Measurement of antimicrobial usage & resistance

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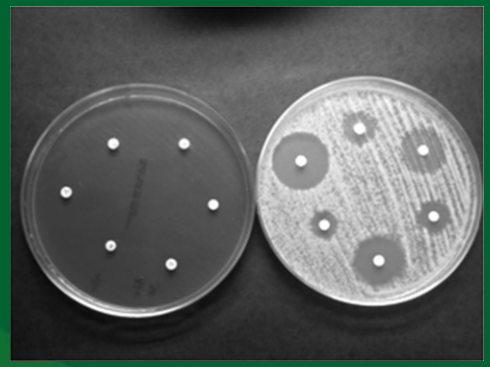

Measurement of Antimicrobial Usage & Resistance

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Leading the way in Agriculture and Rural Research, Education and Consulting

Epidemiology of AMR in faecal *E. coli*

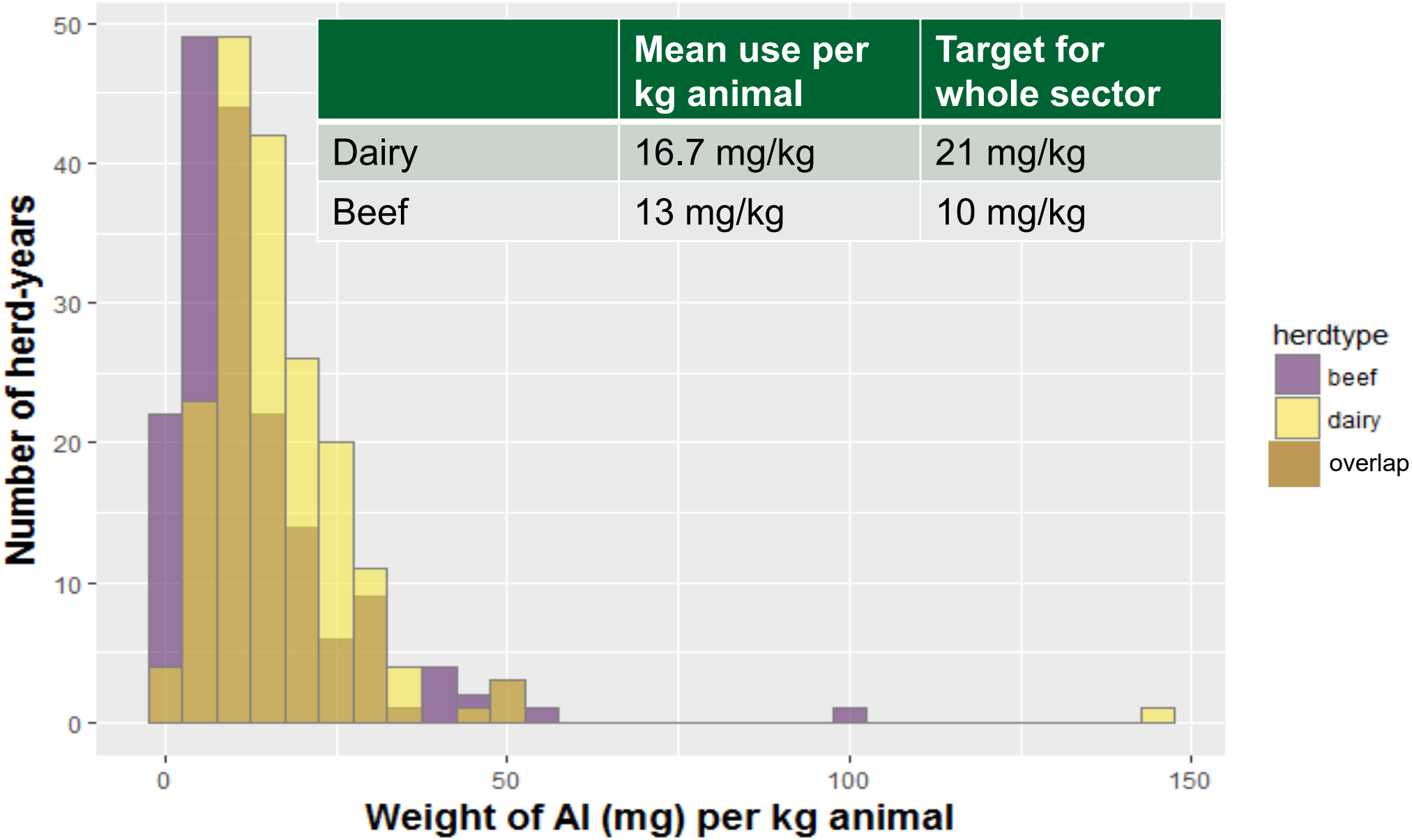
- Higher (sample level) prevalence in diarrhoeic calves than non-diarrhoeic calves
- Higher (sample level) prevalence in calves, compared to adult cows. Lowest in sheep

Table: prevalence of samples from healthy calves, adult cows and sheep testing resistant to three antimicrobials

