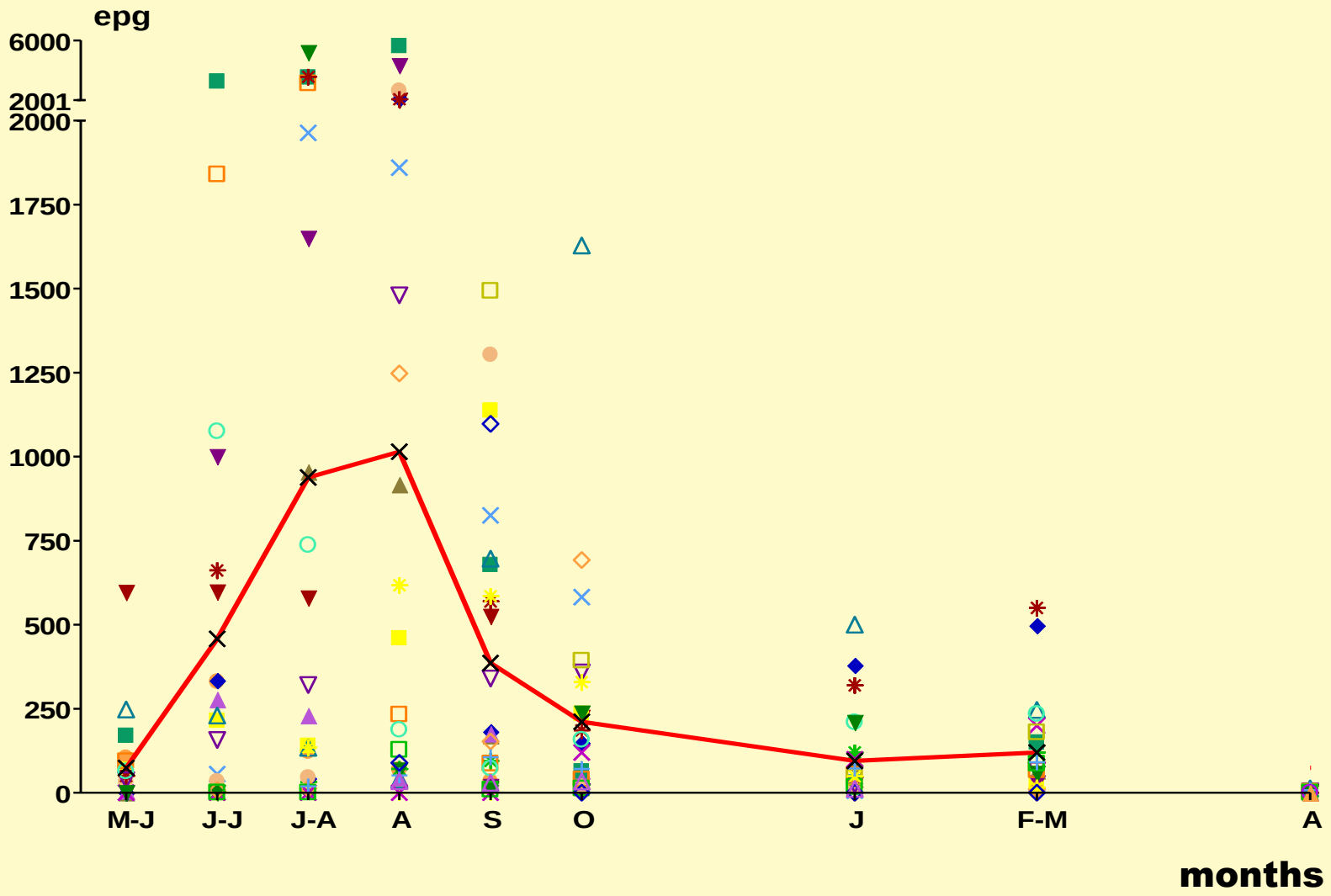


Fig. 2. Average LAMB faecal egg counts (epg) in 32 sheep flocks in Canada (May 2006 – April 2007)

