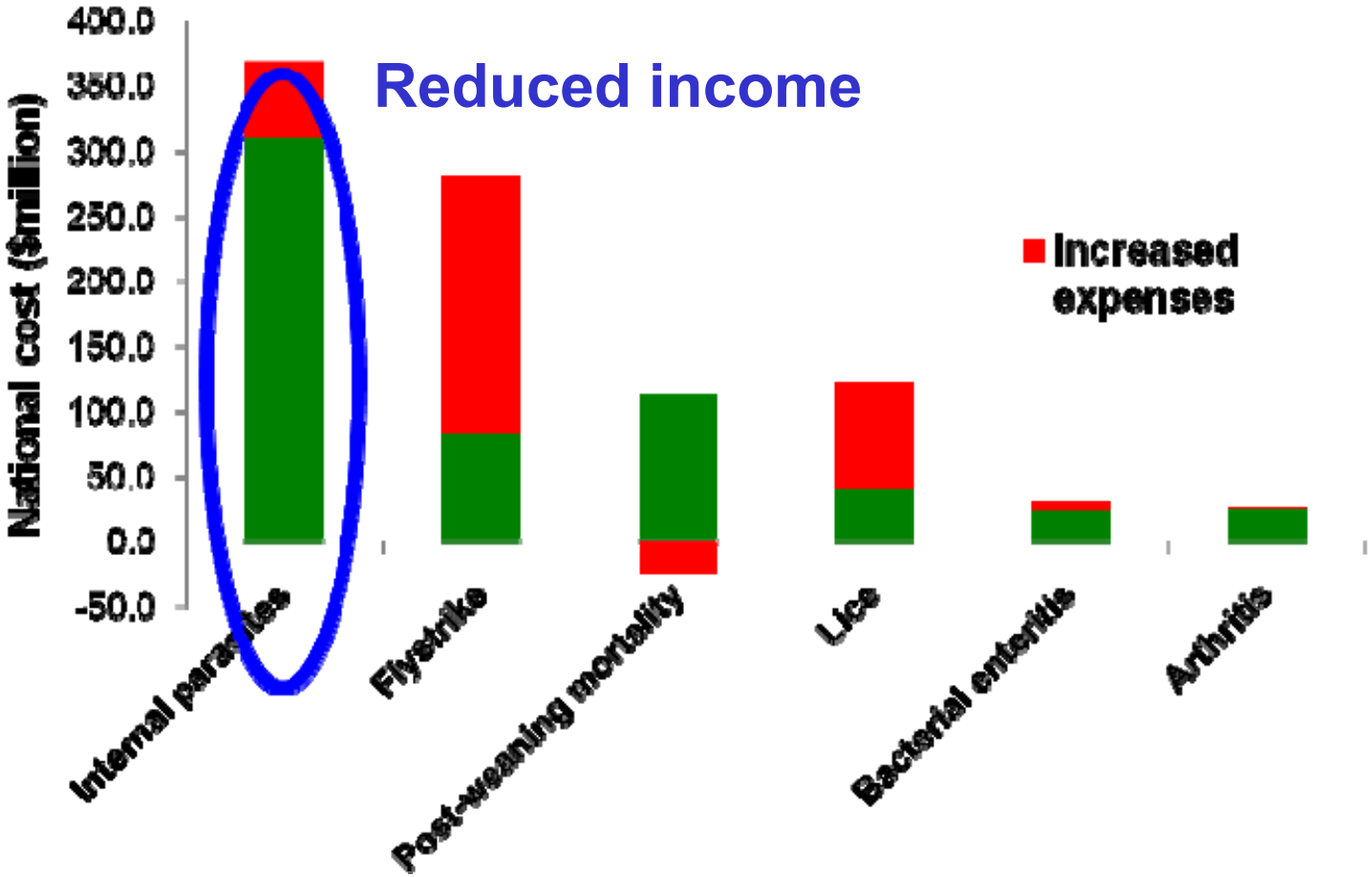
Healthy Sheep, Healthy Profits

Caroline Jacobson

Worms are a wealth hazard



Source: Sackett 2006 – MLA report

Worms = lost income

Zone	Reduced income ($)	Increased expenses ($)				Total ($)
		Crutching	Drenching	Shearing	Other	
High rainfall, summer	5.16	0.55	0.77	–0.33	–0.22	5.93
High rainfall, winter	4.61	0.17	0.73	–0.23	–0.17	4.61
Sheep cereal	1.56	0.08	0.89	–0.08	–0.05	2.40
Pastoral	–	–	–	–	–	–
Prime lamb	7.75	0.12	0.71	–0.06	–0.01	8.51

$$$ that you never see!

	Cost per head		
	Prime lambs	Sheep (grain belt)	Sheep (high rainfall)
Good control	**$4.93**	**$2.25**	**$3.14**
Poor control	**$12.08**	**$2.62**	**$5.24**

	2006 Assumptions
Lamb price (HCW)	**$2.90/kg**
Wool price (20um)	807c/kg (10-year average)

Source: Sackett 2006 – MLA report

What about slaughter sheep?

4400+ sheep from 350 lines

Worms are common in slaughter sheep

	Lambs	Adults
Lines tested	113	244
WEC (all sheep)	1525	486
1000 eggs per gram +	**43%**	**13%**
2000 eggs per gram +	**22%**	**6%**

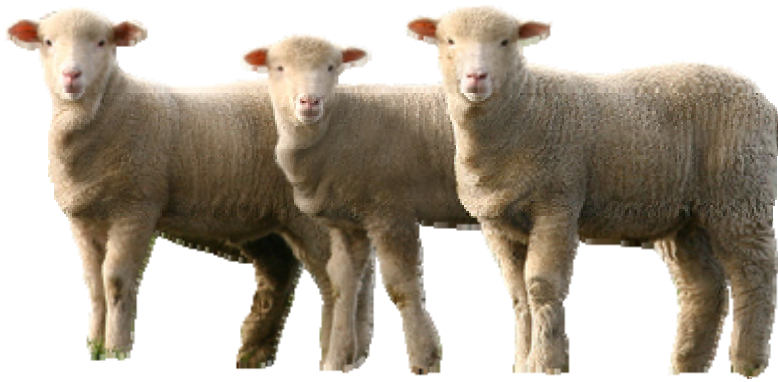
Source: Jacobson 2009, Animal Production Science

Production losses?

