

The Use of Daily Postpartum Rectal Temperatures to Select Dairy Cows for Treatment with Systemic Antibiotics

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Abstract

This retrospective study analyzed descriptive statistics on daily rectal temperatures of 1042 dairy cows taken for 10 days postpartum on one farm in southeastern Pennsylvania from May 1998 to February 2000. Cows were classified as NORMAL if they did not have a retained placenta, dystocia, metritis, or mastitis event and received no systemic antibiotic treatment for the first 10 days postpartum. NORMAL cows had average daily temperatures below 102.0°F during Days 1 through 10 postpartum. Cows with either retained placenta, metritis, dystocia or mastitis tended to have temperatures greater than 102.0°F during Days 2 through 8 postpartum. All cows had the lowest temperatures during the first two days postpartum. Those requiring systemic antibiotic treatment had their highest temperatures on Days 3 through 6 postpartum.

Because there were no differences in daily postpartum temperatures of normal cows by lactation, the same criteria could be used to select primiparous and multiparous cows for treatment with systemic antibiotics. Finding one rectal temperature greater than 102.0°F or 102.5°F would not be sufficiently discriminating to decide to treat with antibiotics because 48% of NORMAL cows had at least one temperature greater than 102.5°F during the first ten days postpartum. Cows with average temperatures greater than 103.5°F had a significant average 1.0°F decline in temperature the day after systemic antibiotic treatment was started. Daily temperatures should be taken for at least seven days postpartum.

Résumé

Cette étude rétrospective rapporte les statistiques descriptives de la température rectale journalière chez 1024 vaches pendant 10 jours post-partum dans une ferme du sud-ouest de la Pennsylvanie de mai 1998 à

février 2000. Les vaches étaient classées NORMALES si elles n'avaient pas de rétention placentaire, de dystocie, de métrite ou de mammite et n'avaient pas reçu un traitement antibiotique systémique pendant les premiers 10 jours post-partum. Les vaches NORMALES avaient une température journalière sous 102.0° F (<38.9° C) durant les premiers 10 jours post-partum. Les vaches ayant une rétention placentaire, une métrite, une dystocie ou une mammite tendaient à avoir des températures plus élevées que 102.0° F (>38.9° C) durant les jours 2 à 8 post-partum. Toutes les vaches avaient une température plus basse pendant les deux premiers jours post-partum. Celles requérant un traitement antibiotique systémique avaient leur plus haute température entre les jours 3 et 6 post-partum.

Comme il n'y avait pas de différence dans la température journalière post-partum des vaches selon le rang de la lactation, le même critère pourrait être utilisé pour choisir les vaches primipares ou multipares qui devraient recevoir un traitement antibiotique systémique. Le fait de trouver une température rectale plus grande que 102.0° F (>38.9° C) ou 102.5° F (>39.2° C) ne serait pas suffisamment en soi pour décider de traiter avec des antibiotiques puisque 48% des vaches NORMALES montrèrent au moins une fois une température supérieure à 102.5° F (>39.2° C) durant les 10 premiers jours post-partum. Les vaches avec une température supérieure à 103.5° F (>39.7° C) ont perdu en moyenne 1.0° F (0.5° C) de température le jour suivant le traitement systémique avec antibiotiques. Les températures journalières devraient être prises au moins 7 jours post-partum.

Introduction

Dairy cows should be monitored closely after calving for postpartum diseases. The immediate postpartum period is a critical time, because it is during this transition period that the dairy cow is most likely to

develop milk fever, retained placenta, metritis, ketosis and displaced abomasum. The economic impact of these diseases through loss of milk revenue, increase in culling and death loss, and increase in drug and veterinary cost is dramatic. The estimated cost per case of common postpartum diseases is: left displaced abomasum - \$340; ketosis - \$145; retained placenta - \$285; and milk fever - \$334.¹ Prevention of these diseases should be a primary goal of dairy producers.

