Metritis in California dairy cows: antibiotic resistance of intrauterine *E. coli*

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Background:

Defining Metritis:

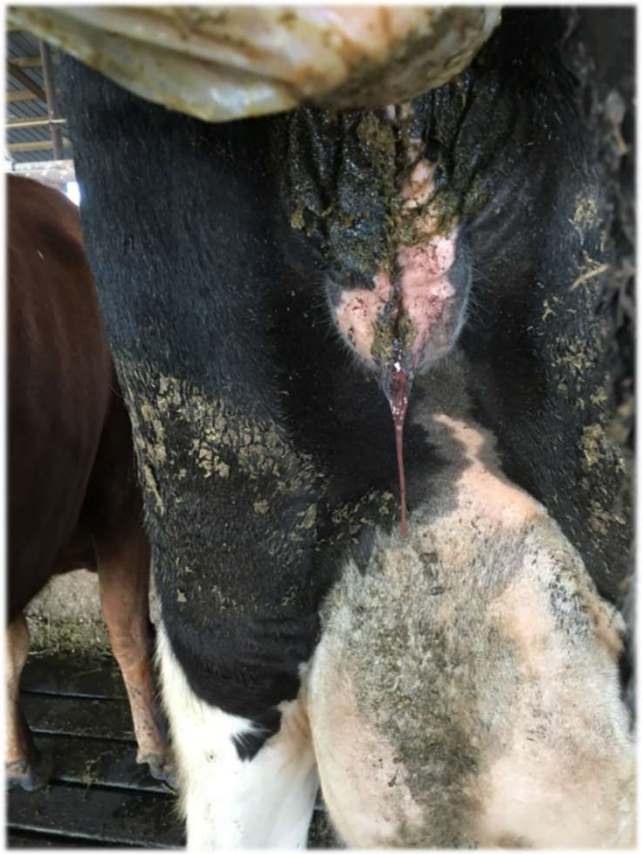
Metritis diagnosis and treatment practices in 45 dairy farms in CA.

Espadamala et al., 2018

Objectives:

- Provide baseline information of current diagnosis criteria and treatment practices for metritis on 45 dairies in California

- **Survey:**
  - Questions on systemic antimicrobial treatments, intrauterine treatments, supportive treatments, and treatment records
- Cow-side observations and responses from fresh cow evaluators.



Source: Espadamala et al., 2018, JDS, PMID: 30077455 (Dr Silva-del-Rio Lab).

Findings:

- Most dairies (70%) performed rectal exams for vaginal discharge (VD) evaluation
- **<u>Systemic antibiotic treatment based on:</u>**
  - Abnormal VD (fetid and nonfetid), regardless of fever (25%)
  - Fever regardless of the odor of abnormal VD (25%)
  - Fetid VD and fever (2%)
  - Fetid VD (9%)
  - Fetid VD or fever (9%)
  - Fever alone (18%)

Large inconsistency in criteria used to define a metritis case, as well as when to treat metritis with antibiotics.

Source: Espadamala et al., 2018, JDS, PMID: 30077455 (Dr Silva-del-Rio Lab).

Findings:

- **Systemic antibiotic treatment :**
  - Ceftiofur (80%)
  - Penicillin procaine (18%)
  - Ampicillin (7%)
- **Intrauterine infusion :**
  - Oxytetracycline (27%)
  - Penicillin procaine (2%)

There is a need to **training fresh cow evaluators** on signs of health disorder indicative of metritis and on appropriate antimicrobial treatment regimens.

Source: Espadamala et al., 2018, JDS, PMID: 30077455 (Dr Silva-del-Rio Lab).

Background:

Metritis in Dairy Cattle (why worry?)