Lambs 14-23 weeks old with 500 epg

- **49-67% lower weight gain**
- **44-79% less wool growth**

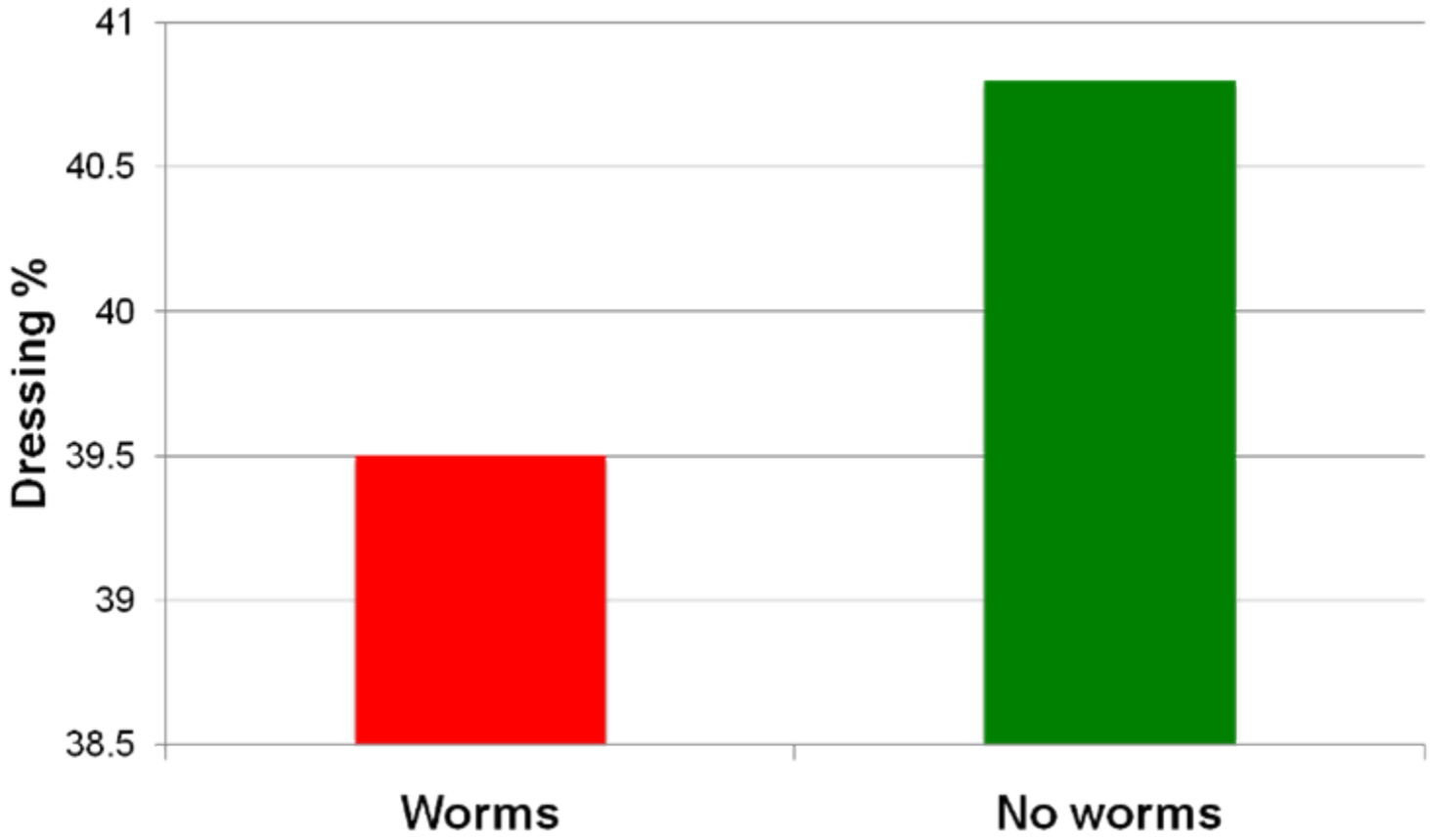
What about prime lambs?



Evicting worms has a cost for the sheep

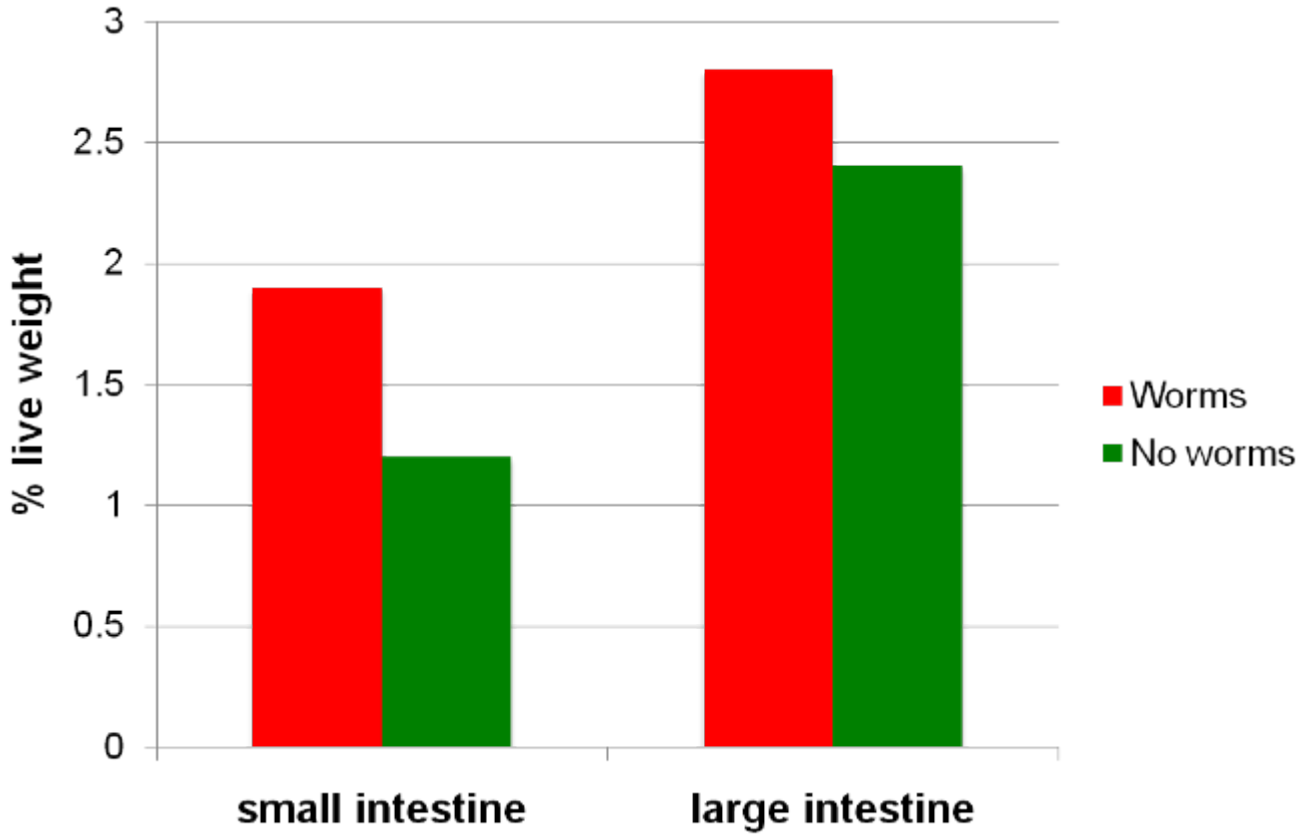
- ↓ appetite
- ↓ feed efficiency
- ↓ growth rate
- ↓ dressing %
- ↓ milk production
- ↑ scouring

