

Drench Resistance in Australian Beef Cattle



Australian Government
Australian Research Council

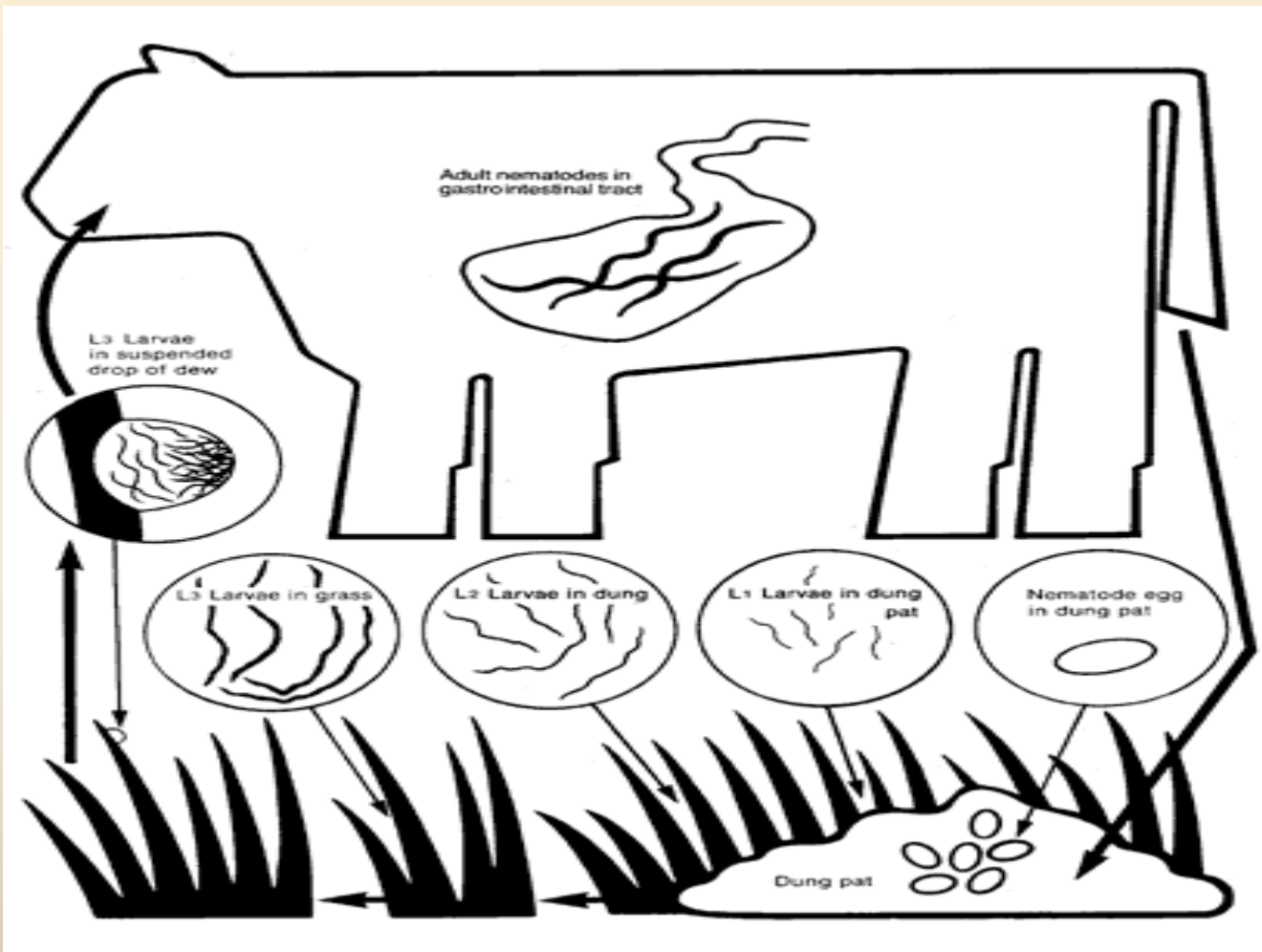




**NEMATODE DRENCH RESISTANCE
IN AUSTRALIAN CATTLE**

Ancore

Nematode lifecycle



Cattle nematodes

- Four main nematodes affecting cattle:
 - *Ostertagia ostertagi* – most pathogenic
 - *Cooperia oncophora* – hardest to control
 - *Trichostrongylus axei* – infects other species
 - *Haemonchus placei* – serious resistance problem but geographically limited (?)

Chemical treatment

- Main classes of anthelmintics:
 - Macrocyclic lactones
 - Benzimidazoles
 - Imidazothiazoles
- Routes of administration:
 - Oral
 - Injectable
 - Pour-on

Development of Resistance

- Parasite biology (genetics)
 - Environment (refugia)
 - Management (anthelmintic use)
- ❖ **There is no reversion**

Risk Factors for Resistance

- Treat and move to a clean pasture
- Excessive and unnecessary treatment
 - Monitor with FEC
- Ineffective dosing
- Introduction
 - Quarantine

Anthelmintic Resistance

- Defined as the failure of a treatment to reduce faecal egg counts by >95%
- ▶ Resistance found in all three main nematocides
 - New Zealand
 - Argentina
 - Brazil
 - Europe
 - **Australia**

Recent Australian Findings

Study	n	Albendazole oral (BZ)	Levamisole oral (Imid)	Ivermectin oral (ML)
Lyndal-Murphy et al. (2010) (Qld)	1 (1)	Anthelmintic remains effective against all major gastrointestinal parasites.	Anthelmintic remains effective against all major gastrointestinal parasites.	<i>Cooperia</i> <i>Haemonchus</i>
Rendell et al. (2010) (Vic)	5 (11) BZ	<i>Ostertagia</i> <i>Trichostrongylus</i>	<i>Ostertagia</i>	<i>Cooperia</i> <i>Ostertagia</i>
	3 (3)- I			
	5 (11)-ML			