- Mean cost of metritis ~ **$512**
  (Pérez-Báez et al., JDS, 2021)
- **Cows with metritis:**
  - ↓ milk yield,
  - ↓ pregnancy rates
  - ↑ culling risk

Source: Pérez-Báez et al., 2021, PMID: 33455790

Background:

Difference between cows with and without metritis

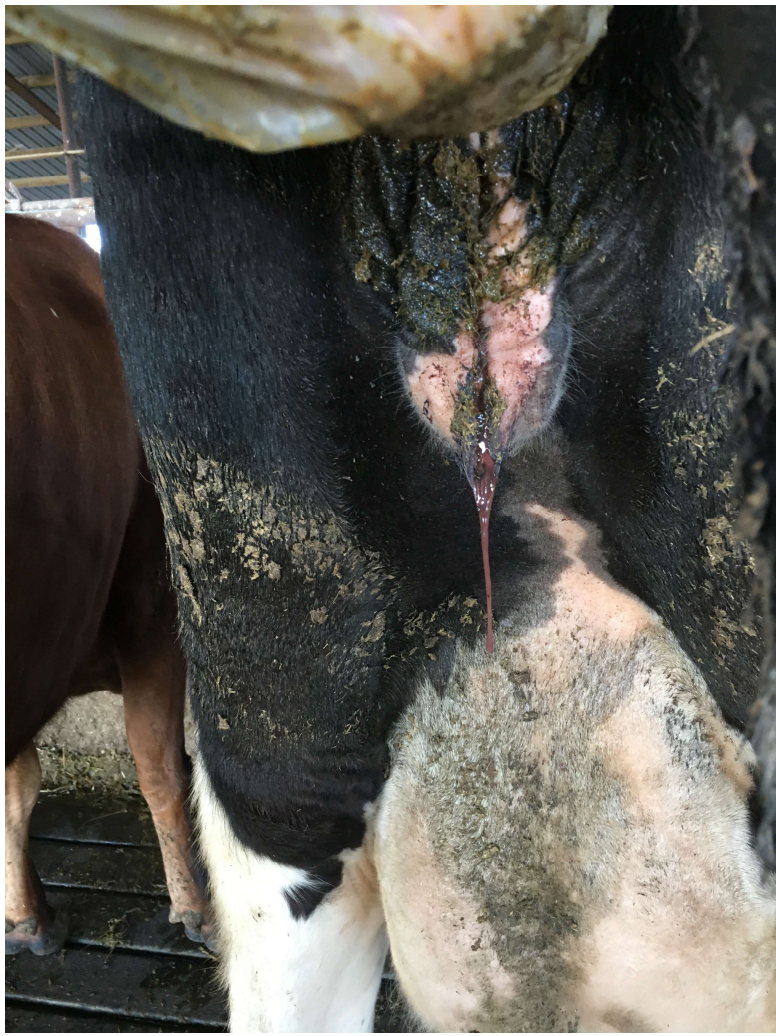
Variable	Difference
Milk by 305 DIM, kg	-813.9
Gross profit, $/cow	-510.7
DMI, kg	-457.5
Milk sales by 305 DIM, $/cow	-321.5
Pregnant by 305 DIM,%	-10
Died, %	1.7
Sold, %	7.7
Culled by 305 DIM, %	9.4
Treatment costs, $/cow	117.9
Replacement costs, $/cow	148

(Pérez-Báez et al., 2021)

Background:

Metritis in Dairy Cattle

- ***Escherichia coli*** has been linked as having a major role in causing metritis in dairy cows **(Bicalho et. al, 2010)**
- Very little data available on **antimicrobial susceptibility of *E. coli*** from cows with metritis