Wormy paddocks reduce dressing %



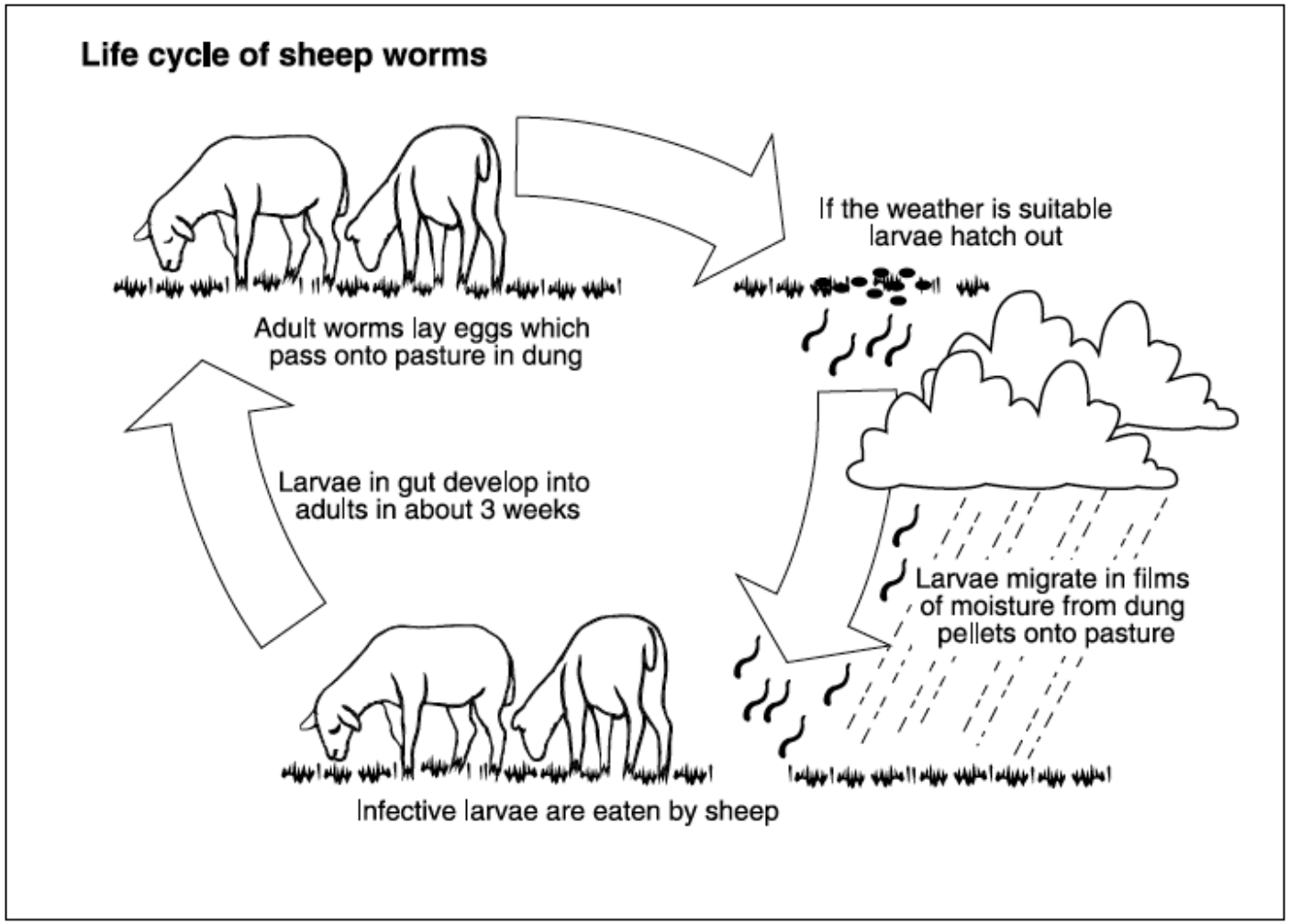
Source: Jacobson 2009, Veterinary Parasitology

Wormy paddocks increase gut weight



Source: Jacobson 2009, Veterinary Parasitology

Know your enemy



Where are the worms?

Sheep

- Immature worms
- Adult worms

Pasture

- Eggs
- Larvae on pasture

The toolchest

- Drenches
- Monitoring - egg counts
- Genetics
- Paddock management

Effective AND sustainable

Sustainable control: Building in some "refugia"

- Resistance genes from "mum and dad"
  - 0 resistant genes = susceptible to treatment
  - 1 resistant gene = partially resistant ?
  - 2 resistant genes = resistant
- Refugia = source of susceptible genes
- Dilute resistant genes in next generation

Where is the refugia?

