Anthelmintic resistance in gut worms of cattle

Orla Keane
Teagasc

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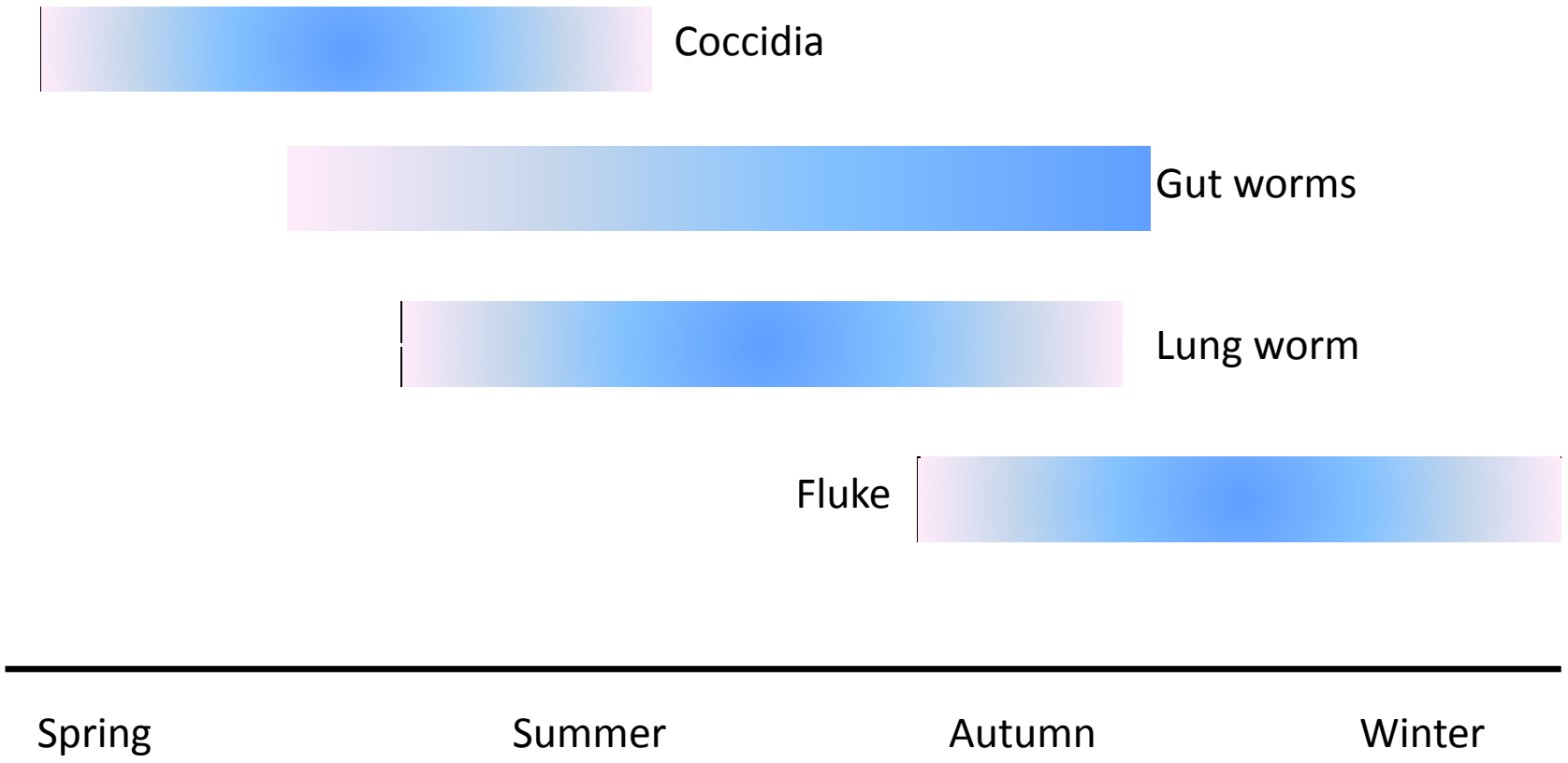
Agriculture and Food Development Authority