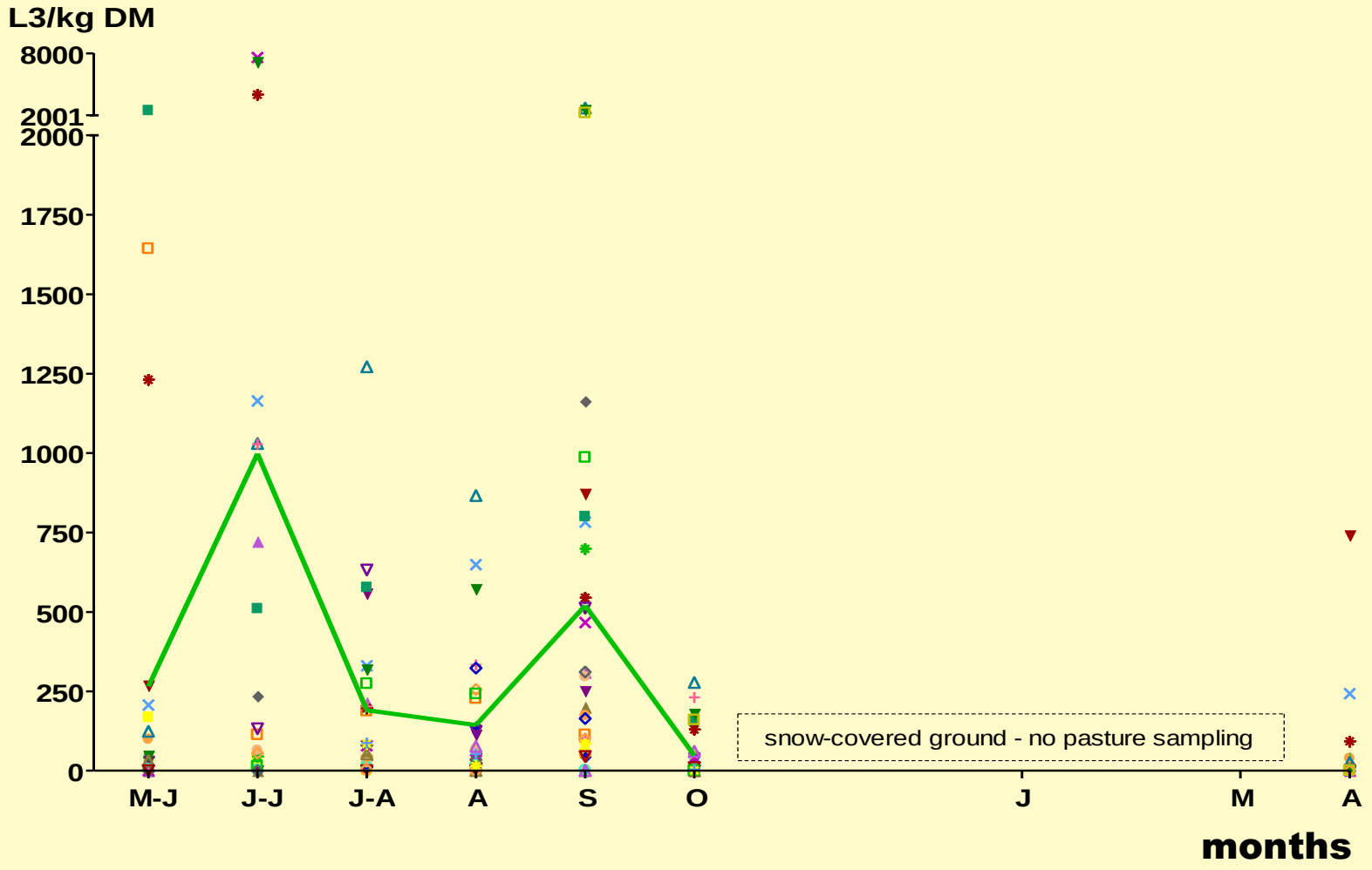


Fig. 3. Pasture infectivity in 32 sheep flocks in Canada (May 2006 – April 2007)