Untreated sheep

Pasture when conditions are right

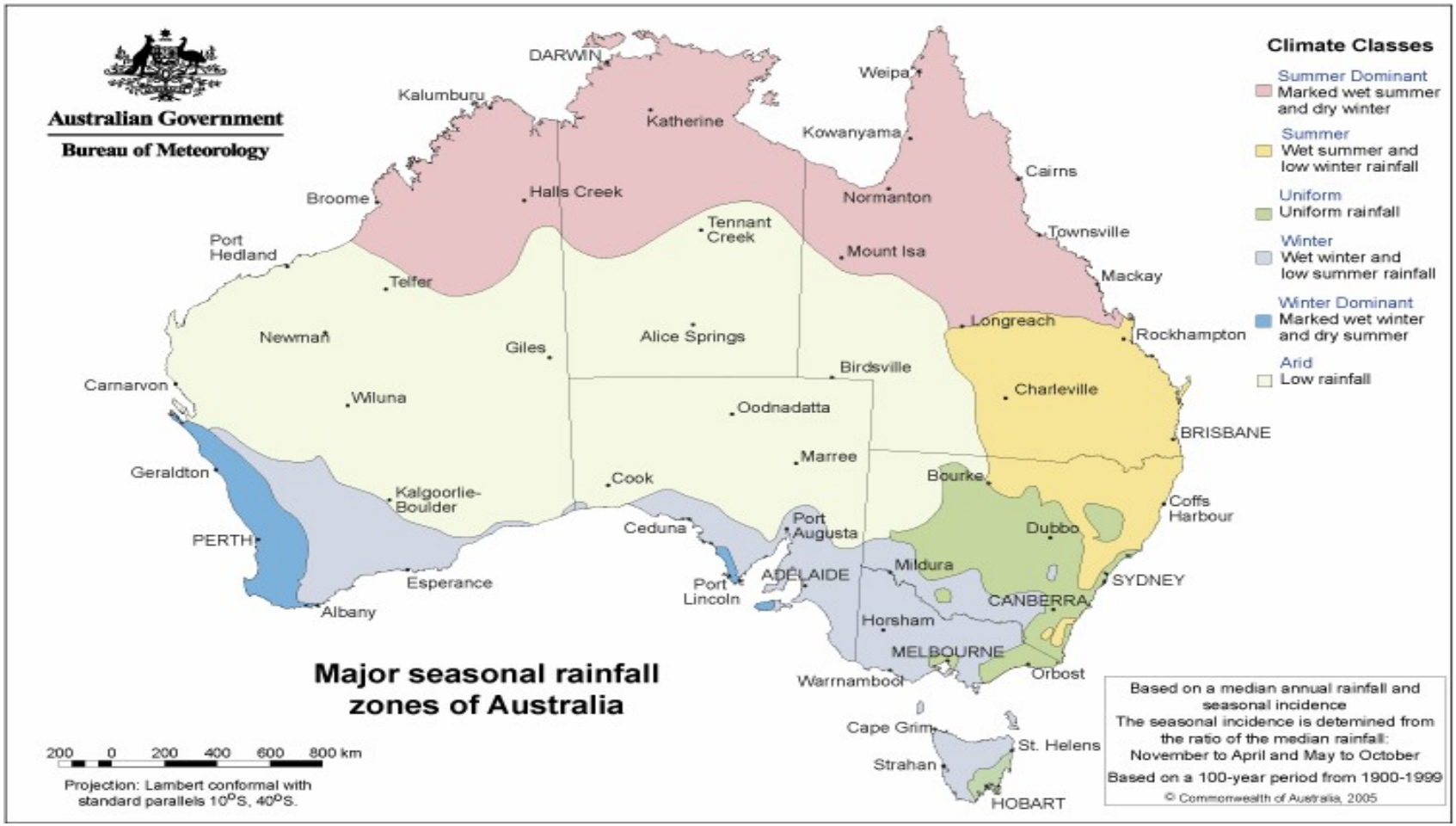
- Immature worms
- Adult worms

- Eggs
- Larvae on pasture

Sustainable treatment decisions

Short-acting	Persistent
BZ and Levamisole	Moxidectin
Ivermectin	Capsules
Abamectin	
Monepantel	

High- and low-risk control programmes



Source: Barry Hosking (Novartis) and Robert Dobson (Murdoch University)

Modelling

- Computer-based model
- 20 year time-frame
- Different treatment regimes
- 0% or 10% adult sheep left untreated

- Examples of scenarios:

Zone	Class	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
WA	Ewes							COM		MPL		
VIC	Ewes		COM			MPL					COM	
NNSW	Ewes			MPL		MOX	COM	MPL				MOX
WA	Lambs	MPL		COM						MPL		
VIC	Lambs		COM			MPL			COM			
NNSW	Lambs	COM		MPL		MOX	COM	MPL		MOX		

Outcomes of modelling

- BZ+LEV+Abamectin useful combination
- Best rotation differs between worm species & management
- Choice of drug rotation was most critical decision
- Up to 4% adult sheep untreated helped delay drug resistance without compromising worm control
- Careful integration of new treatments may help delay drug resistance to all drug classes

Sustainable treatment decisions

Short-acting	Persistent
BZ and Levamisole (LEV)	
Ivermectin, Abamectin	Moxidectin
BZ+LEV+Abamectin	Capsules
Monepantel	

Ensure some refugia

Care on green pastures

Making the most of treatments

- Worm egg count **monitoring**
  - Before and after drenching
- **Don't underdose** – check drench gun and weigh sheep
- **Fasting** sheep before treatment
  - Check label first
- **Quarantine** treatments for all new sheep

Using the right treatment

- Know the **target worms** on your property
- **Rotation** of treatment groups
- Effective treatment groups in **combinations**
- Avoid persistent treatments on **green pasture**
- Ensure refugia with short-acting treatments on **dry pasture**