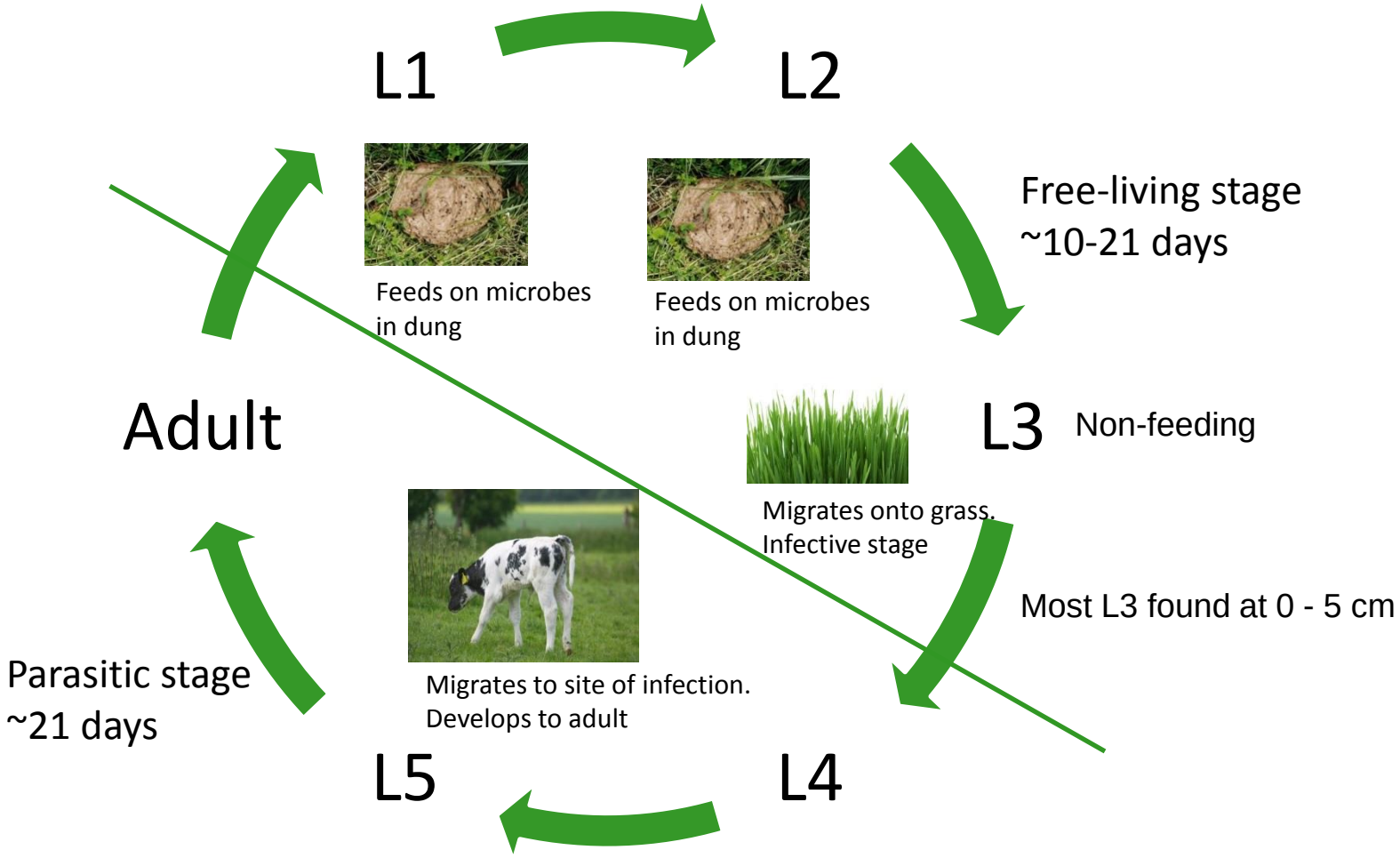
Overview

- Background
- What is anthelmintic resistance?
- Anthelmintic resistance in Ireland
- Risk factors for the development of anthelmintic resistance
- Sustainable worm control