Presumably, early detection and treatment of disease is of economic benefit because of the potential to restore the cow to productivity sooner. The current trend in the dairy industry is for dairy operations to become larger. As the number of dairy cows per farm has increased, traditional methods of detecting sick cows that rely on individualizing animals has begun to fail, making it difficult to detect sick cows in a timely fashion. To compensate for this area of uncertainty, many large dairy operations have developed protocols using technologies such as rectal thermometers that record temperatures quickly, milk meters, pedometers and milk component analysis to aid in the early detection of sick cows. Recording rectal temperatures of postpartum dairy cows for a specific period of time is one protocol that has received tremendous attention in the past few years because of ease of implementation and low cost. The objective of this study was to obtain descriptive statistics on daily postpartum rectal temperatures of both normal cows and cows with postpartum diseases as preliminary data for future studies examining the economic benefit of monitoring daily temperatures of postpartum dairy cows.

Materials and Methods

This retrospective study analyzed descriptive statistics on daily rectal temperatures taken from 1042 cows for 10 days postpartum (by health events) on one farm in southeastern Pennsylvania from May 1998 to February 2000. The diagnosis of dystocia, retained placenta and mastitis was in most instances made by personnel on the dairy, unless a veterinarian was specifically asked to examine the cow. A cow was considered to have a retained placenta if the placenta was not discharged within 24 hours of parturition. A veterinarian examining a sick cow always made the diagnosis of metritis, because routine postpartum rectal examinations were not performed on these cows. Therefore, all cows coded with metritis were systemically ill. The dairy manager recorded all health, treatment and temperature infor-

mation occurring during the first 10 days postpartum. Daily rectal temperatures were always taken in the morning before 7 am.

An algorithm was used by the dairy farm to guide the selection of cows for treatment with systemic antibiotics. Multiparous cows with a rectal temperature greater than 103.5°F for two consecutive days, and primiparous cows with a rectal temperature greater than 103.0°F for two consecutive days, were treated with 20 ml of ceftiofur^a for five days. If, however, a cow appeared depressed or milk production was decreased on the first day of having a temperature greater than 103.5°F, she could be treated on Day 1 at the discretion of the dairy manager. The farm monitored daily milk production using milk meters and Dairy Comp305 records.

Additional treatments used by the farm were as follows. All cows received one prostaglandin (dinoprost^b) injection between 33 and 39 days-in-milk (DIM). Cows with mastitis diagnosed by farm personnel received intramammary pirlimycin^c according to the labeled directions. Cows with metritis not responding to ceftiofur after five days of treatment were treated with 50 ml of procaine penicillin G^d daily for five days.

For purposes of data analysis (Table 1), cows were classified as NORMAL if they did not have a retained placenta, dystocia, metritis or mastitis event, and received no systemic antibiotic treatment during the first 10 days postpartum. Cows were classified as NORMAL+ANTIBIOTIC if they did not have a recorded retained placenta, dystocia, metritis, or mastitis event, but received systemic antibiotic treatment. Cows were classified as ABNORMAL if they had either a retained placenta, dystocia, metritis or mastitis event during the first 10 days postpartum. ABNORMAL cows only received systemic antibiotic therapy if the farm algorithm selected them. ABNORMAL cows were further classified into the disease categories of either retained placenta, dystocia, metritis or mastitis. ABNORMAL cows with multiple disease conditions were assigned to each disease category, therefore their data could be included in more than one disease category.

Results

There were 1042 cows in the data set. Five hundred-sixty nine cows were classified as NORMAL, and 342 cows were classified as ABNORMAL. The remain-

^aNaxcel®. Pharmacia Animal Health, Kalamazoo, MI 49001

^bLutalyse® Sterile Solution. Pharmacia Animal Health, Kalamazoo, MI 49001

^cPirsue® Aqueous Gel. Pharmacia Animal Health, Kalamazoo, MI 49001

^dPfi-Pen G®. Pfizer Animal Health, Exton, PA 19341

Table 1. Classification, health condition and treatment assignment of cows in the retrospective study.