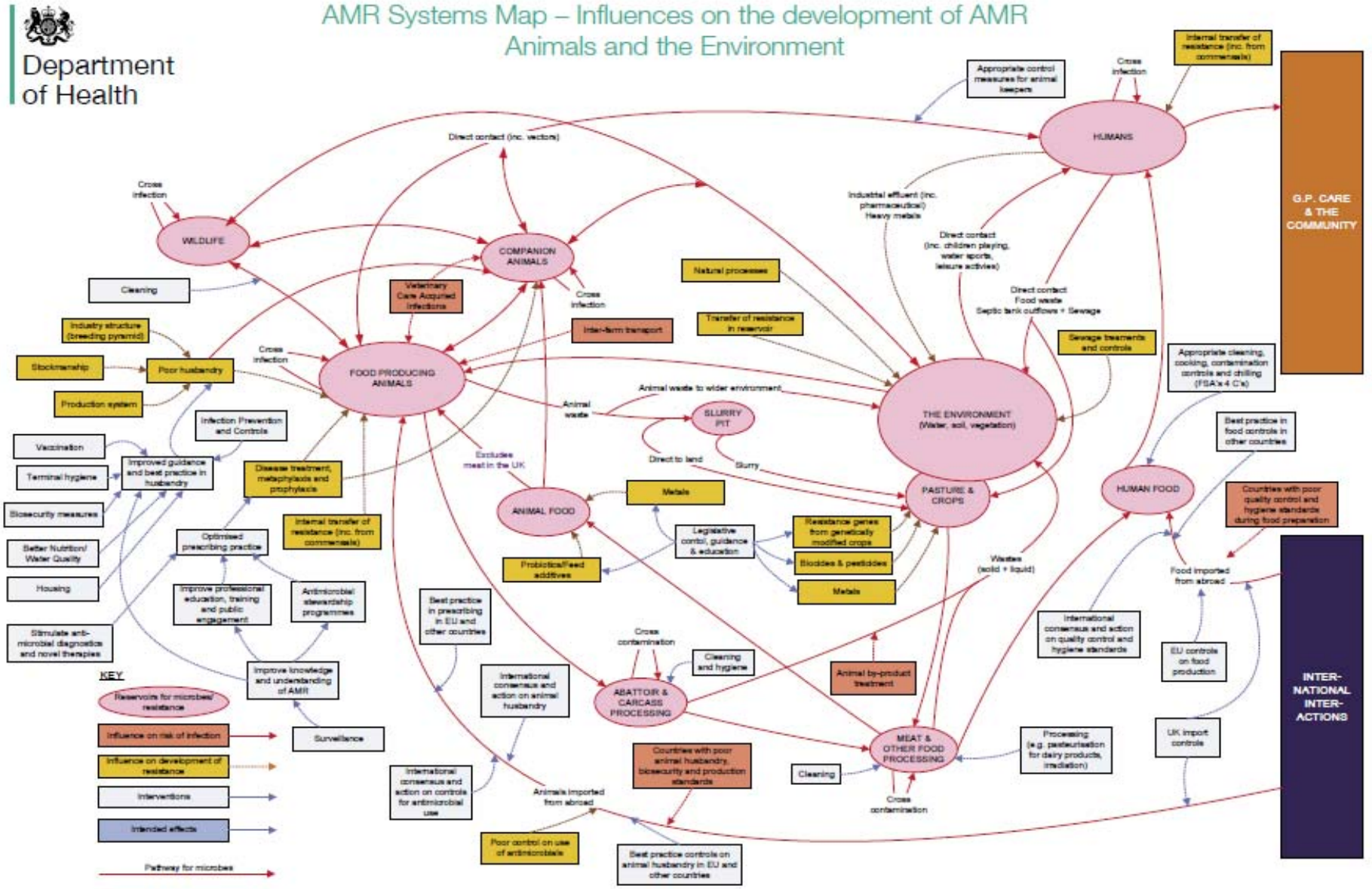
	Ampicillin	Apramycin	Nalidixic Acid
Calves	87.8%	15.2%	7.38%
Adult cows	47.0%	3.36%	1.94%
Sheep	20.6%	4.55%	0.785%

AMU: difficult to measure

	Mean use per kg animal	Target for whole sector
Dairy	16.7 mg/kg	21 mg/kg
Beef	13 mg/kg	10 mg/kg



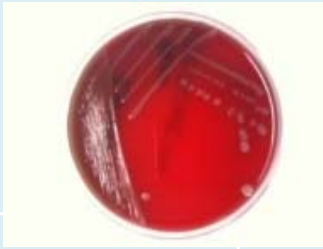
Importance of measurement



What measures of AMR are available?

	Phenotypic	Genotypic
Isolate level test	Minimum Inhibitory Concentration (MIC) determination, Disk diffusion	PCR, Whole genome sequencing
Whole sample level test	Streak plating, Spiral plating, Spread plating, Disk diffusion,	PCR, Whole genome sequencing

40 ruminant faecal samples – isolate level V sample level

Ampicillin		**Sample level** (Streak plating method) 	
Isolate level		**Sensitive**	**Resistant**
Based on Minimum Inhibitory Concentration (MIC) of 8 isolates 	**Sensitive**	**26**	**8**
	Resistant	**0**	**6**

RESAS (WP2.2.6) 2016-2021 comparison of methods

- Samples (n=189) from >1 study, in which *E. coli* was detected
- Sample level V isolate level (disk diffusion)
- Prevalence estimates (ampicillin): 60% V 2%

Sample level – Ampicillin streak plate score	**Isolate level**	
	Sensitive	Resistant
Sensitive	74	1
Resistant	111	3

Prevalence

- Comparisons of prevalence between studies only meaningful if the same measure was used.
- In the literature the most common measure of resistance is based on a single isolate per sample – this gives lower estimates of prevalence than whole sample techniques.

Future studies

- Exploring a method of serial dilution to enumerate the density of all *E. coli* and density of resistant *E. coli*
- If this method is successful then we aim to replicate measurement of AMR at more than one level (isolate, sample, animal) – where does variation lie?

Measurement of AMR: Should we be worried?

- We should be aware of the massive differences the different measures of AMR make.
- We should be concerned that we don't know what the best measures of AMR are for progressing the knowledge base.
- We should be aware that most published studies don't consider the choice of measurement.

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