Parasite Calendar



Worm lifecycle

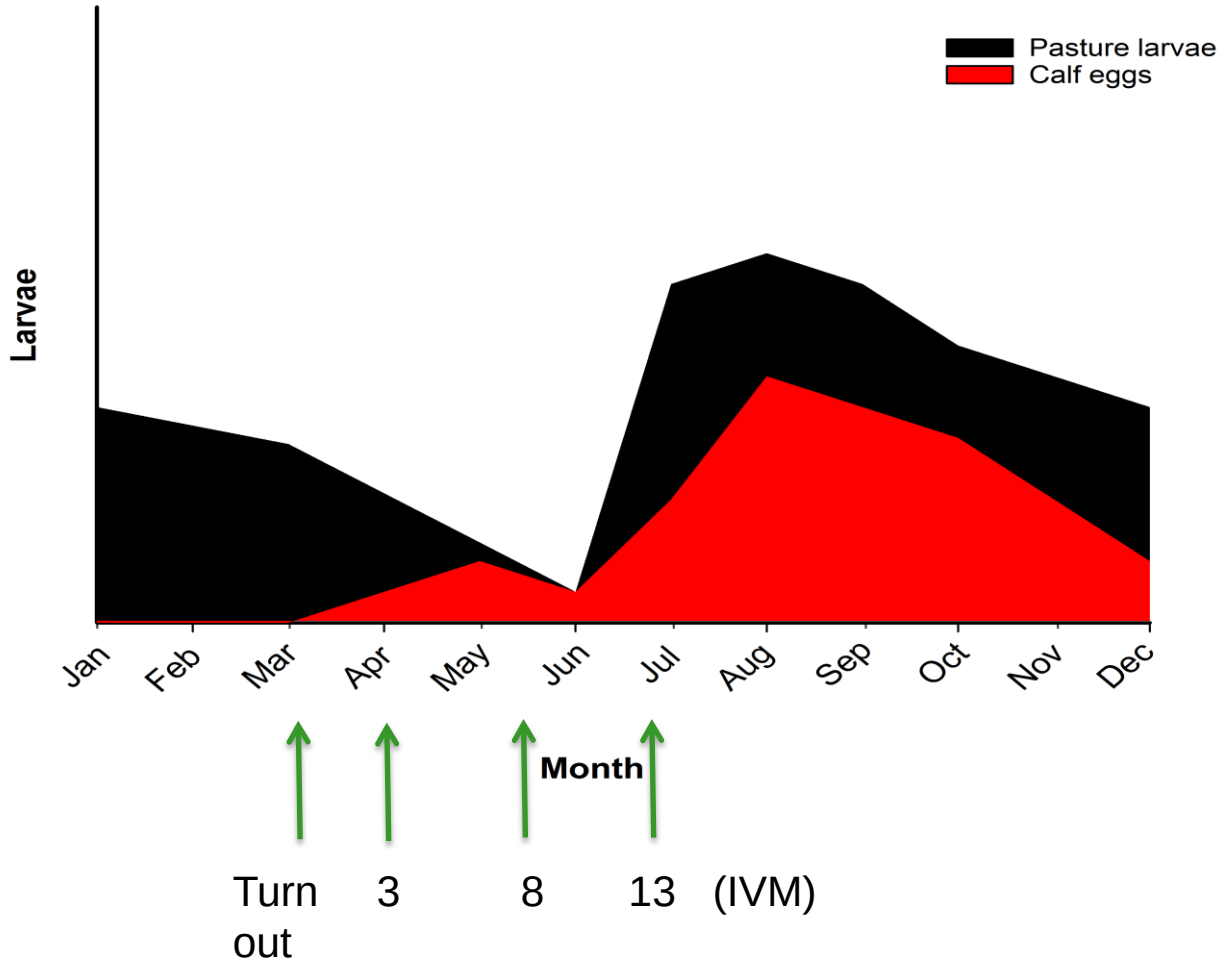


Gut worms of cattle

- Many different species
- *Cooperia oncophera*
- *Ostertagia ostertagi*

Cooperia oncophera	*Ostertagia ostertagi*
Small intestine	Abomasum
Main contributor to FEC in FGS	Type I or Type II disease
Immunity develops quickly	Immunity develops slowly

Pasture Larval Burden



Anthelmintic drug classes currently available