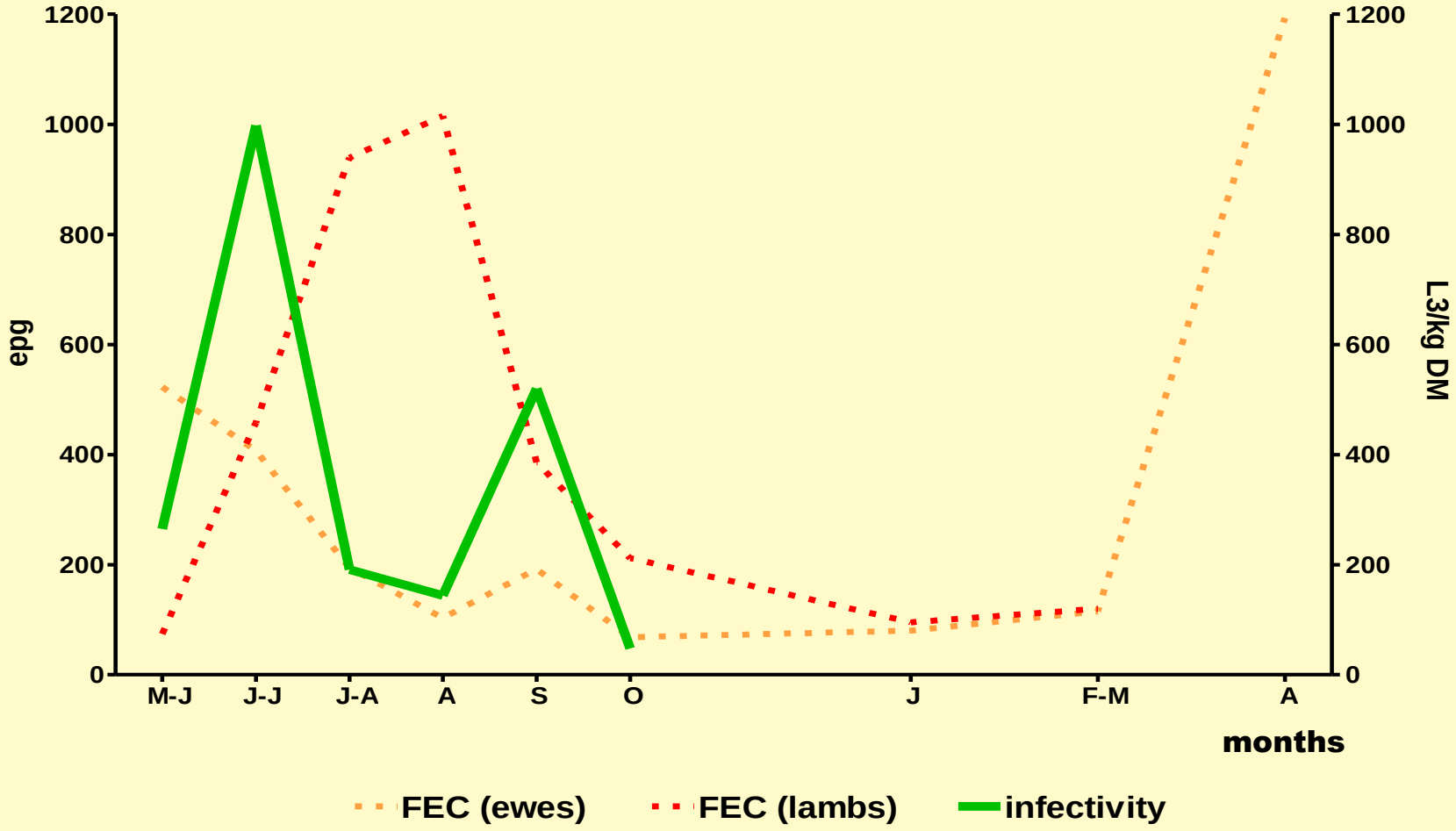


Fig. 4. Faecal egg counts and pasture infectivity in 32 sheep flocks in Canada (May 2006 – April 2007)