Reducing reliance on treatments

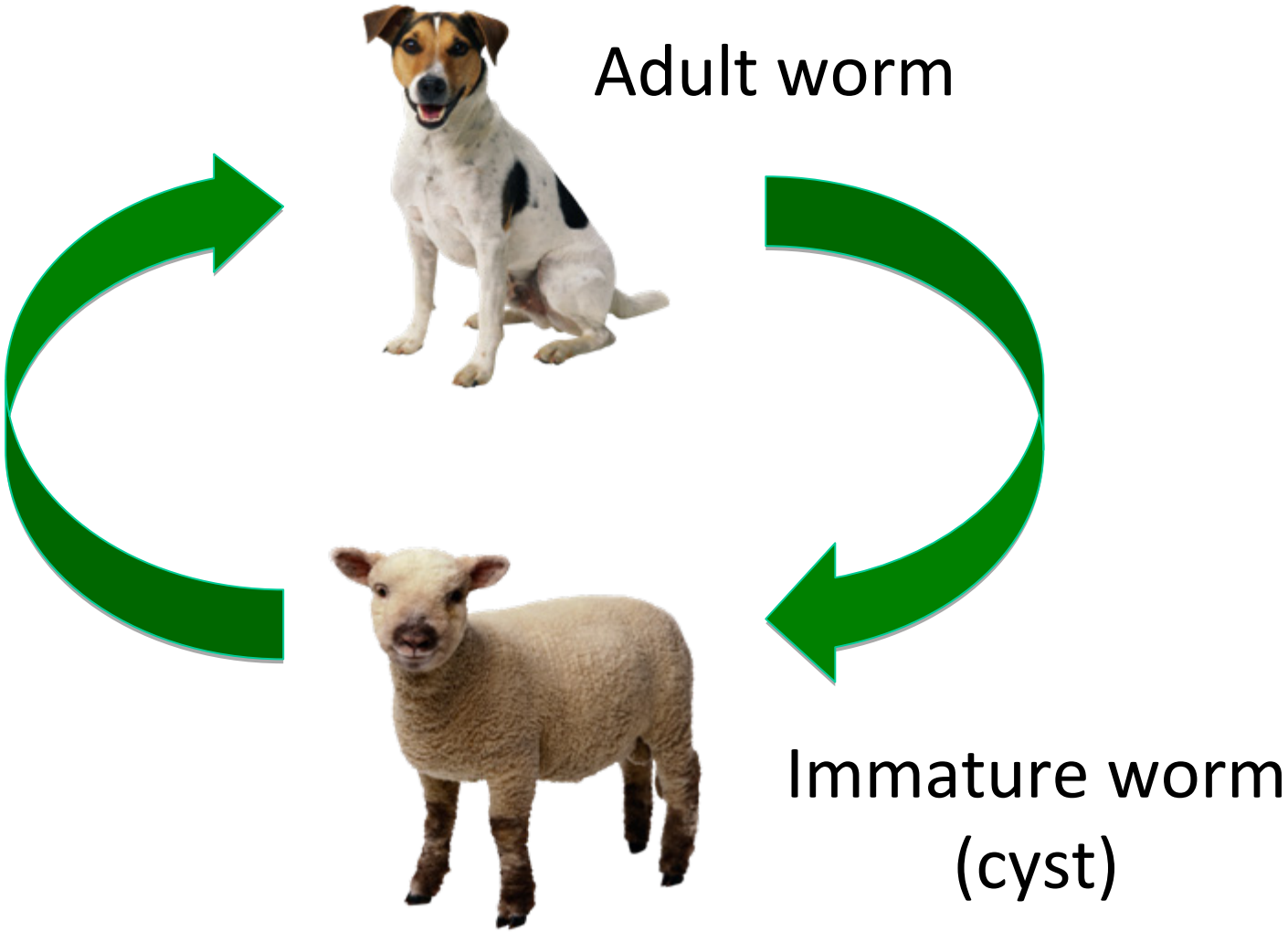
- **Genetics** – buy rams with WEC ASBV
- **Grazing management** – clean paddocks for lambs
- **Monitoring** – drench the mobs that need it

But there are other worm wealth hazards lurking...

Significance of tapeworms

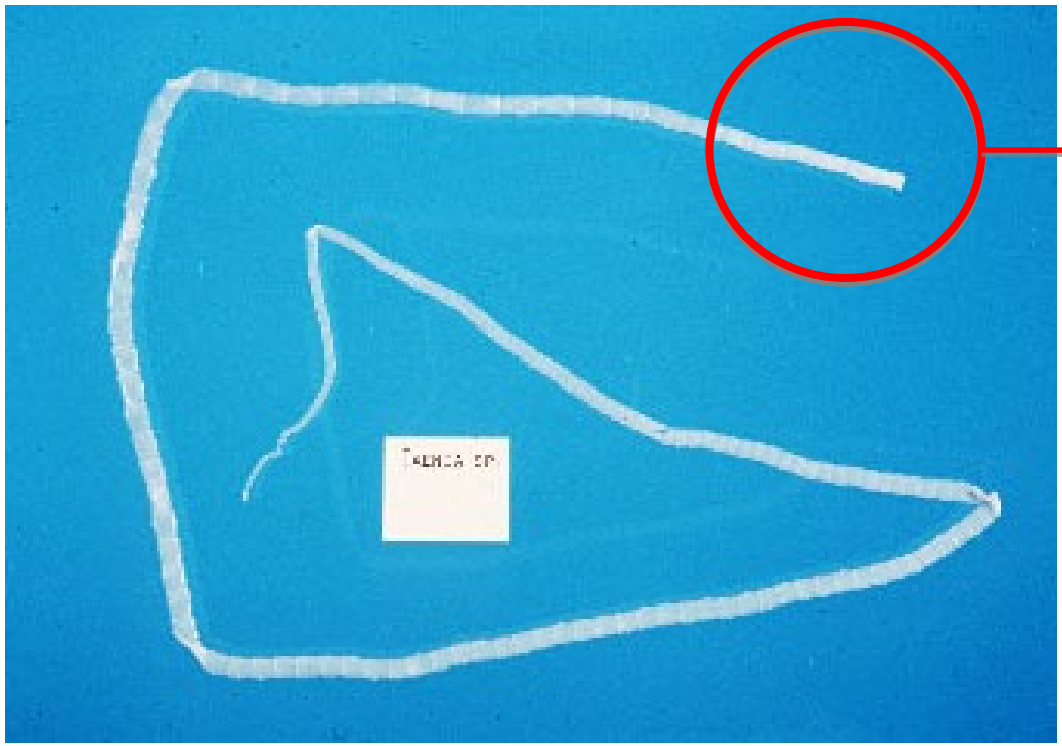
	Sheep Tapeworm	Ovis	Bladder worm	Hydatid
Wealth Hazard?	Rarely cause problems	✓ **Muscle**	✓ Offal	✓ Offal
Human health hazard?	✗	✗	✗	✓