Class	Common name	Chemicals	First released	First resistance reported
Benzimidazole	White (1-BZ)	Albendazole Fenbendazole Oxfendazole	1961	1964
Levamisole	Yellow (2-LV)	Levamisole	1970	1979
Macrocyclic lactone	Clear (3-ML)	Doramectin Eprinomectin Ivermectin Moxidectin	1981	1988

Anthelmintic Resistance

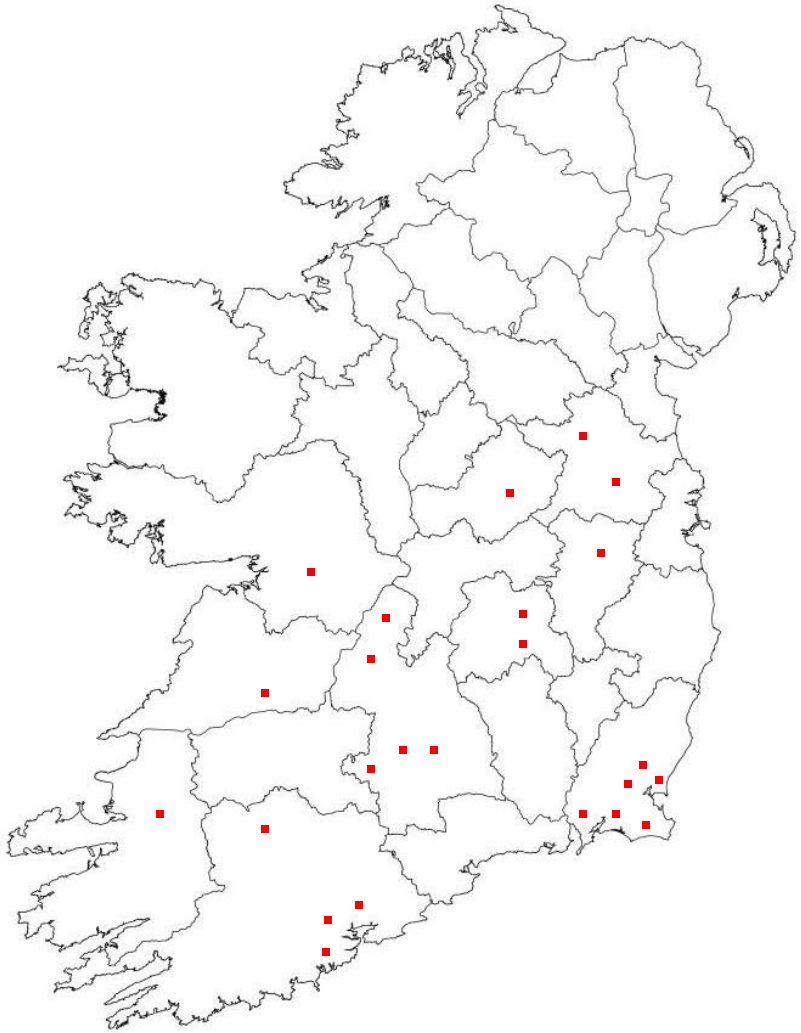
- Anthelmintic resistance is the ability of a worm to survive a dose that should kill it.

