

Negatively controlled, randomized clinical trial comparing 2-day intramammary use of amoxicillin to 5-day use of ceftiofur hydrochloride for treatment of bovine clinical mastitis caused by Gram-positive pathogens.

Tiago Tomazi^{1,2}, Ana Tomazi¹, Josiane Silva¹, Leonardo Bringhamti¹, Marjory Rodrigues¹, Jantijn Swinkels³, Lowell Midla², Scott Nordstrom², Rodrigo Bicalho¹.

INTRODUCTION

- ▶ Efficient therapeutic interventions can help to reduce antimicrobial (ATM) use in dairy farms.
- ▶ Not every case of clinical mastitis (CM) benefits from:
 - ▶ Antibiotic use.
 - ▶ Broad spectrum antibiotic.
 - ▶ Extended therapy.
- ▶ Microbiome analysis.
 - ▶ Dynamics of bacteria in the mammary gland.

OBJECTIVE

- | | |
|--|--|
| <p>(Amoxicillin)
Narrow spectrum.
X</p> <p>(Ceftiofur Hydrochloride)
Broad spectrum.</p> | <p>▶ Quarter-level outcomes:</p> <ul style="list-style-type: none"> ▶ Clinical and bact. cures. ▶ Total bacterial count. ▶ Milk composition and SCC. ▶ Recurrence of CM. ▶ Microbiome. <p>▶ Cow-level outcomes:</p> <ul style="list-style-type: none"> ▶ SCC and milk production. ▶ Survival in the herd. |
|--|--|

MATERIALS AND METHODS

- ▶ **Non-severe clinical mastitis:**
 - AMOX:** three infusions with 62.5 mg of amoxicillin (Amoxi-Mast®, Merck Animal Health, De Soto, KS, USA) - 12 hours apart.
 - CEFT:** five infusions with 125 mg of ceftiofur hydrochloride (Spectramast LC®, Zoetis) - 24 hours apart.
 - NEG-CTL (subset):** no interventions up to five days after diagnosis.
- ▶ Duplicate milk samples (quarter-level outcomes):
 - ▶ Before treatment (day 0) and on days 3, 5, 8 and 14 ± 3.
- ▶ Within 90 days of CM diagnosis:
 - ▶ Recurrence.
 - ▶ Cow-level outcomes.

The 2-d protocol with 3 intramammary infusions of amoxicillin (narrow-spectrum antimicrobial) had similar overall clinical and bacteriological cures as 5 administrations (once a day) with ceftiofur hydrochloride (wide spectrum) for the treatment of Gram-positive clinical mastitis. No significant difference was observed on CM recurrence and cow survival.



To download this paper, scan the QR code!

RESULTS

TABLE 1:

477 quarter-cases of CM:

- ▶ AMOX: 198
- ▶ CEFT: 223
- ▶ NEG-CTL: 56

Isolated bacteria:

- ▶ *Strep. uberis*: 60.6%
- ▶ *Strep. dysgalactiae*: 19.3%
- ▶ *Streptococcus spp.*: 8.4%
- ▶ *Staphylococcus spp.*: 6.1%

No significant difference:

- ▶ Clinical cure.
- ▶ Bacteriological cure.
- ▶ Recurrence of CM.

FIGURE 1:

Compared to antibiotic-treated groups, quarters assigned to NEG-CTL had:

- ▶ Higher linear scores of SCC.
- ▶ Higher bacterial load (cfu).
- ▶ Higher *Streptococcus* relative abundance.

AMOX compared to CEFT:

- ▶ Higher quarter LSSCC on days 8 and 14.
- ▶ Higher Log₁₀ CFU from day 5 to day 14.
- ▶ Higher *Streptococcus* relative abundance (RA) on day 14.

FIGURE 2:

No significant treatment effect was observed for:

- ▶ LSSCC: $P = 0.06$
- ▶ Milk production: $P = 0.24$

LSSCC was higher for the AMOX group in the first test day after CM.

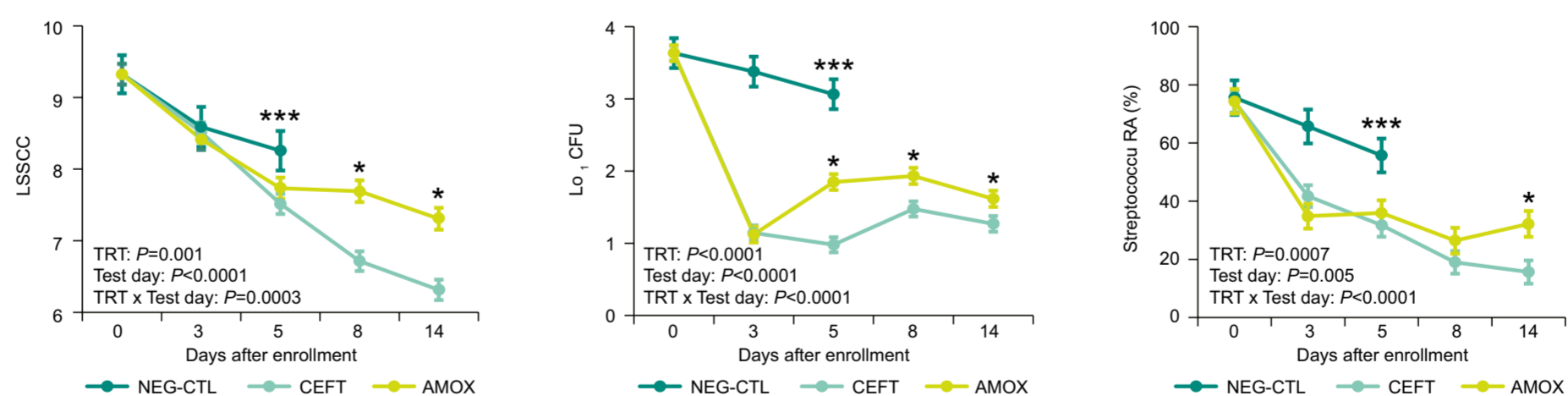
- ▶ No significant difference from the second test day.