Ovis lifecycle



Adult *Ovis* in the dog

Very long worm – Often 1m+



segments

Photo credit: Murdoch University (Parasitology)

Each segment can reproduce

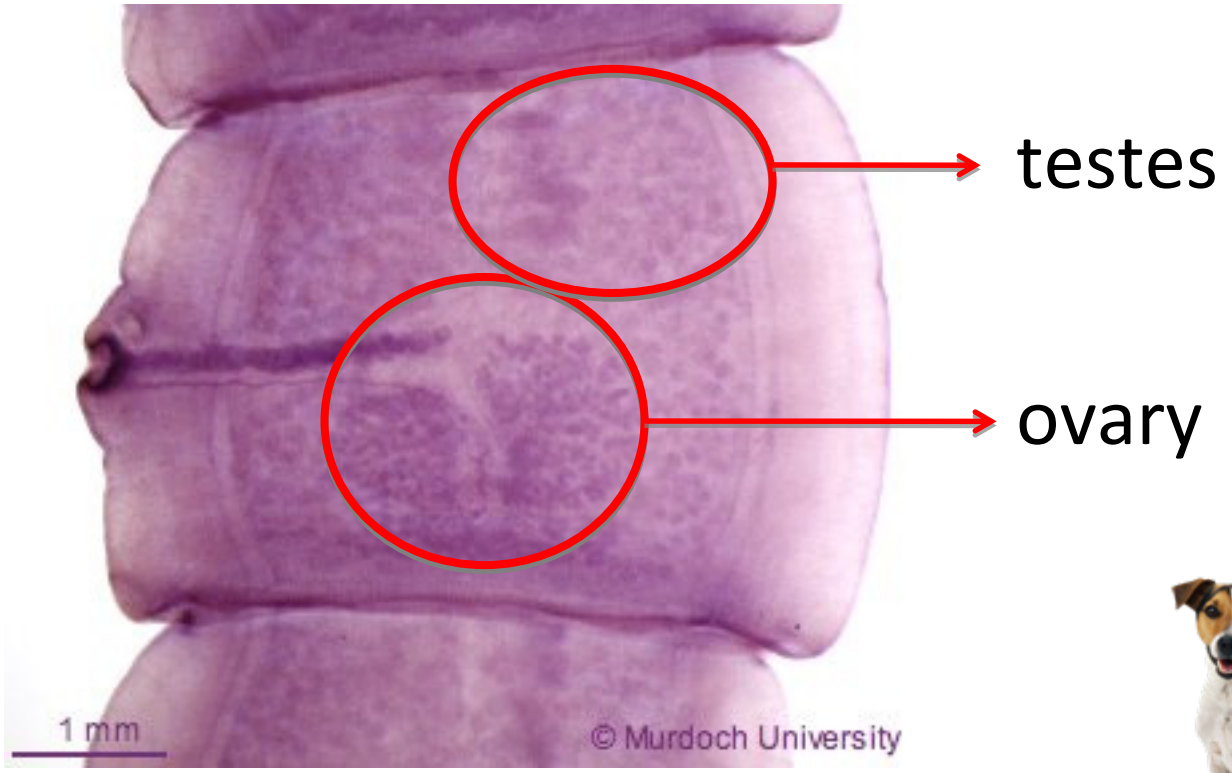


Photo credit: Murdoch University (Parasitology)

Each segment can make eggs

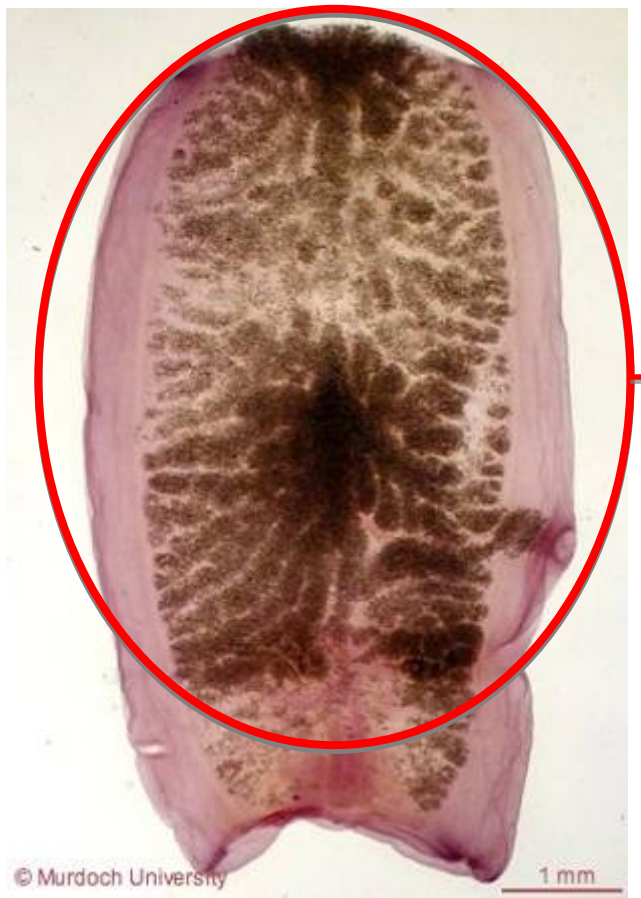


Photo credit: Murdoch University (Parasitology)

More than
85 000 eggs

Ovis segments onto pasture

Photo credit: Murdoch University (Parasitology)

3 segments / worm daily

1 segment = 85 000+ eggs

250 000+ eggs/day/worm

Sheep eat ovis eggs on pasture

- Survive many months
- **Dispersed widely**
  - 20 000m^2 in 10 days
  - 80m radius