McMillan (2010) (NSW & Vic)	1 (6)	88% <i>Haemonchus</i> 5% <i>Trichostrongylus</i> 3% <i>Ostertagia</i> 4% <i>Cooperia</i>	Anthelmintic remains effective against all major gastrointestinal parasites.	42% <i>Cooperia</i> 33% <i>Ostertagia</i> 25% other

Table 1: Summary of parasite species identified in recent Australian cattle parasite resistance studies using oral drenches, n=properties where treatment failure detected, (n)=properties tested.

Recent Australian Findings

Study	n	IVM (inj)	MOX (pour-on)
Lyndall-Murphy (Qld)	1 (2)	48 % <i>Haemonchus</i> 52 % <i>Cooperia</i>	
Lyndall- Murphy (Qld)	1(1)		100 % <i>Cooperia</i>
Brockwell (NSW & Vic)	2(2)		100 % <i>Cooperia</i> (1)

Table 2: Summary of parasite species identified in recent Australian cattle parasite resistance studies using non-oral drenches, n=properties where treatment failure detected, (n)=properties tested.

Location	Albendazole oral (BZ)	Levamisole oral (Imid)	Ivermectin oral (ML)	Moxidectin pour-on (ML)	Combination Pour-on (Imid + ML)
Tallangatta Valley (Vic)	91.14%	97.48%	50.04%	96.95%	100%
	Resistant	Low resistant	Resistant	Low Resistant	<i>Susceptible</i>
Tarcutta (NSW)	86.56%	99.68	84.13%	94.72%	100%
	Resistant	<i>Susceptible</i>	Resistant	Resistant	<i>Susceptible</i>

Table 3: Reduction in faecal egg count (FECR%) from recent Australian cattle parasite resistance studies

Current trial

- Test combination treatment against MOX
- IVM resistant property
- Young cattle (replacement heifers) < 12 mths
- FEC > 200epg
- Contact: District Vet or Yvette

Conclusions

- Know your herd's resistance status
 - FECRT
- Protect your herd
 - Management
 - Quarantine
- Anthelmintic Future:
 - Learn from the sheep experience-FEC
 - Combination treatments
 - New chemical classes ?