Classification	Systemic antibiotics	Health condition
¹ NORMAL	No	No clinical abnormalities
² ABNORMAL	Yes/No	Clinical abnormalities
³ NORMAL+ ANTIBIOTIC	Yes	No clinical abnormalities

¹NORMAL - Cows without retained placenta, dystocia, metritis or mastitis event and received no systemic antibiotic treatment during Days 1 through 10 postpartum.

²ABNORMAL - Cows with either retained placenta, dystocia, metritis or mastitis event recorded during Days 1 through 10 postpartum; 56% of these cows received systemic antibiotic therapy.

³NORMAL+ANTIBIOTIC - Cows receiving systemic antibiotic therapy, but no recorded retained placenta, dystocia, metritis or mastitis event.

ing 131 cows did not exhibit any disease conditions, but received systemic antibiotics (NORMAL+ANTIBIOTIC) because of meeting the temperature criteria. Table 2 presents the average temperature (with 95% confidence intervals) by day postpartum for NORMAL and ABNORMAL cows, and by disease category. Cows that were classified as NORMAL had lower average temperatures at almost every day postpartum compared to ABNORMAL cows as a group, or ABNORMAL cows classified into disease categories. The average NORMAL temperature was below 102.0°F for the first 10 days postpartum. NORMAL cows had their lowest temperatures on Days 1 and 2 postpartum.

ABNORMAL cows tended to have average rectal temperatures above 102.0°F regardless of disease category classification for Days 2 through 8 postpartum (Table 2). There were no notable differences in daily temperatures across the disease categories except that the average rectal temperature of cows with metritis was higher than cows with dystocia on Day 3, and the average rectal temperature of cows with metritis was higher than cows with mastitis on Day 4 postpartum. The point estimates for average daily temperature tended to be higher on Days 3 and 4 postpartum. Average temperatures by DIM might have been higher if antibiotic treatment had not been initiated in many of the ABNORMAL cows according to the farm protocol.

Table 3 presents further descriptive statistics on the cows described in Table 2. The average maximum temperature of the NORMAL cows was 102.5°F (102.1-102.9°F), which was significantly lower than the maximum average temperature for cows in the various

disease categories. ABNORMAL cows had an average maximum temperature of 103.6°F (103.5-103.7°F). Cows with metritis tended to have the highest average maximum temperature compared to the other disease categories, with the exception of mastitis. Forty eight percent of NORMAL cows had at least one daily temperature above 102.5°F, compared to 93, 83, 100 and 78% for cows with retained placenta, mastitis, metritis, and dystocia, respectively. ABNORMAL cows had rectal temperatures greater than 102.5°F for significantly more days (2.9) than NORMAL cows (1.9 days). Cows with metritis had significantly more days with temperatures greater than 102.5°F than NORMAL cows or cows in the other disease categories. It took ABNORMAL cows 3.4 days, compared to 4.5 days for NORMAL cows, for the rectal temperatures to exceed 102.5°F. The farm algorithm used as a guide to select cows for systemic antibiotic treatment resulted in 72, 55, 98, and 46% of cows coded, respectively, for retained placenta, mastitis, metritis, and dystocia being treated with systemic antibiotics.

Thirty-three percent of the total cows were classified as ABNORMAL, while 31% of the total cows received systemic antibiotics, and 58% of these cows were classified as ABNORMAL. Sixty-nine percent of the total cows did not receive antibiotic treatment, and 21% of these cows had a dystocia, retained placenta, mastitis or metritis.

ABNORMAL cows treated with antibiotics had significantly higher average daily rectal temperatures than ABNORMAL cows not treated with antibiotics during Days 1 through 9 postpartum (Table 4). ABNORMAL cows not treated with antibiotics had significantly higher temperatures than NORMAL cows during Days 2 through 5 postpartum. NORMAL cows and NORMAL+ANTIBIOTIC cows had similar average daily temperatures postpartum, with NORMAL+ANTIBIOTIC cows tending to have lower average temperature point estimates compared to NORMAL cows, although confidence intervals tended to overlap.

