

Persistence of erythromycin resistance gene *erm*(B) in cattle feedlot pens over time

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OBJECTIVE:

Determine whether the distribution of erythromycin resistance gene *erm*(B) is associated with beef cattle fecal excretions and ascertain whether the gene is enriched in areas of feedlot pens with high manure deposition over time.

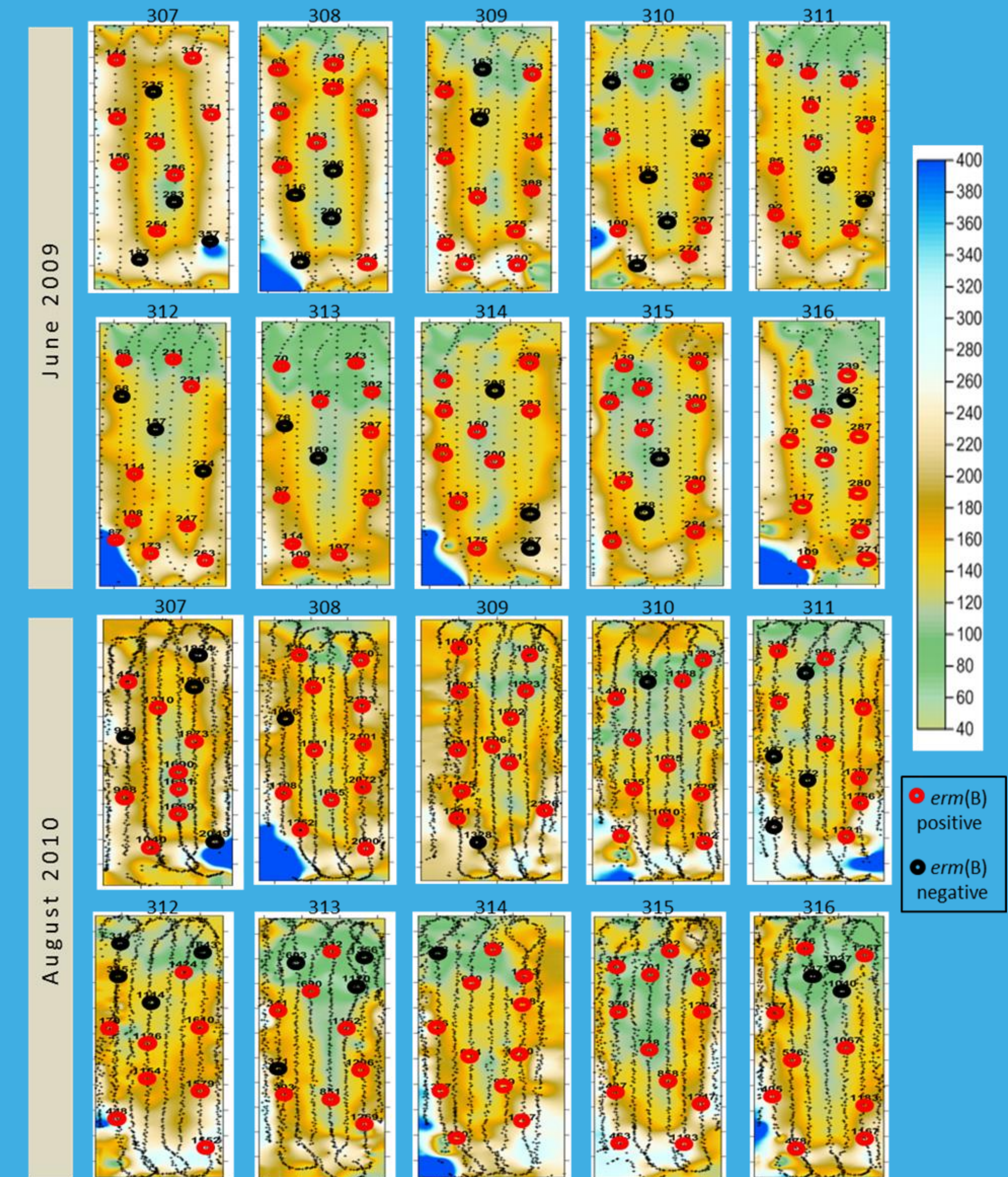
Background

- Erythromycin, a macrolide antibiotic that is commonly used to treat infections in humans, is on the World Health Organization's list of antimicrobial agents that are critical to human health.
- In cattle, related macrolides like Tylosin are used to treat respiratory disease, pneumonia, metritis, mastitis, and foot rot.
- Bacteria can develop resistance to macrolide antibiotics by encoding for a suite of more than 30 *erm* genes.
- Genes that code for antibiotic resistance enter the environment via feces and have the potential to be transferred through agroecosystems and the food chain.

Methods

- Grab samples taken at 12 locations based of EMI values, over a year long period (June 2009-August 2010) from 10 pens.
- Samples (n=240) from initial and final collections analyzed for the *erm*(B) gene
- DNA was extracted from the soil, purified, then screened with PCR
- Statistical data was analyzed with ANOVA and Logistic procedures available in SAS Analysis program version 9.2.
 - Differences were considered significant at $P \leq 0.05$ and were considered tendencies when the P-value ranged from $P = 0.05$ to $P < 0.10$.

Results



Mapping of feedlot pens at two time points. High EMI readings (dark blue) have been previously correlated with areas of high manure deposition. Red dots indicate sites of *erm*(B) positive samples.

Statistical Differences between *erm*(B) positive and *erm*(B) negative sites*

	June 2009 76% <i>erm</i> (B) positive		August 2010 81% <i>erm</i> (B) positive	
	Edge	Mound	Edge	Mound
Moisture, %	none	none	none	none
Volatile Solids, %	none	none	none	P<0.05
Total S, g/kg DM	none	none	none	0.05<P<0.1
Total N, g/kg DM	none	none	0.05<P<0.1	P<0.05
Total P, g/kg DM	none	none	none	0.05<P<0.1
Total K, g/kg DM	none	none	none	none
Soil temperature, °C	none	none	none	none
Surface temperature, °C	none	none	none	none
Soil pH	P<0.05	none	none	none
Shallow ECa, mS/m	none	none	P<0.05	none
Deep ECa, mS/m	none	none	none	none

*Statistically significant differences were observed between mound and edge in 2009, but this trend was not supported once additional data was collected.



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14 months of manure accumulation did not result in a larger number of *erm*(B) positive soils

Distribution of *erm*(B) genes was not correlated with location of high manure deposition in feedlot pens