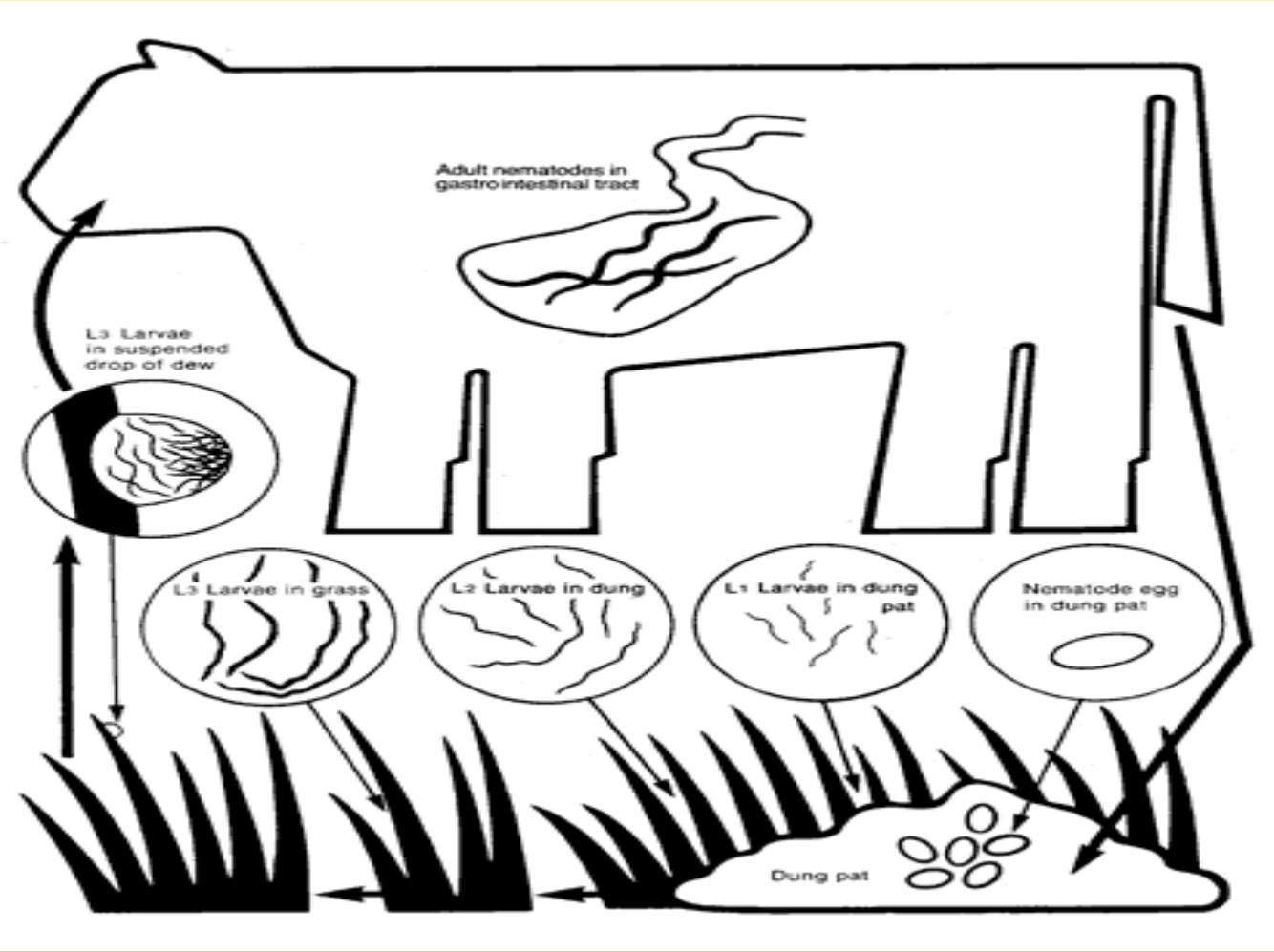

Drench Resistance in Australian Beef Cattle
Ancare
CHARLES STURT UNIVERSITY
Australian Government
Australian Research Council
Virbac
ANIMAL HEALTH