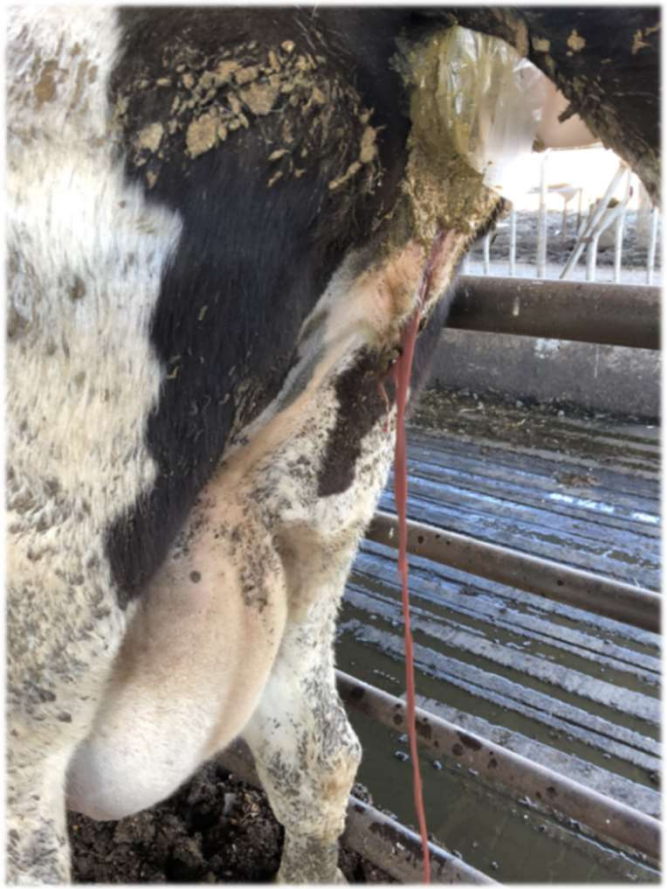
Source: Bicalho et al., 2010, JDS, PMID: 21094754

Antimicrobial resistance from cows with metritis in California.

Objective:

1) Assess antimicrobial resistance (AMR) of *E. coli* isolated from the uterus of cows with and without metritis in dairy farms in California;

2) Evaluate risk factors associated with AMR in intrauterine *E. coli*



Methods:

Post-partum cows (≤21 DIM)

25 Dairy Farms in California

MET = watery, red or brown colored, and fetid vaginal discharge

PD = non-fetid purulent or mucopurulent vaginal discharge

Control = no vaginal discharge or a clear, non-purulent mucus vaginal discharge

Intrauterine Swab collection

Cow and farm management data

Isolation of *Escherichia coli*

Antibiotic susceptibility testing

Antimicrobial resistance from cows with metritis in California.

Findings :

- 307 cows sampled at 3 to 21 days in milk
- ~ 68% (58/86) of cows with metritis had *E. coli* isolates (58/86)
- 76% of farms **treated all** cases of metritis
- 76% of farms used ceftiofur as the first choice for treatment of metritis
- 72% of farms recorded treatments for metritis cases

 Antimicrobial resistance (AMR) of *Escherichia coli* (EC) from cows with metritis in California. Basbas C, Garzon A., Silva-del-Rio N, Karle B, Aly S, Champagne J, Williams D, Lima FS, Pereira RV.

Antimicrobial resistance from cows with metritis in California.

Finding:

Criteria used for diagnosis of metritis on the farm:

Diagnostic criteria	%
Foul-Smell	92
Fever	80
Depressed attitude	72
Drop in milk	52
Watery discharge	44
Pus discharge	44

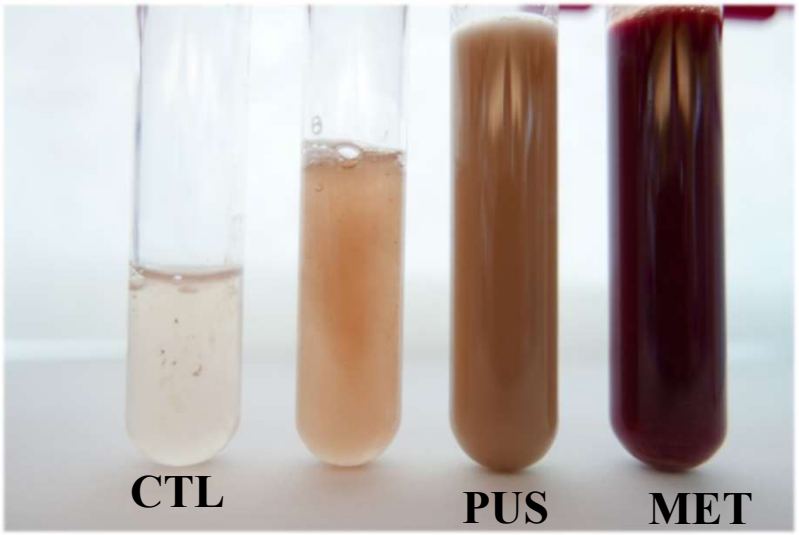
Preliminary data (not published); do not share without authors permission. **Antimicrobial resistance (AMR) of *Escherichia coli* (EC) from cows with metritis in California.** Basbas C, Garzon A., Silva-del-Rio N, Karle B, Aly S, Champagne J, Williams D, Lima FS, Pereira RV.