There were no significant differences in the average daily temperature postpartum between NORMAL primiparous and multiparous cows (Table 5). Cows treated with systemic antibiotics, regardless of whether they had a previous disease condition, responded with a significant 1.0°F decrease in temperature the day after treatment was initiated (Table 6). Table 7 presents the percentage of cows treated with systemic antibiotics by DIM when treatment was first started. The majority of cows were started on systemic antibiotics between two and five DIM.

Discussion

This study examined rectal temperatures taken from Days 1 through 10 postpartum from 1042 cows

Table 2. Average daily rectal temperatures (°F) with 95% confidence intervals during Days 1 through 10 postpartum.

DAYS	NORMAL ¹	ABNORMAL ²	RETAINED PLACENTA	MASTITIS	METRITIS	DYSTOCIA
Day 1-95% Confidence Interval	101.4 (101.4-101.5)	101.8 (101.7-101.8)	101.9 (101.7-102.0)	102.1 (101.8-102.4)	101.8 (101.6-102.0)	101.7 (101.6-101.8)
Day 2-95% Confidence Interval	101.4 (101.4-101.5)	102.0 (102.0-102.2)	102.2 (102.1-102.4)	102.3 (102.0-102.6)	102.2 (102.0-102.4)	102.0 (101.8-102.1)
Day 3-95% Confidence Interval	101.6 (101.6-101.7)	102.4 (102.3-102.6)	102.7 (102.5-102.9)	102.5 (102.2-102.7)	103.0 (102.7-103.3)	102.3 (102.2-102.5)
Day 4-95% Confidence Interval	101.7 (101.6-101.8)	102.4 (102.3-102.5)	102.7 (102.5-102.8)	102.2 (102.0-102.5)	102.9 (102.6-103.1)	102.4 (102.2-102.5)
Day 5-95% Confidence Interval	101.7 (101.7-101.8)	102.3 (102.2-102.4)	102.5 (102.3-102.6)	102.1 (101.9-102.4)	102.6 (102.4-102.8)	102.3 (102.1-102.4)
Day 6-95% Confidence Interval	101.8 (101.7-101.8)	102.2 (102.1-102.3)	102.2 (102.1-102.4)	102.1 (101.8-102.4)	102.6 (102.4-102.8)	102.3 (102.1-102.4)
Day 7-95% Confidence Interval	101.8 (101.7-101.8)	102.1 (102.0-102.2)	102.1 (102.0-102.2)	102.2 (102.0-102.5)	102.4 (102.2-102.7)	102.1 (102.0-102.2)
Day 8-95% Confidence Interval	101.7 (101.7-101.8)	102.0 (102.0-102.2)	102.1 (102.0-102.3)	102.2 (101.9-102.5)	102.2 (102.0-102.5)	102.0 (101.9-102.2)
Day 9-95% Confidence Interval	101.7 (101.7-101.8)	101.9 (101.8-102.0)	101.9 (101.8-102.1)	101.9 (101.7-102.1)	102.0 (101.8-102.2)	101.8 (101.7-101.9)
Day 10-95% Confidence Interval	101.8 (101.7-101.8)	101.8 (101.8-102.0)	101.8 (101.7-101.9)	101.8 (101.6-102.1)	101.7 (101.5-101.9)	101.8 (101.7-101.9)

¹NORMAL - Cows without retained placenta, dystocia, metritis or mastitis event during Days 1 through 10 postpartum. No systemic antibiotics were administered.

²ABNORMAL - Cows with either retained placenta, dystocia, metritis or mastitis event recorded during Days 1 through 10 postpartum.

on one dairy farm. Because an algorithm was used as a guide by the dairy farm to select cows for antibiotic treatment, average daily temperatures taken after treatment with systemic antibiotics would likely have been higher if the cows had not received systemic antibiotics.