Cyst = measles

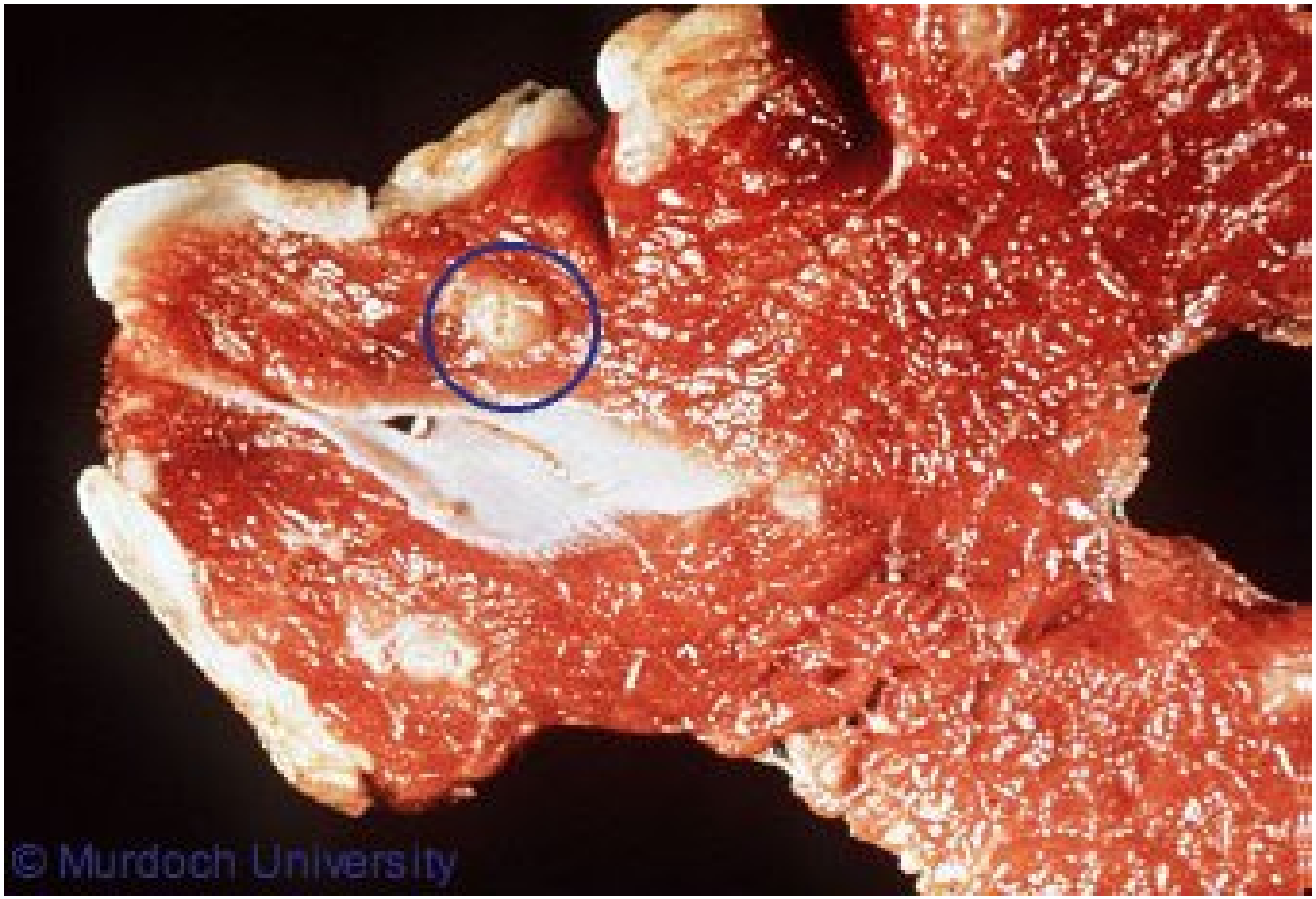
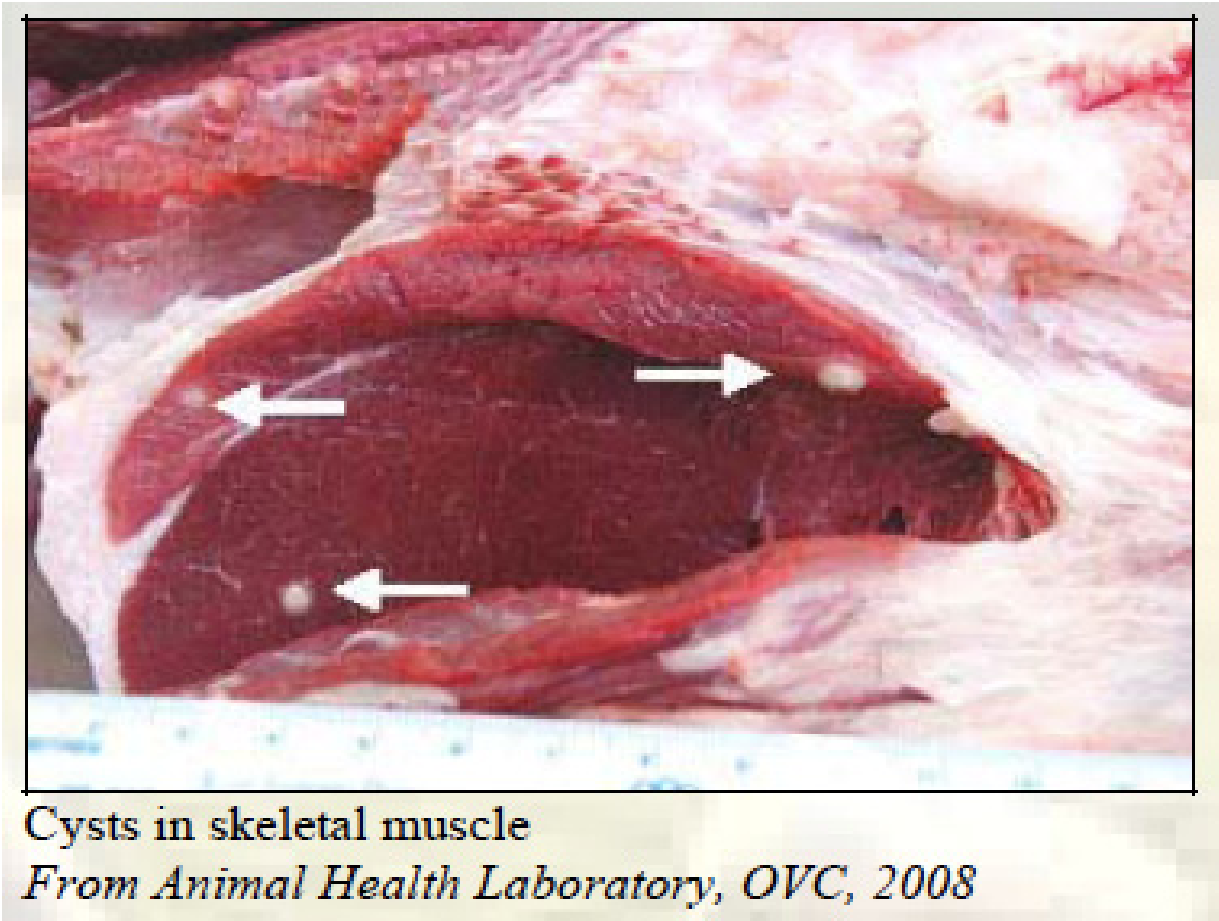