NEMATODE DRENCH RESISTANCE IN AUSTRALIAN CATTLE

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.	*Cooperia* *Haemonchus*
Rendell et al. (2010) (Vic)	5 (11) BZ	*Ostertagia* *Trichostrongylus*	*Ostertagia*	*Cooperia* *Ostertagia*
	3 (3)- I			
	5 (11)-ML			
McMillan (2010) (NSW & Vic)	1 (6)	88% *Haemonchus* 5% *Trichostrongulus* *3% Ostertagia* 4% *Cooperia*	Anthelmintic remains effective against all major gastrointestinal parasites.	42% *Cooperia* 33% *Ostertagia* *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 % Haemonchus* *52 % Cooperia*	
Lyndall- Murphy (Qld)	1(1)		*100 % Cooperia*
Brockwell (NSW & Vic)	2(2)		*100 % Cooperia (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	*Susceptible*
Tarcutta (NSW)	86.56%	99.68	84.13%	94.72%	100%
	Resistant	*Susceptible*	**Resistant**	**Resistant**	*Susceptible*

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 ?

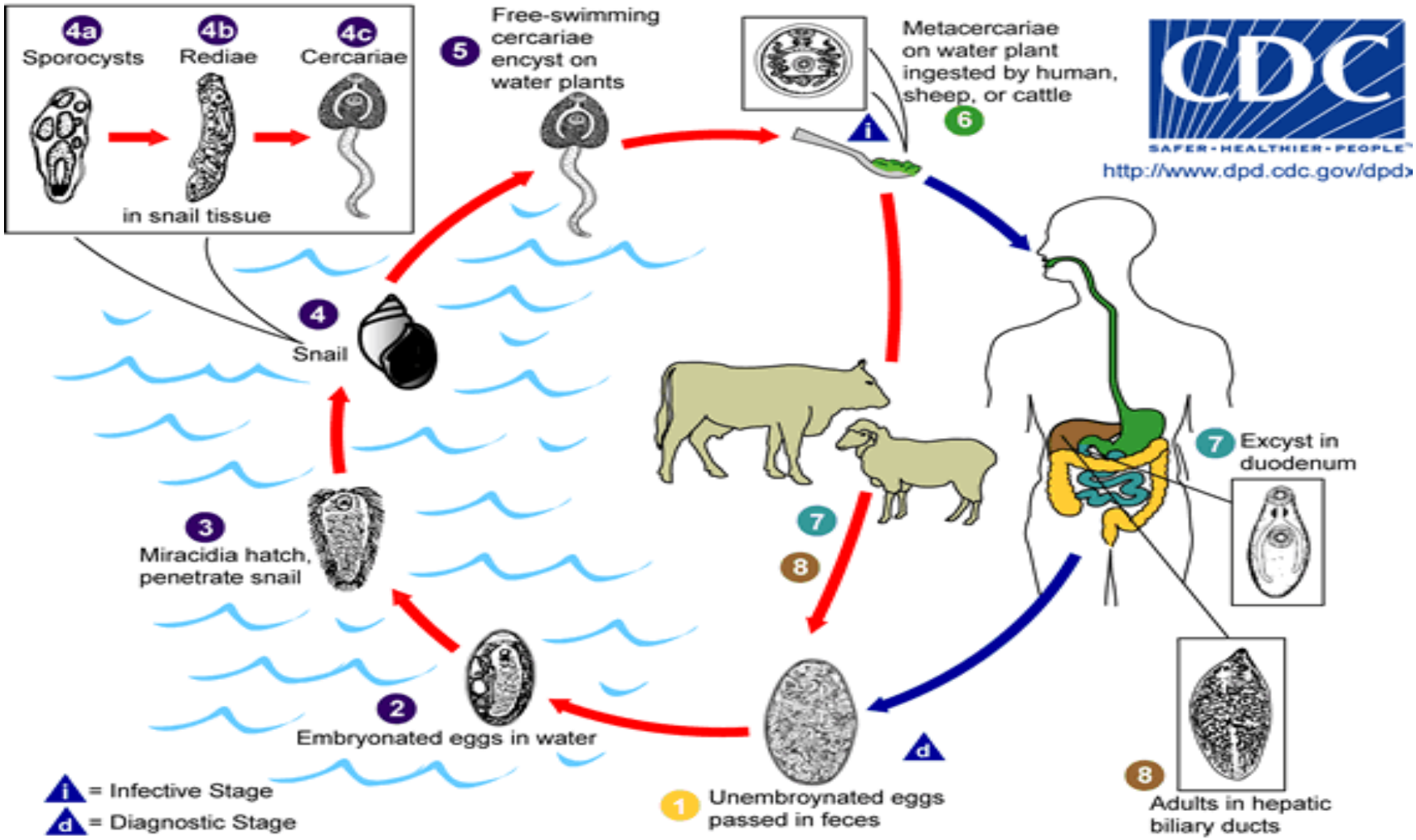
Triclabendazole resistant *Fasciola hepatica*