The average daily rectal temperatures of cows in the NORMAL group were consistently below 102.0°F during Days 1 through 10 postpartum. The average daily rectal temperatures of ABNORMAL cows were 102.0°F or above during Days 2 through 8 postpartum. ABNORMAL cows receiving systemic antibiotics post-

Table 3. Descriptive statistics on cows in each treatment category.

	NORMAL ¹	RETAINED PLACENTA	MASTITIS	METRITIS	DYSTOCIA	ABNORMAL ²
Max temp-95% Confidence Interval	102.5 °F (102.1-102.9)	103.7 °F (103.6-103.8)	103.9 °F (103.7-104.0)	104.1 °F (104.0-104.1)	103.4 °F (103.3-103.6)	103.6 °F (103.5-103.7)
Days to max temp-95% Confidence Interval	5.7 (5.5-5.9)	4.0 (3.8-4.3)	4.3 (4.0-4.6)	4.5 (4.3-4.8)	5.3 (5.0-5.6)	4.9 (4.6-5.1)
Total Cows	569	123	63	68	186	342
Percent of cows treated with antibiotics-95% Confidence Interval	0	72% (63-79)	55% (43-68)	98% (91-100)	46% (39-54)	55% (49-60)
Average days-in-milk at treatment-95% Confidence Interval	—	3.6 (3.2-4.0)	4.0 (3.2-4.8)	4.5 (3.9-5.1)	4.5 (4.1-5.0)	4.7 (4.1-4.7)
Percent of cows with temp > 102.5°F	48%	93%	83%	100%	78%	84%
No. of days until temp > 102.5°F-95% Confidence Interval	4.5 (4.3-4.7)	3.0 (2.8-3.1)	2.7 (2.5-2.9)	3.2 (3.0-3.4)	3.7 (3.5-4.0)	3.4 (3.2-3.6)
No. of days with a temp >102.5°F-95% Confidence Interval	1.9 (1.8-2.0)	3.1 (2.9-3.3)	3.1 (2.9-3.3)	3.6 (3.4-3.8)	2.7 (2.6-2.9)	2.9 (2.7-3.1)

¹NORMAL - Cows without retained placenta, dystocia, metritis or mastitis event and received no systemic antibiotic treatment during Days 1 through 10 postpartum.

²ABNORMAL - Cows with either retained placenta, dystocia, metritis or mastitis event recorded during Days 1 through 10 postpartum.

partum, according to the farm protocol, tended to have temperatures consistently greater than NORMAL cows or ABNORMAL cows not receiving antibiotics. Therefore, cows with dystocia, retained placenta, metritis or mastitis consistently had higher temperatures postpartum and were more likely to require systemic antibi-

otic therapy than NORMAL cows. Of the cows receiving systemic antibiotic therapy in this data set, 59% were classified as ABNORMAL and 41% were classified as NORMAL+ANTIBIOTIC. Therefore, treating all cows with systemic antibiotics for dystocia, retained placenta, mastitis or metritis would result in over-treat-

Table 4. Average rectal temperatures (F°) and 95% confidence intervals by days postpartum.