Photo credit: Murdoch University (Parasitology)

Cyst = measles

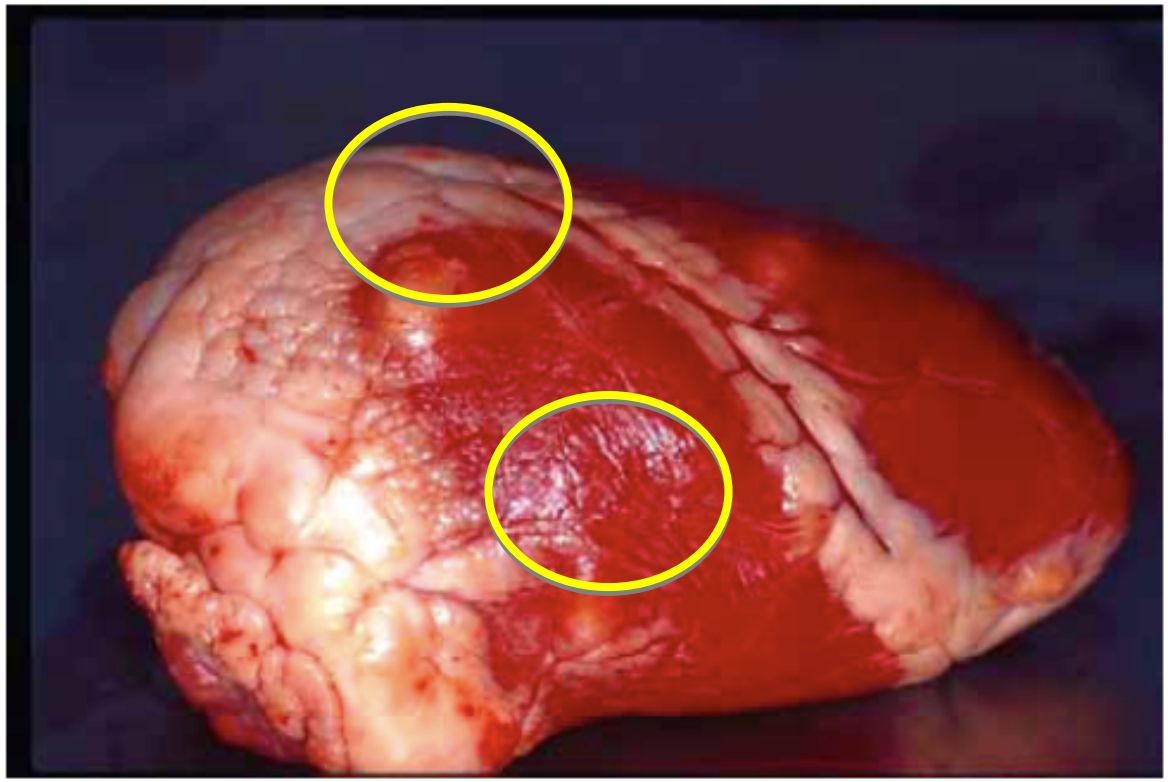


Cysts in skeletal muscle

From Animal Health Laboratory, OVC, 2008

Photo credit: Canadian Sheep Federation

Cyst = measles



Cysticercus ovis *in the heart muscle.*

Photo credit: DAFWA

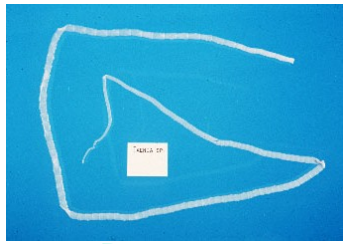
Measles: a common disease

% affected

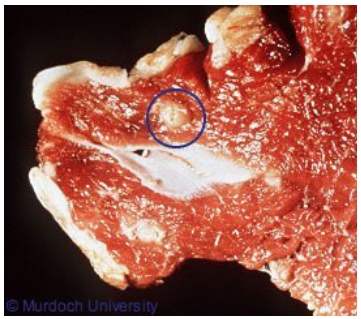
	Jan	Feb	Mar	Apr	May	June	July	Aug
Mutton	5.5	4.6	4.9	3.5	4.6	6.1	5.3	5.7
Lamb	0.7	0.6	0.6	0.7	0.7	1.3	1.4	4.0

More common in older sheep **BUT still significant in lambs!**

Dog eats cyst



250 000+ eggs/day



Cysts in muscle

Dispersed over paddock

Worm all dogs

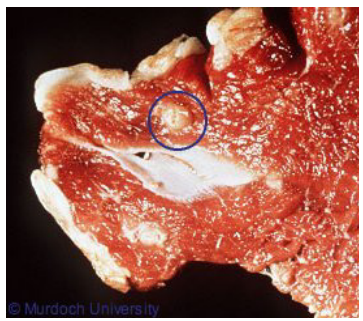
Praziquantel

5 weekly intervals

Dog diet

Cooking or freezing meat

Prevent scavenging



Take home messages

- Worms reduce income
- Manage worms – practical, effective and sustainable
- New treatments available – use these carefully
- wormboss.com.au

- Dog tapeworms can infect sheep
  - Worm dogs every 5 weeks with tapewormer
  - Don’t let dogs eat raw meat or offal