Effects of an Oral Antibiotic on Fertility in Range Beef Cattle

R. L. Saltman,[1] P. J. Chenoweth,[2] D. O. Rae,[3] P. C. Genho,[4] S. A. Moore,[4] G. Crosby[4]
[1]*Hoffmann-La Roche Inc, 45 Eisenhower Drive, Paramus, NJ 07652*
[2]*Kansas State University, Manhattan, KS 66502*
[3]*University of Florida, Gainesville, FL 32601*
[4]*Deseret Cattle and Citrus, St. Cloud, FL 34769*

Abstract

In a series of Florida trials, crossbred beef females were fed different chlortetracycline (CTC) regimes relative to weaning and breeding to determine effects on fertility. In trial 1, alternately sorted crossbred yearling heifers were either given CTC at 1.1 mg/kg/day for 30 days prior to natural breeding (T, n=225) or no CTC (C, n=225). More pregnancies occurred in the treated group compared with controls (71.5% and 56.8% respectively; P<0.01). In experiment 2, crossbred yearling heifers were placed in 3 comparable groups after 3 months postweaning CTC at 1.1 mg/kg/day.; A (n=106) controls, B (n=97) CTC at 22 mg/kg/day for 5 days prebreeding, then 1.1 mg/kg/day for the first 30 days of breeding, C (n=101) CTC at 1.1 mg/kg/day for the first 30 days of breeding. Groups did not differ in pregnancies (overall 71.6%) although days pregnant tended (P<0.10) to favor both CTC groups. In experiment 3, crossbred beef cows were placed in 2 comparable groups (n=149-214) at each of 3 locations; CTC at 1.1 mg/kg/day for 30 days bracketing the start of breeding, and no CTC. Treated females achieved more pregancies than non-treated (83.3% and 78.4% respectively; P<0.05) and achieved them earlier in the breeding season (P<0.001). In all trials, body condition score (BCS) at breeding was a significant factor in pregnancy outcome. Overall, feeding of CTC to both heifers and cows at the start of breeding appeared to benefit fertility parameters. Both BCS and prior feeding of CTC influenced results.

Introduction

Growth promotants, including antibiotics, are commonly used in some countries to improve the efficiency and economics of livestock production. Mass antibiotic administration is also used to confer protection against endemic or threatened disease in intensive livestock operations. Although adverse female reproductive effects of some growth promotant regimes have been observed (1) little information is available concerning the effects, either positive or negative, of mass administration of feed-grade antibiotics on fertility in livestock. If a beneficial effect is conferred upon reproduction parameters via such medication, then the mechanism(s) by which this might occur is(are) open to conjecture. For example, such benefit may occur either through the suppression or control of subclinical disease entities (i.e. prevention of adverse effects), or it might occur via undetermined positive metabolic effects in target animals. The present studies evolved from attempts to define and control suspected adverse effects of *Ureaplasma diversum* in a large beef herd in Florida (2). Here, oral administration of chlortetracycline (CTC) at time of breeding appeared to benefit reproduction in crossbred heifers despite clear evidence that this was occurring via control of *U. diversum*. Thus the objective of the present studies was to evaluate the potential beneficial effects of an oral antibiotic, in this case chlortetracycline (CTC), on fertility in commercial, crossbred, beef heifers and multiparous cows in Florida, and to examine previous data from this perspective.[a]

Materials and Methods

In a series of Florida studies, crossbred females were fed different chlortetracycline (CTC) regimes relative to weaning and breeding. In all studies, females were prior vaccinated for IBR, BVD, PI_3 and Campylobacter/Leptospirosis and bulls checked for breeding soundness and lack of Trichomonosis. Body condition score (BCS) was recorded at strategic periods. In heifers, reproductive tract scores were assigned prebreeding and concurrent monitoring was performed for *U. diversum*. Breed-

[a] *The use of CTC for this purpose is not approved by the US Food and Drug Administration.*

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ing seasons, using multi-sires at bull to female ratios (BFR) of 1:40 to 1:50, varied from 60 to 90 days. For breeding, heifers were rotated through 200 acre improved pastures at regular intervals. Pregnancy testing by per-rectal palpation was performed on at least one occasion within 60 days of the end of breeding.

Experiment 1: Yearling heifers representing Brahman/Hereford crosses were given either 1.1 mg/kg CTC in the 30 days prior to breeding (TRT; n=225), or were not given CTC (CON; n=225)(2). At different junctures, heifers were monitored for *U. diversum* via vaginal culture, and vaginal lesion scores were applied. Breeding was for 61 days at a BFR of 1: 40.

Experiment 2: Yearling heifers, representing Brahman crosses with Angus, Hereford or Simmental, were randomly allotted into 3 prebreeding groups following a 3 month postweaning course of CTC @ 1.1 mg/kg (3). Groups were as follows; A (n=106) - controls (no CTC); B (n=97) - CTC @ 22 mg/kg/day for 5 days immediately prebreeding then @ 1.1 mg/kg/day for the first 30 days of breeding, and C (n=101) - CTC @ 1.1 mg/kg/day for the first 30 days of breeding. CTC groups were combined from the start of breeding, which was for 76 days. Breeding was at a BFR of 1:50.