	NORMAL ¹	ABNORMAL ² AND RECEIVING ANTIBIOTICS	ABNORMAL ² AND NOT RECEIVING ANTIBIOTICS	NORMAL ³ + ANTIBIOTIC
Number of Cows	569	191	151	131
Day Postpartum	Rectal Temperature (°F)			
Day 1–95% Confidence Interval	101.4 (101.4-101.5)	101.9 (101.8-102.0)	101.6 (101.5-101.7)	100.9 (100.8-101.1)
Day 2–95% Confidence Interval	101.4 (101.4-101.5)	102.3 (102.2-102.4)	101.7 (101.6-101.8)	101.4 (101.2-101.7)
Day 3–95% Confidence Interval	101.6 (101.6-101.7)	102.8 (102.7-103.0)	102.0 (101.9-102.1)	101.6 (101.4-101.8)
Day 4–95% Confidence Interval	101.7 (101.6-101.8)	102.7 (102.6-102.8)	102.1 (102.0-102.2)	101.8 (101.6-102.0)
Day 5–95% Confidence Interval	101.7 (101.7-101.8)	102.6 (102.5-102.7)	102.0 (101.9-102.1)	101.6 (101.5-101.8)
Day 6–95% Confidence Interval	101.8 (101.7-101.8)	102.5 (102.4-102.6)	101.9 (101.8-102.0)	101.5 (101.3-101.6)
Day 7–95% Confidence Interval	101.8 (101.7-101.8)	102.3 (102.2-102.4)	101.9 (101.8-102.0)	101.7 (101.5-101.8)
Day 8–95% Confidence Interval	101.7 (101.7-101.8)	102.2 (102.1-102.3)	101.9 (101.8-102.0)	101.5 (101.3-101.7)
Day 9–95% Confidence Interval	101.7 (101.7-101.8)	102.0 (101.9-102.1)	101.8 (101.7-101.8)	101.5 (101.3-101.6)
Day 10–95% Confidence Interval	101.8 (101.7-101.8)	101.9 (101.8-101.9)	101.8 (101.7-101.9)	101.3 (101.2-101.5)

¹NORMAL - Cows without retained placenta, dystocia, metritis or mastitis event and received no systemic antibiotic treatment during Days 1 through 10 postpartum.

²ABNORMAL - Cows with either retained placenta, dystocia, metritis or mastitis event recorded during Days 1 through 10 postpartum.

³NORMAL+ANTIBIOTIC - Cows receiving systemic antibiotic therapy, but no recorded retained placenta, dystocia, metritis or mastitis event.

Table 5. Average daily rectal temperatures and 95% confidence intervals for NORMAL¹ cows by lactation during Days 1 through 10 postpartum.

DAY POSTPARTUM	LACTATION	TEMPERATURE (°F)	95% CONFIDENCE INTERVAL (°F)
1	1	101.3	101.2-101.4
	>1	101.5	101.4-101.6
2	1	101.5	101.3-101.6
	>1	101.4	101.3-101.5
3	1	101.7	101.6-101.9
	>1	101.6	101.5-101.7
4	1	101.7	101.6-101.8
	>1	101.7	101.6-101.8
5	1	101.7	101.6-101.8
	>1	101.7	101.7-101.8
6	1	101.7	101.6-101.8
	>1	101.8	101.7-101.8
7	1	101.8	101.7-101.9
	>1	101.8	101.7-101.9
8	1	101.7	101.6-101.8
	>1	101.7	101.7-101.8
9	1	101.6	101.5-101.7
	>1	101.8	101.7-101.8
10	1	101.6	101.5-101.7
	>1	101.8	101.7-101.9

¹NORMAL - Cows without retained placenta, dystocia, metritis or mastitis event and received no systemic antibiotic treatment during Days 1 through 10 postpartum.

ing cows, assuming an increase in body temperature alone is an accurate indicator for therapy. Ignoring cows without a postpartum disease condition would possibly result in missing cows that would benefit from systemic antibiotic therapy, as these cows responded with a significant drop in temperature the day after systemic antibiotic therapy was initiated. However, most cows with retained placenta and metritis in this data set required systemic antibiotics according to the farm protocol between three and five DIM. It should be noted that cows defined as having metritis in this study were systemically ill and diagnosed with metritis by a veterinarian.

Cows treated with systemic antibiotics, regardless of whether they had a previous disease condition, responded with a significant 1.0°F decrease in temperature by the following day after treatment was initiated. These findings are supported by Smith *et al*², who reported that antibiotic treatment of cows with toxic puerperal metritis resulted in a significant decrease in temperature by the first day following treatment. Results from this study suggest that most cows with retained placenta and metritis, as defined in this study, would benefit from systemic antibiotic therapy initiated between three and five DIM. Further studies would be required to determine any additional benefits of treat-

ing all cows with retained placenta with systemic antibiotics at the time of parturition.