- It is a genetically inherited trait

- Anthelmintics from different classes (e.g. 1-BZ, 2-LV or 3-ML) have different modes of action but within a class products share a similar mode of action - when resistance develops to one product within a class all the products in the same class are often affected

Anthelmintic Resistance in Ireland

Farm location



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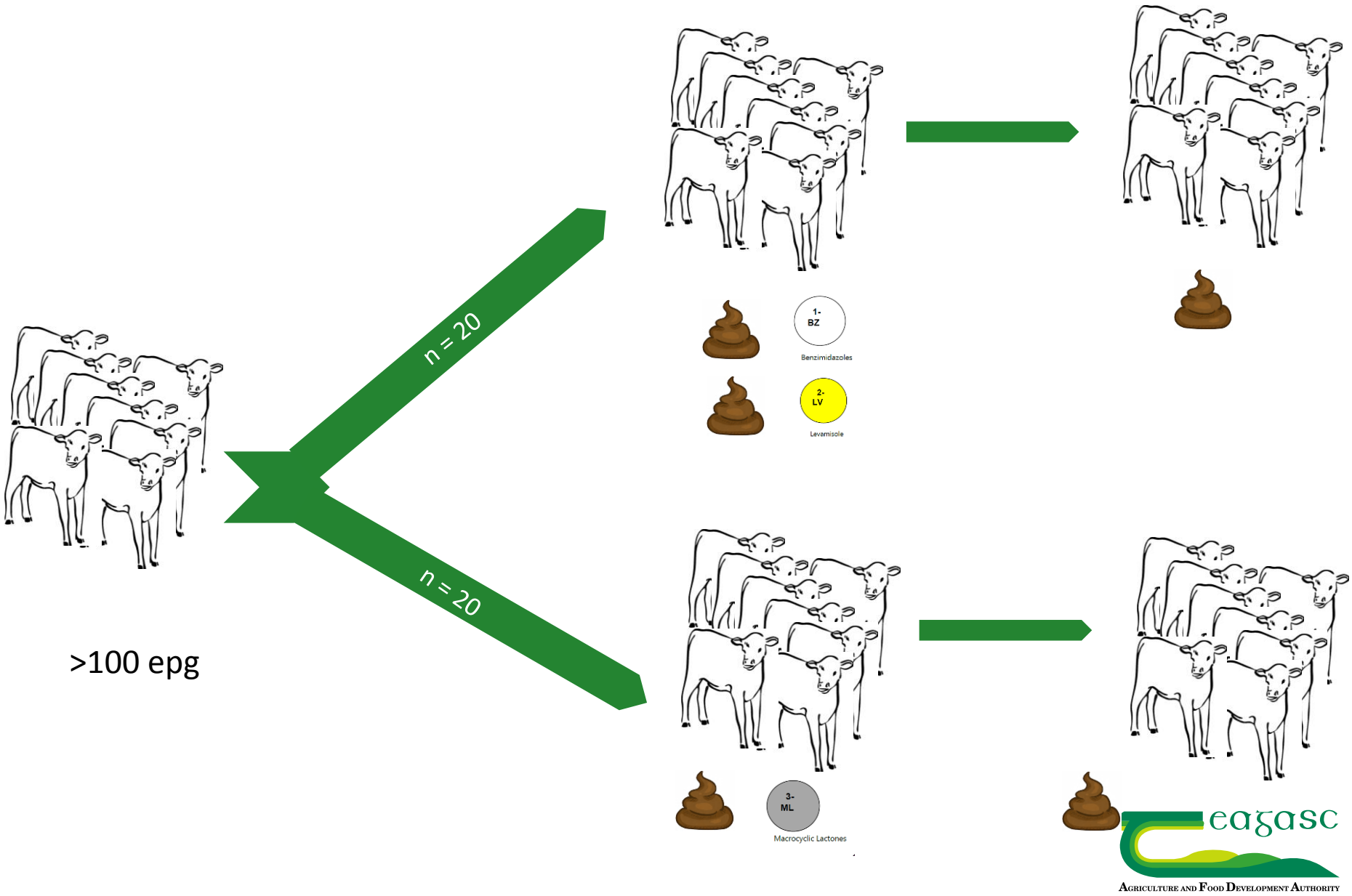
Faecal Egg Count Reduction Test