Triclabendazole resistant *Fasciola hepatica*



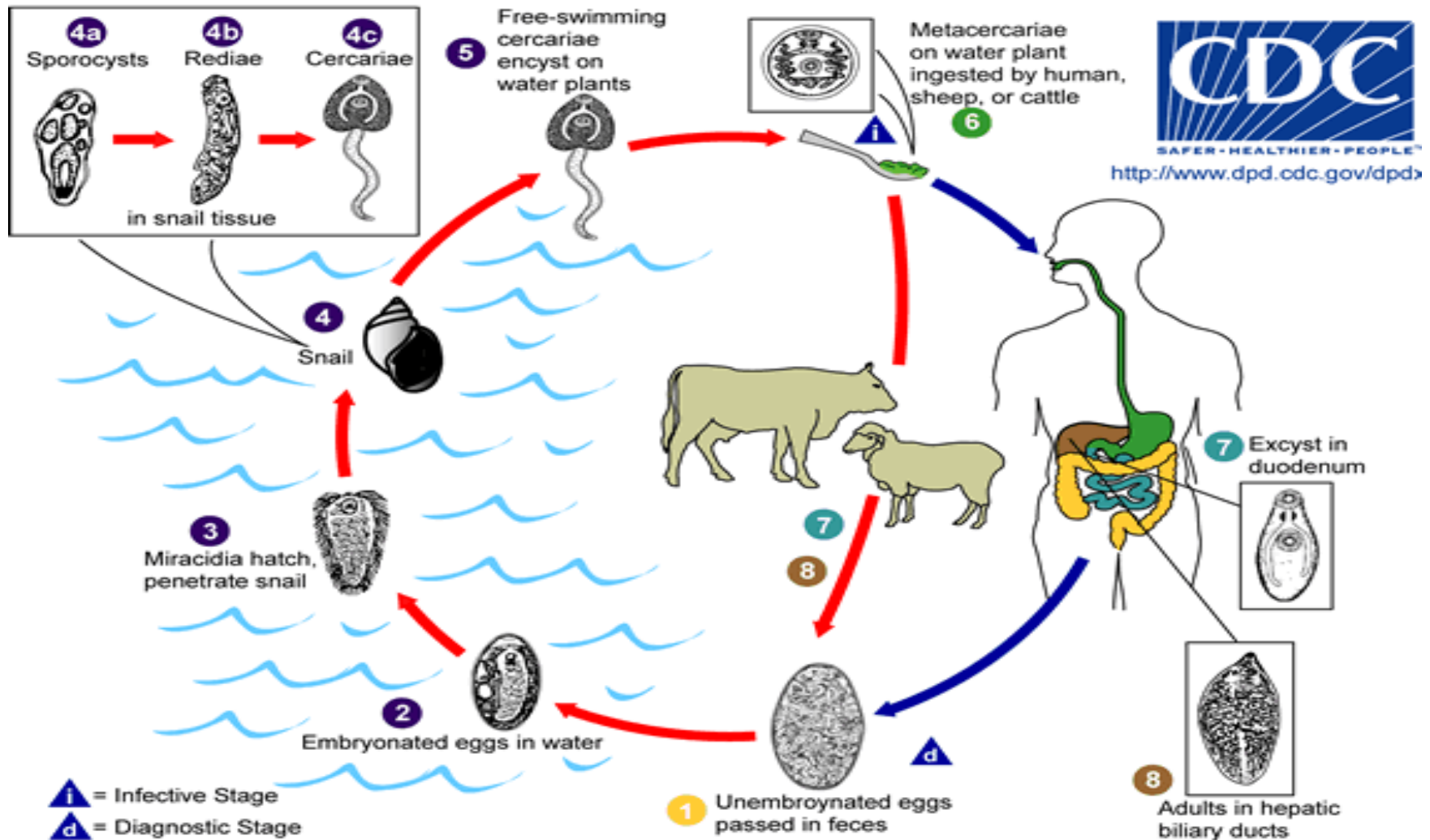
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ANIMAL HEALTH