Rectal temperatures of NORMAL cows and ABNORMAL cows were lowest on the first two days postpartum. ABNORMAL cows tended to have their highest average temperatures on Days 3 through 6 postpartum. In this data set, 66% of treated cows were first administered systemic antibiotics between Days 2 and 5 postpartum, and 12.8% of the cows were started on systemic antibiotics between eight and 10 days postpartum. These data suggest that daily temperatures should be taken for at least seven days postpartum.

The daily temperatures in this data set were taken early in the morning, and there were no significant differences in the trends in the average temperatures of NORMAL cows by lactation number. Therefore, the same criteria could be used to select primiparous and multiparous cows for systemic antibiotic treatment.

Data from this retrospective study suggest that primiparous and multiparous cows with temperatures greater than 102.0°F should be watched carefully. Finding one daily temperature greater than 102.0°F or 102.5°F would not be sufficiently discriminating to dictate treatment with systemic antibiotics because 48% of NORMAL cows had at least one temperature

Table 6. Average daily rectal temperatures (°F) of cows after treatment with systemic antibiotics.

	ABNORMAL ¹ + ANTIBIOTIC	NORMAL ² + ANTIBIOTIC
Average days-in-milk at treatment-95% Confidence Interval	4.4 (4.1 - 4.7)	4.7 (4.3-5.2)
Temperature on Day 1 of treatment-95% Confidence Interval	103.5 (103.3-103.6)	103.5 (103.2-103.7)
Temperature on Day 2 of treatment-95% Confidence Interval	102.5 (102.3-102.6)	102.3 (102.2-102.5)
Temperature on Day 3 of treatment-95% Confidence Interval	102.2 (102.1-102.3)	102.1 (101.9-102.3)
Temperature on Day 4 of treatment-95% Confidence Interval	102.1 (102.0-102.2)	102.0 (101.9-102.2)
Temperature on Day 5 of treatment-95% Confidence Interval	102.0 (101.9-102.1)	102.1 (102.0-102.2)

¹ABNORMAL+ANTIBIOTIC - Cows with either retained placenta, dystocia, metritis or mastitis event recorded during Days 1 through 10 postpartum, and received systemic antibiotics.

²NORMAL+ANTIBIOTIC - Cows receiving systemic antibiotic therapy, but no recorded retained placenta, dystocia, metritis or mastitis event.

greater than 102.5°F during the first 10 days postpartum. Finding two rectal temperatures greater than 102.5°F would not be sufficiently discriminating to dictate treatment with antibiotics, because NORMAL cows had temperatures greater than 102.5°F for an average of 1.9 days during the first 10 days postpartum. Cows with temperatures between 102.0 - 103.0°F should be carefully monitored to determine whether they require systemic antibiotic therapy. Cows receiving systemic antibiotics in this study had an average temperature of 103.5°F on the

Table 7. Percent of cows treated with systemic antibiotics by days-in-milk postpartum.

DAYS IN MILK AT FIRST TREATMENT WITH ANTIBIOTICS	NUMBER OF COWS	PERCENT OF COWS TREATED WITH ANTIBIOTIC
1	24	7.5%
2	50	15.6%
3	60	18.6%
4	58	18.0%
5	43	13.4%
6	19	5.9%
7	27	8.4%
8	17	5.3%
9	15	4.7%
10	9	2.8%

first day of treatment. Since these cows responded with significant decreases in temperature 24 hours after treatment, the cutoff temperature of 103.0°F or 103.5°F used in this study for initiating systemic antibiotic treatment is logical. The positive response to systemic antibiotic therapy in this data set supports the use of the algorithm used on this farm, whereby two consecutive rectal temperatures above a threshold temperature were a guide to select cows for treatment with systemic antibiotics.