Antimicrobial resistance from cows with metritis in California.

Finding:

Table 1. Odds ratio of isolation of *E. coli* from intrauterine swabs

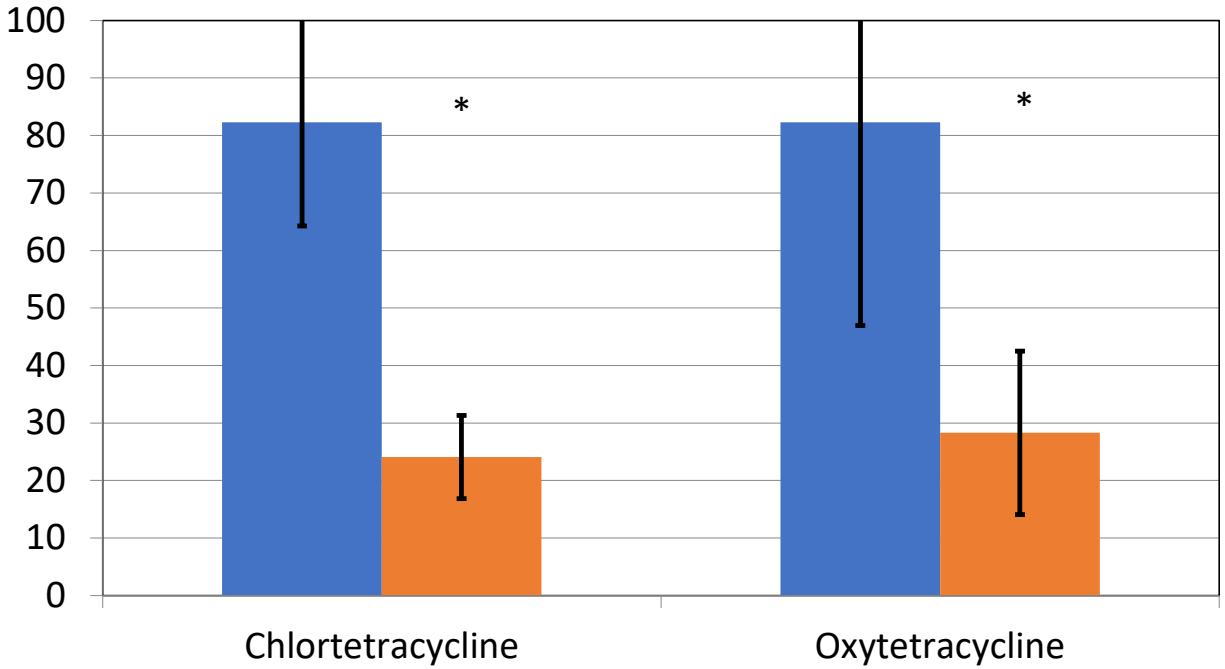
Variable	Odds Ratio	*P* value
Clinical Group[1]		**0.005**
MET vs PUS	1.67	0.11
MET vs CTL	2.00	**0.03**
PUS vs CTL	1.19	0.53



Antimicrobial resistance from cows with metritis in California.