Life cycle



Treatments

- Triclabendazole – all stages
- Nitroxynil
- Clorsulan
- Combination injectable – all stages

Traditional Schedule:

Dec-Feb. Treat all stages in high fluke risk areas

Mar-May. Treat all stages

Sept. Treat adults. Use an alternative to TCBZ

Improved diagnosis & control

ARC Linkage Project aims:

- Define genetic diversity
 - Resistant and susceptible populations
- Validate diagnostic test
 - FEC, serum antibody and faecal antigen ELISAs
- Measure extent of resistance

Resistant properties identified

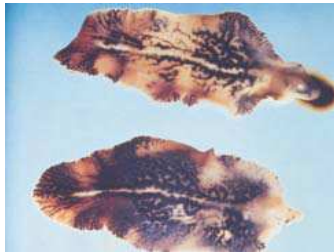
	mean FEC (10g)			
LOCATION	pre-trt	post-trt	FECR (%)	STATUS
Bega (NSW)	48 ± 10	11 ± 2	80.4	Resistant
Tallangatta Valley (Vic)	27 ± 6	16 ± 4	78.9	Resistant

Trial

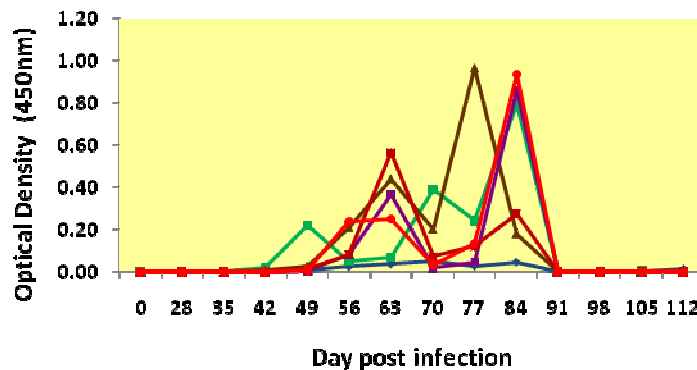
- TCBZ failure?
- +ve fluke egg count
- 30 head (15 treated TCBZ, 15 untreated controls)
- Visits
 - day 0 (treatment TCBZ, FEC)
 - Day 21 (treatment Nitromec, FEC)
- Contact : District Vet or Yvette

Comparative kinetics of serological and copro-antigen ELISA and faecal egg count in cattle over 18 weeks of experimental infection with *Fasciola hepatica*

YM Brockwell, TW Spithill, GR Anderson, V Grillo and NC Sangster



Faecal *Fasciola hepatica* antigen levels of animals treated with TCBZ day 84 PI



- Aim to evaluate a *F. hepatica* faecal antigen ELISA for improved diagnosis
- ELISA
 - detects infection: 3/12 animals on day 42, 12/12 on day 56,
 - test is negative 7 days post treatment
 - correlation between OD and fluke burden $r^2 = 0.87$
 - detects infections >14 fluke
 - more flexible sample storage and processing
- FUTURE PLANS
 - field testing
 - bulk samples for herd testing
 - potential for drug resistance testing

Conclusions so far

- Yes - we have TCBZ resistance ☹️
- Yes - the faecal antigen ELISA is a suitable alternative diagnostic tool 😊
- DNA typing has revealed a high level of genetic diversity



Acknowledgements



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District Veterinarians and Animal Health Officers



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