>100 epg

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Resistance Results

Anthelmintic	Number of Farms	Number Resistant	Prevalence
Benzimidazole (oral)	15	9*	60%
Levamisole (oral)	11	2	18%
Ivermectin (injectable)	16	16	100%
Moxidectin (injectable)	11	8	73%

1-BZ and 3-ML (IVM) resistant *Cooperia* and *Ostertagia* were detected
2-LV and 3-ML (MOX) *Cooperia* were detected – efficacy could not be tested against *Ostertagia*

Reduction Results

Farm	Benzimidazole	Levamisole	Ivermectin	Moxidectin
2	69	92	-181	38
7	68	100	72	88
13	99	83	82	93
16	90	100	57	37
18	98	99	89	99

Red – resistant

Green – susceptible

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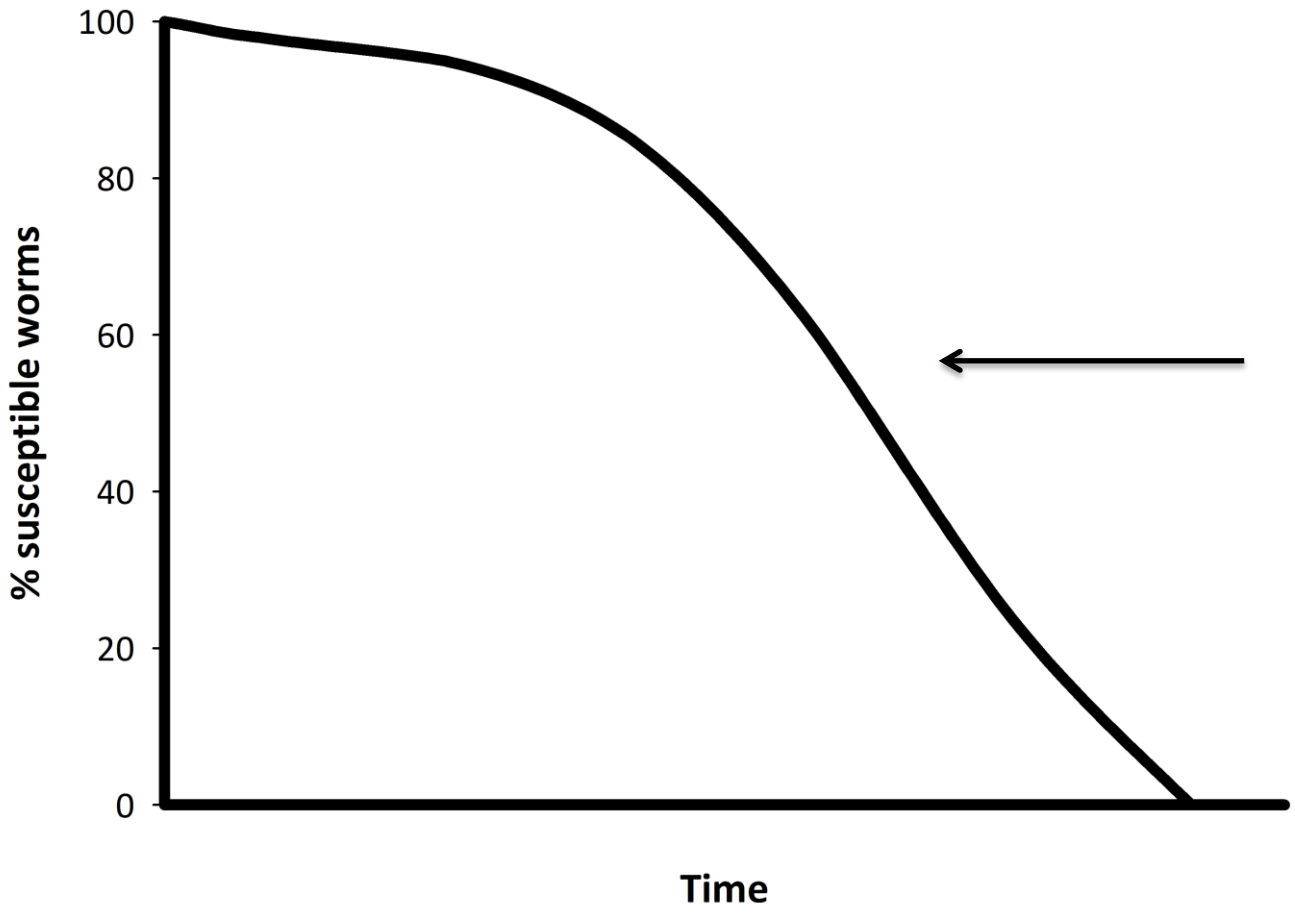
Sustainable Worm Control