Finding:

Farm-level practice of infusion of cows with oxytetracycline to treat metritis:



*indicates a significant difference

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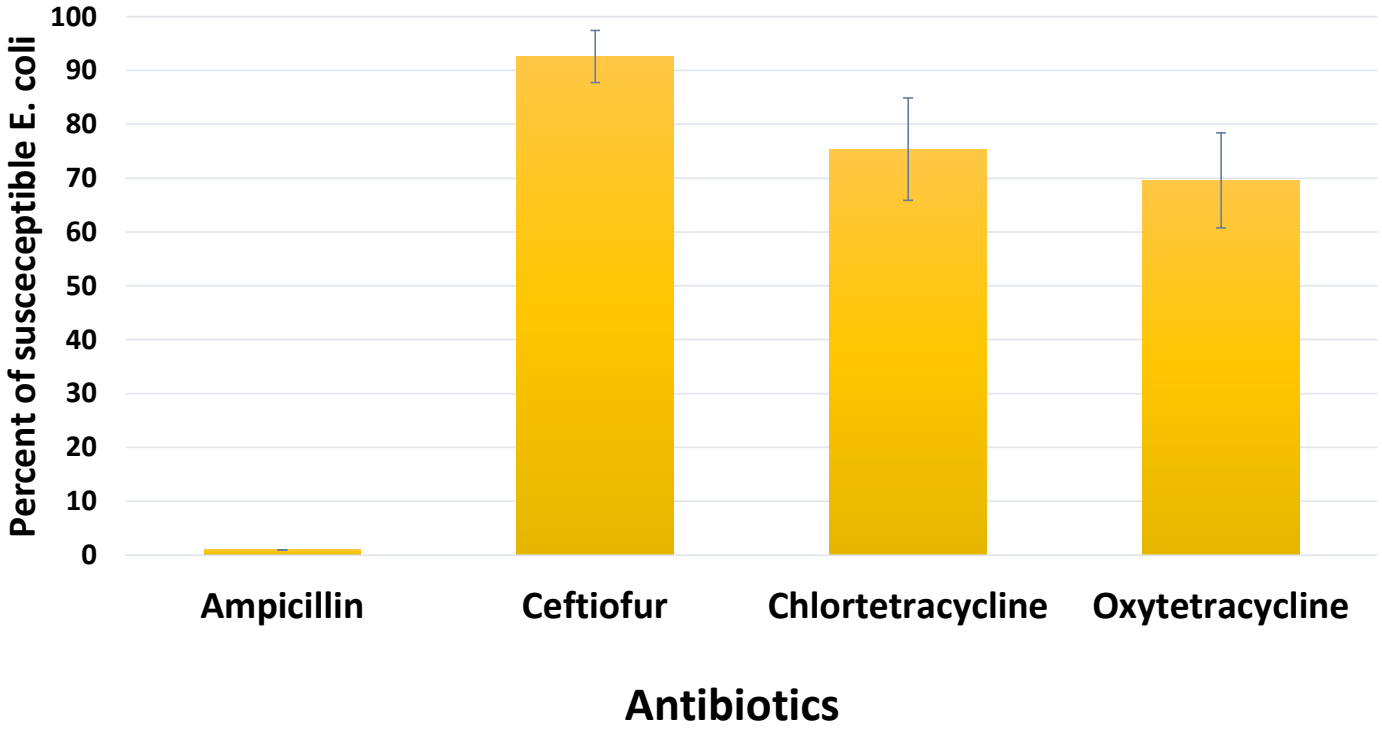
Figure. Distribution of intrauterine ***E. coli*** antimicrobial **<u>susceptibility</u>** from cows with metritis between 3 to 21 DIM (n=162).



- All isolates resistant to ampicillin
- ~ 30% or isolates resistant to oxytetracycline
- High susceptibility to ceftiofur

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Conclusions

Antimicrobial resistance for intrauterine *E. coli*:

- ***Low* antibiotic resistance to ceftiofur**
- ***"Moderate"* resistance to tetracycline drugs**
- ***High* antibiotic resistance to ampicillin**
- Intrauterine infusion with oxytetracycline was associated with higher resistance to tetracycline drugs
  - More research needed to evaluate if there is a true **causative relationship**

Machado et al, 2020, PMID: 32828506.

Questions?

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Center for Food Animal Health