Experiment 3: Within each of 3 units (numbers 3, 4 and 5), 2 herds of multiparous females of comparable genotype, BCS and parity were either given CTC @ 1.1 mg/kg/day for 15 days prior to breeding (group A), or no CTC (group B)(4). Genotypes and average cow ages were as follows; unit 3 - Simmental cross, 8.9 years; unit 4 - Hereford cross, 9.6 years and unit 5 - Angus cross, 11.4 years. Breeding was for 90 days at a BFR of 1:40.

Analyses were generally conducted using the linear model of SAS. Models varied, however, as an example, experiment 3 employed the following model; PR DPEG = location (unit) + treatment (CTC, no CTC) + error, where DPREG = days pregnant coded as categorical data (i.e. means represent coded values relating to 20 day intervals of breeding). Body condition score (BCS) was included in models where this assessment was made at time of breeding.

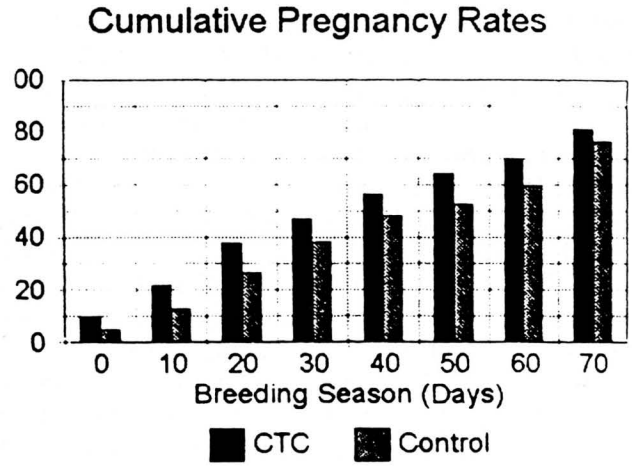
Results

Experiment 1: More pregnancies occurred in treated heifers than in controls (71.5% and 56.8% respectively; P<0.01), with an overall pregnancy rate of 64.1%. However, days to conception (DTC) did not differ between groups. Body condition score, which was similar among groups pre-treatment, differed post-treatment (4.95 and 4.84 respectively; P<0.05) where it influenced pregnancy rate (P<0.001). Both vaginal culture for *U.diversum* and vaginal lesion score taken at different junctures throughout the trial also influenced results, although not in a logical or consistent fashion.

Experiment 2: Heifer groups did not differ in pregnancies (overall 71.6%) although days pregnant tended to favor (P<.10) both CTC groups. Body condition score during breeding influenced pregnancy rate (P<0.002) although these did not differ between groups prebreeding. However, in this trial there was some indication that CTC might have helped to counter the effects of depressed body condition in relation to pregnancy rates.

Experiment 3: Treated females achieved more pregnancies (83.3%) than controls (78.4%)(P<0.05), and achieved them earlier in the breeding season (P<0.001). Here, body condition at pregnancy test significantly (P<0.001) influenced pregnancy rate. However, it was excluded from the model because formal assessment was not made at time of breeding although informal assessment at that time indicated that little difference in BCS existed among groups, within units.

Figure 1. Effect of CTC in cows



Discussion

In experiment 1, CTC administration at breeding appeared to benefit pregnancy rates in crossbred heifers. Although this experiment was originally designed to study the effects of CTC administration on *U.diversum*, which had been previously identified as a possible problem in this herd, no logical associations could be found between fertility data and either *U.diversum* culture rates or vaginal lesion scores. This was despite a high positive culture rate (43.6%) in these heifers at trial commencement, with the majority showing varying degrees of vaginal lesions, as well as evidence that *U.diversum* can cause reproductive problems in cattle under certain, largely undefined, conditions (5). Body condition score, which differed post-treatment only, was associated with pregnancy rate. Thus the mechanism whereby CTC might have exerted its advantageous effect is unclear as it may have suppressed pathogens

(e.g. *U. diversum*) or directly influenced growth and development, as reflected in improved BCS scores in the treated group.

In experiment 2, no apparent beneficial effects on heifer pregnancy rates could be attributed to the feeding of CTC (1.1 mg/kg for 30 days) at the start of breeding, whether or not a high CTC level (22 mg/kg for 5 days) had been applied immediately pre-breeding. However, heifers in both CTC groups tended to get pregnant a little earlier ($P<0.10$) than did the controls. Here, there is a possibility that the feeding of CTC to all heifers for 90 days post-weaning might have confounded results. This assumption is supported by two observations; firstly that overall heifer pregnancy rates compared favourably with previous years, and secondly as prebreeding *U. diversum* culture rates in heifers were lower (approximately 25%) than on previous occasions in which post-weaning CTC was not administered.

In experiment 3, the feeding of CTC at 1.1 mg/kg/day to multiparous cows at the commencement of breeding positively influenced both pregnancy rate ($P<0.05$) and the time taken to get pregnant ($P<0.0001$). Body condition, assessed at time of pregnancy test, also influenced pregnancy rates, but was omitted from the statistical model as it was not assessed at commencement of breeding. Unit (which was confounded by breed type) also had a strong influence on both traits.

In summary, the conclusion is that feeding of CTC to both heifers and cows at the start of breeding appeared to improve fertility parameters. Body condition and prior feeding of CTC also influenced results. Further work is indicated to ascertain the mechanisms by which mass medication with low levels of feed-grade antibiotics might favourably influence fertility in female cattle.

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