Factors that influence the development of AR

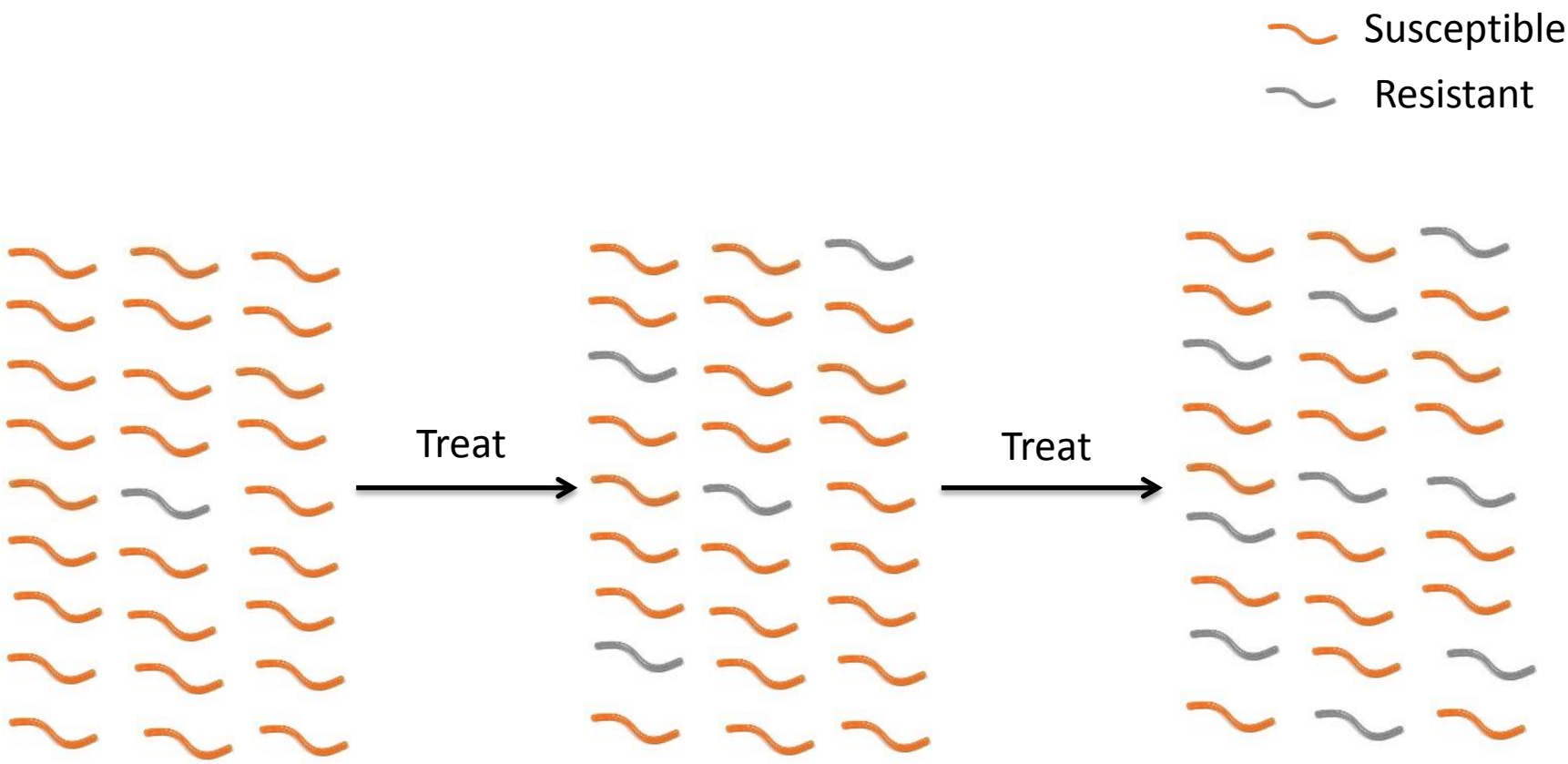
Any practice that gives the resistant worms a selective advantage