Epidemiology of GIN

- **Take-home messages from this study:**
  - There was very large variation between farms in the burdens of gastrointestinal nematodes both on pasture and in sheep
  - The months with highest fecal egg counts were May-June for ewes and July-August for lambs
  - The average number of infective nematode larvae (L3) recovered from pasture samples showed 2 main peaks: June-July and September

Overwintering of GIN on pasture

- It was previously believed that *H. contortus* does not overwinter on pasture
- However, *H. contortus* larvae were found on pasture in spring in the previous study
- The objective of this study was:
  - To understand whether the population of *H. contortus* larvae overwintering on pasture is a significant source of infection

Overwintering of GIN on pasture

- **3** farms in Ontario were selected
  - Set up **data-loggers** to measure air and ground temperature, air humidity and soil moisture
  - **Soil** and **pasture samples** collected monthly (Nov-Apr)
  - **5 tracer lambs** put out to graze for 28 days on 1-acre isolated plots – slaughtered and GI contents collected

Overwintering of GIN on pasture

- **Environmental data** - still to be analysed
- **Soil and pasture samples** – few parasite larvae were found in Nov-Dec
- **Tracer lambs** – *H. contortus* adult worms were found in the abomasum of one lamb from one farm

Overwintering of GIN on pasture

- **The take-home messages from this study are:**
  - Very few *H. contortus* larvae overwinter on pasture
  - Those that survive have low infectivity
  - Pastures are essentially clean of *H. contortus* in the spring

Sustainable Integrated Parasite Control

1. Regular Monitoring

- Detect high shedders
- Evaluate success of parasite control strategies practiced
  - June (ewes)
  - July (lambs)

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2. Pasture Management Strategies

– **80% of the parasites are in the environment...**

a) Crop Rotation

b) Rest Pastures for more than one year (end of June)

c) Low Stocking Densities

Sustainable Integrated Parasite Control

2. Pasture Management

d) Mixed-Species/Rotational Grazing

Cows, Horses...

...not Goats or Camelids

Sustainable Integrated Parasite Control

3. Nutrition

- Adequate nutrition

  ensures proper immune

  responses towards parasites

- Bypass protein e.g. corn gluten; roasted soybeans
- Especially important in peri-parturient ewes

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4. Bioactive Forages

- Some plants are rich in **Condensed Tannins**
  e.g. Sulla, Chicory, Sanfoin, Birdsfoot trefoil

- Effect may be through increased availability of by-pass protein as well as direct effect on parasites

- May be useful adjuncts for parasite control BUT
  - bioactivity is not specific
  - potentially toxic to sheep

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5. Genetic Resistance

- By Breed:
  - Certain breeds are more resistant
    e.g. Gulf Coast Native, Katahdin, St. Croix
  - May have unfavourable side-effects
    e.g. lower productivity

- Within breed:
  - No genetic marker
  - Select animals based on reduced fecal egg output and higher immune response (detected in saliva)
  - Selection done on large ram groups

Sustainable Integrated Parasite Control

6. Copper Oxide Wire Particles

- Several studies to show it reduces infection of

  Haemonchus contortus

  - **Temporarily**
  - **Reduces FEC**
  - **Doesn't improve weight gain**

- Not effective against other GIN
- Copper toxicity?

Sustainable Integrated Parasite Control

7. Antiparasite vaccines

- Work is being done on *H. contortus* vaccines
  - ↓ nematode egg output
  - ↓ worm burden
- However:
  - In Canada we have mixed parasite infections – limited use
  - Not commercially available

Conclusions

- Gastrointestinal nematodes are a problem on many sheep farms in Canada
- Use of multiple control methods should increase the sustainability of parasite control on farms
- Monitor the effectiveness of your control program with your veterinarian