Cow survival in the herd was not different between groups ($P = 0.66$)

TABLE 1. Effect of treatments on clinical and bacteriological cure at day 14 ± 3 after clinical mastitis diagnosis and on risk of CM recurrence within 90 days of enrollment.

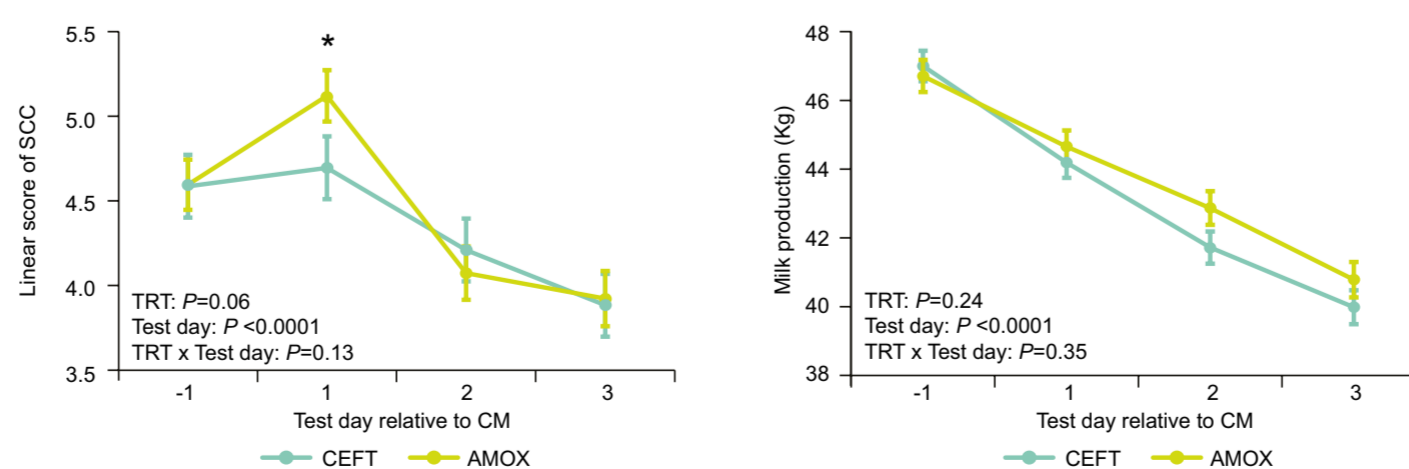
ITEM	AMOX	CEFT	P-VALUE
Clinical cure			
Adjusted frequency	82.70%	87.80%	0.18
Odds ratio (95% CI)	0.67 (0.37 - 1.19)	Baseline	
Bacteriological cure			
Adjusted frequency	56.60%	64.50%	0.12
Odds ratio (95% CI)	0.72 (0.50 - 1.09)	Baseline	
Recurrence of CM			
Adjusted frequency	9.60%	8.00%	0.60
Odds ratio (95% CI)	1.23 (0.56 - 2.70)	Baseline	

FIGURE 1. Linear score of somatic cell count (LSSCC), bacterial load (Log₁₀ CFU) and *Streptococcus* spp. relative abundance (RA; based on microbiome analysis¹) of mammary quarters with non-severe clinical mastitis treated with 2 days AMOX-MAST (AMOX) or 5 days SPECTROMAST LC (CEFT) compared to a negative control group (NEG-CTL).



¹Microbiome analysis was performed using the method of 16S rRNA gene sequencing. *** $P<0.05$ (antibiotic-treated quarters versus NEG-CTL). * $P<0.05$ (AMOX versus CEFT).

FIGURE 2. Linear score of somatic cell count and milk production (pounds/test day) of cows with clinical mastitis caused by Gram-positive pathogens and treated with 2 days AMOX-MAST (AMOX) or 5 days SPECTROMAST LC (CEFT).



Results were based on DHIA monthly results (test days) performed before and three months after the identification of clinical mastitis. * $P<0.05$ (AMOX versus CEFT).

AUTHORS' AFFILIATION

1. Cornell University, Ithaca, USA.
2. Merck Animal Health, Madison, NJ, USA.
3. MSD Animal Health, Boxmeer, Netherlands.