Has antimicrobial usage altered the ecology of *Mycoplasma species* in intensively managed production units?

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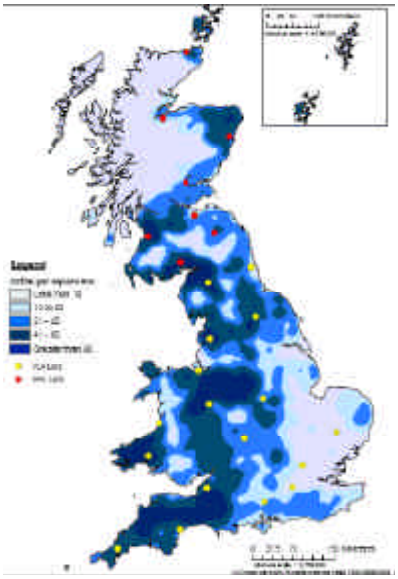
UK Cattle Population (December 2008)



- 8.6 M Cattle
- 61.3% beef, 36.6% dairy

UK Sales of antimicrobials for food producing cattle

In 2007 9 Tonnes of active antimicrobial used in approx 9M cattle

= 1g per cow.

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UK Antimicrobial products sold – all species

Induced *in vitro* Antimicrobial Resistance by sub-culturing at MIC level

Within 10 sub-cultures Resistance has been induced in MmmSC and *M. bovis* isolates to 14 antimicrobials.

Antimicrobial	Subculture	*M. bovis*	MmmSC
Tilmicosin	0	1	0.12
	9	>32	>32
Lincomycin	0	0.25	0.25
	9	>32	>32
Florfenicol	0	2	0.5
	9	>32	32
Spectinomycin	0	2	8
	7	>32	>32
Oxytetracycline	0	1	0.12
	6	32	>32
Danofloxacin	0	0.5	0.12
	7	32	8

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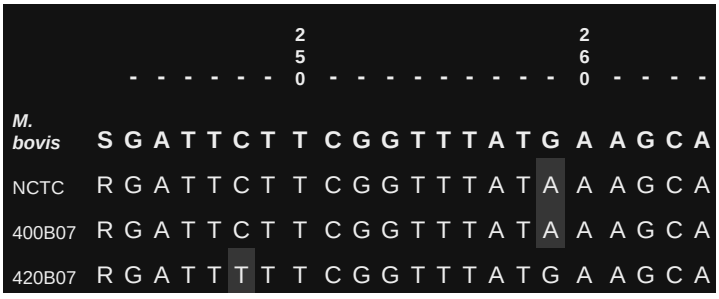
Single point genetic mutation induces antimicrobial resistance

Fluoroquinolone: Mutation in *gyr*A, similar to that described for *E. coli*



Antimicrobial effectiveness against *Mycoplasma bovis*

	M. bovis (20 UK strains)			*M. bovis* (20 Turkish strains)		
	MIC Range		MIC 50	MIC Range		MIC 50
Tilmicosin	<0.06-	>64.00	>64.00	>32.00-	>32.00	>32.00
Oxytetracycline	0.12-	32	2	8	>32.00	32.00
Spectinomycin	2.00-	>64.00	8	2.00-	8.00	8.00
Erythromycin	32.00-	>32.00	>32.00	0.12-	>32.00	>32.00
Ciprofloxacin	<0.25-	2	1	2.00-	32.00	32.00
Clindamycin	0.25-	>32.00	>32.00	0.12-	8.00	0.25
Lincomycin	1.00-	>32.00	>32.00	0.12-	2.00	1.00
Enrofloxacin	0.12-	1	0.25	1.00-	32.00	32.00
Danofloxacin	0.12-	0.5	0.25	0.50-	8.00	8.00
Tylosin	ND			1.00-	32.00	32.00
Florfenicol	2.00-	16	4	2.00-	32.00	32.00
Chloramphenicol	0.25-	32	8	8.00-	32.00	32.00
Marbofloxacin	0.50-	1.00*	1.00	0.25-	>8.00	8.00
Draxxin	ND			0.25-	>8.00	0.25
	* Isolate recently with MIC 64.00					

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Changes?

- Greater awareness of Mycoplasma diseases?
- Improved diagnosis – molecular methods PCR, PCR/DGGE?
- Changes in livestock management –more movement / introduction of animals?
- Effect of antimicrobials?