CHARLES STURT UNIVERSITY

Australian Government
Australian Research Council

Virbac ANIMAL HEALTH

Life cycle


4a
Sporocysts
4b
Rediae
4c
Cercariae
in snail tissue
5
Free-swimming
cercariae
encyst on
water plants
Metacercariae
on water plant
ingested by human,
sheep, or cattle
6
i
CDC
SAFER·HEALTHIER·PEOPLE
http://www.dpd.cdc.gov/dpdx
4
Snail
3
Miracidia hatch,
penetrate snail
7
Excyst in
duodenum
7
8
2
Embryonated eggs in water
d
1
Unembroynated eggs
passed in feces
8
Adults in hepatic
biliary ducts
i = Infective Stage
d = Diagnostic Stage

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

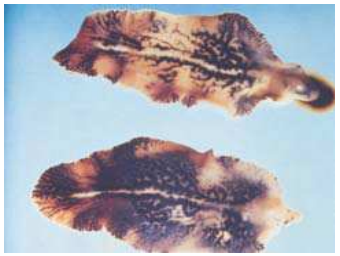
	mean FEC (10g)			
LOCATION	pre-trt	post-trt	FECR (%)	STATUS
Bega (NSW)	48 ± 10	11 ± 2	80.4	Resistant
Tallangatta Valley (Vic)	27 ± 6	16 ± 4	78.9	Resistant

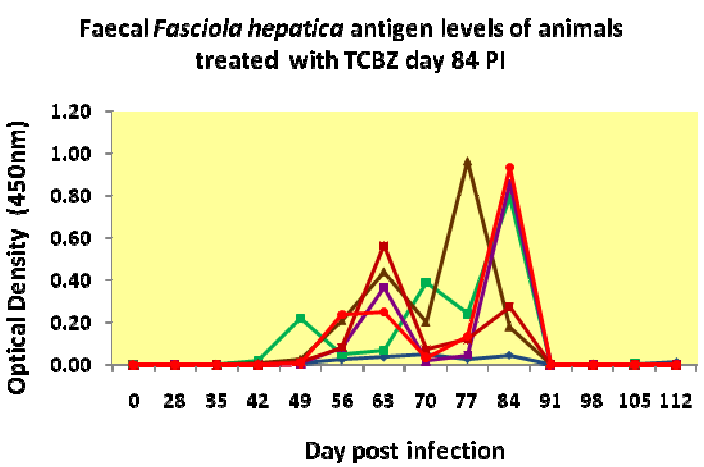
Trial

- 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





- 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

CHARLES STURT UNIVERSITY
Australian Government
Australian Research Council
Virbac ANIMAL HEALTH

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

Ancare

Australian Government
Australian Research Council

Virbac
ANIMAL HEALTH

District Veterinarians and Animal Health Officers

LHPA

State Government Victoria
DEPARTMENT OF PRIMARY INDUSTRIES

Jesse McMillan

Preferred contact details:

Dr Yvette Brockwell

Email: ybrockwell@csu.edu.au

Phone: 0427 686471