Conclusions

Results of this study were somewhat limited in scope because of the retrospective nature of the data analyzed. Further questions should be investigated before dairy producers accept the reported benefits of systemic antibiotic therapy based on routine postpartum temperature monitoring. Dairy producers will treat more cows with systemic antibiotics by taking daily temperatures postpartum, and cows in need of treatment are likely to receive the required therapy in a more timely manner. In this study, 31% of all cows received systemic antibiotic therapy. Although cows in this study responded positively to systemic antibiotic therapy, further controlled studies need to be done to quantify the economic benefit of a significant decrease in temperature after systemic antibiotic therapy is started. Additionally, research will help determine whether systemic antibiotic therapy will reduce the incidence of postpartum diseases, such as ketosis and displaced abomasum, and improve reproductive performance. Results of future studies will need to be balanced against the need to prudently use antibiotics.

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References

1. Guard C: The cost of lameness and value of routine hoof care. *Proc Hoof Health Conference*, p 5, Batavia, New York, 1997.
2. Smith BI, Donovan GA, Risco C, Littell R, Young C, Stanker LH, Elliott J: Comparison of various antibiotic treatments for cows diagnosed with toxic puerperal metritis. *J Dairy Sci* 81:1555-1562, 1998.

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INDICATIONS:

Baytril® 100 (enrofloxacin) injectable solution is indicated for the treatment of bovine respiratory disease (BRD) associated with *Pasteurella haemolytica*, *Pasteurella multocida* and *Haemophilus somnus*.

DOSAGE ADMINISTRATION:

Single-Dose Therapy: Administer once, a subcutaneous dose of 7.5-12.5 mg/kg of body weight (3.4-5.7 mL/100 lb).

Multiple-Day Therapy: Administer daily, a subcutaneous dose of 2.5 - 5.0 mg/kg of body weight (1.1-2.3 mL/100 lb). Treatment should be repeated at 24-hour intervals for three days. Additional treatments may be given on days 4 and 5 to animals which have shown clinical improvement but not total recovery.

HUMAN WARNINGS: For use in animals only. Keep out of the reach of children. Avoid contact with eyes. In case of contact, immediately flush eyes with copious amounts of water for 15 minutes. In case of dermal contact, wash skin with soap and water. Consult a physician if irritation persists following ocular or dermal exposures. Individuals with a history of hypersensitivity to quinolones should avoid this product. In humans, there is a risk of user photosensitization within a few hours after excessive exposure to quinolones. If excessive accidental exposure occurs, avoid direct sunlight. To report adverse reactions or to obtain a copy of the Material Safety Data Sheet, call 1-800-633-3796.

WARNING: Animals intended for human consumption must not be slaughtered within 28 days from the last treatment.

Do not use in cattle intended for dairy production.

A withdrawal period has not been established for this product in pre-ruminating calves. Do not use in calves to be processed for veal.

PRECAUTIONS: The effects of enrofloxacin on bovine reproductive performance, pregnancy, and lactation have not been adequately determined.

Subcutaneous injection can cause a transient local tissue reaction that may result in trim loss of edible tissue at slaughter.

Baytril® 100 contains different excipients than other Baytril® products. The safety and efficacy of this formulation in species other than cattle have not been determined.

Quinolone-class drugs should be used with caution in animals with known or suspected Central Nervous System (CNS) disorders. In such animals, quinolones have, in rare instances, been associated with CNS stimulation which may lead to convulsive seizures.

Quinolone-class drugs have been shown to produce erosions of cartilage of weight-bearing joints and other signs of arthropathy in immature animals of various species. No articular cartilage lesions were observed in the stifle joints of 23-day-old calves at 2 days and 9 days following treatment with enrofloxacin at doses up to 25 mg/kg for 15 consecutive days.

STORAGE CONDITIONS:

Protect from direct sunlight. Do not freeze or store at or above 40° C (104° F).

HOW SUPPLIED:

Baytril® 100 (enrofloxacin) Antimicrobial Injectable Solution:

Code: 0236 100 mg/mL 100 mL Bottle

Code: 0321 100 mg/mL 250 mL Bottle

For customer service, to obtain product information, including the Material Safety Data Sheet, or to report adverse reactions call (800) 633-3796.

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For more information, contact your Bayer representative or call 1-800-633-3796.



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