1. Current resistance level
2. Treatment frequency
3. Under-dosing
4. *Refugia* i.e. the proportion of the worm population not exposed to anthelmintic treatment

Current resistance level



Treatment Frequency



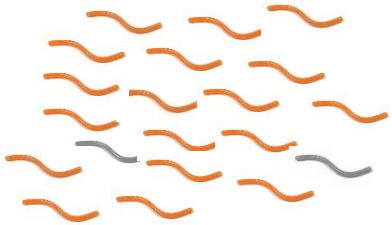
Under-dosing

Refugia

Susceptible worm

Resistant worm

Poor *refugia*

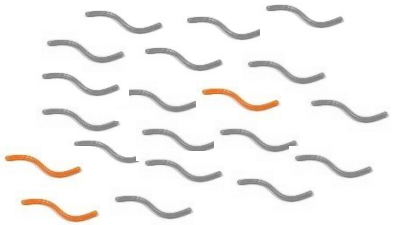


Worm population
On a farm

Treat with
anthelmintic

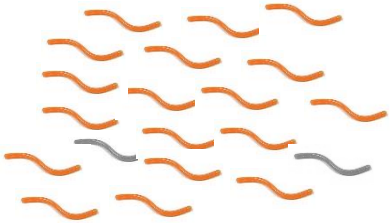
Few susceptible worms
to dilute resistant worms

Resistant worms
shed onto pasture



Resistance develops rapidly

Good *refugia*



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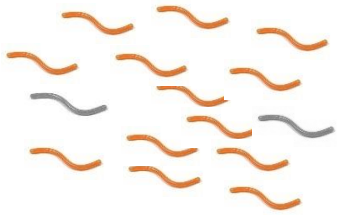

Resistant worms
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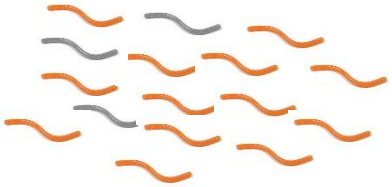

Resistance develops slowly

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Grazing Management

- Maximise *refugia*
- Minimise treatment of older/immune animals
- Graze treated young stock and untreated older stock over the same pastures
- Leader-follower systems
- Mixed grazing
- Do not ‘dose and move’ to clean pasture

Appropriate use of anthelmintics

- Dose only when necessary – strategic or targeted
- Use an appropriate and effective product
- Give the correct dose rate
- Administer the product in the right way
- Oral > Injectable > Pour on
- Minimise/eliminate use of persistent products where possible

What to do?