

ENHANCING FERTILITY OF POSTPARTUM DAIRY COWS IN TANZANIA: TRIALS WITH CLOPROSTENOL AND INTRAUTERINE DISINFECTANT

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SUMMARY

Cows remaining open for more than 150 days after calving were randomly divided into three groups and treated. Group A (n=20) was treated with Nelex[®] on Day 1 (day of beginning treatments), cloprostenol on Day 20 and Nelex[®] 24 hours after breeding, Group B (n=32) was given Nelex[®] on Day 1 and cloprostenol on Day 20. Group C (n=332) were treated with cloprostenol upon detection of a corpus luteum. Definite oestrus expression within three days after cloprostenol administration was exhibited in 50% of the animals in groups A and B and 25% of those in group C. Pregnancy rates for groups A, B and C were 65.0, 59.4 and 40.6% respectively. These results suggested that Nelex[®] in combination with cloprostenol could improve oestrus expression and fertility of postpartum cows.

INTRODUCTION

Disinfectants such as iodine, metacresol sulphionate and Lotagen have been used to treat uterine infections and enhance fertility of postpartum cows (Roberts, 1971; Mutiga, 1978; Murray *et al.*, 1990). Intrauterine administration of the disinfectants is as effective as antibiotic treatment (Roberts, 1971). Disinfectants also have the advantage of not posing problems associated with drug residues in milk (Hemeida *et al.*, 1986). Intrauterine disinfectants are known to stimulate an endogenous release of prostaglandin F_{2α} and can, therefore, be used to induce oestrus (Seguin *et al.*, 1974; Kindahl *et al.*, 1977). The induced oestrus might hasten the recovery from uterine infections and improve fertility (Eldon, 1987).

The occurrence of oestrus after intrauterine administration of disinfectants is however unpredictable, oscillating between 7 and 10 days. This makes it difficult to utilize time set breeding techniques. Administration of prostaglandin F_{2α} or one of its analogues 20 days after disinfectant administration can overcome this difficulty by inducing a second oestrus which is predictable and therefore suitable for breeding (Paisley *et al.*, 1986). Roberts (1971) has recommended that an additional intrauterine administration of disinfectants 24 to 48 hours after breeding be effected in order to control persisting and post service infections. These recommendations may be appropriate for a tropical environment, because by using intrauterine disinfectants the costs associated with use of a two prostaglandin

F₂ treatment regimen, recommended by several scientists (Wenkoff 1987) are reduced. However, such recommendations have to be tried under East African management and husbandry conditions.

The present study evaluated a treatment regimen that utilizes an intrauterine disinfectant for enhancing fertility of postpartum cows.

MATERIALS AND METHODS

Study area

The study was conducted in dairy farms located within a radius of 40 km of Morogoro township. Morogoro is situated at latitude 6°20', South and longitude 37°39', East. Its altitude is 528 metres above sea level. Day length varies from 11 to 13 h and small temperature variations are experienced throughout the year. The average maximum and minimum temperatures are 32.4 and 14.8°C in February and July, respectively. The annual rainfall is more than 800 mm.

Animals

The animals studied were Frisian, Ayrshire and crosses of these with Tanzania short Horn Zebu. The animals were at pasture during the day and in loose houses at night. In addition to pasture grazing, cows were supplemented with concentrates during milking. Milking was done between 06.00 and 08.00 h and between 16.00 and 18.00 h. All animals received regular veterinary care which included acaricide spraying against ticks, chemoprophylaxis against trypanosomiasis and routine vaccinations.

Breeding was by artificial insemination or by hand mating.

Treatment trial

Animals used in this trial were from a larger group of 150 cows, calving between July 1st, 1989 and June 30th, 1990, that were examined per rectum once a week, commencing within one week after calving. Weekly examination continued until each animal was either diagnosed as pregnant or had remained open up to Day 150 post partum. Details regarding these examinations are given by Mujuni *et al.* (1993).

Animals remaining open up to day 150 postpartum were randomly allocated to three groups and treated. Group A (n=20) was given an intrauterine infusion of a condensation product of metacresol sulphonic acid and formaldehyde (Nelex[®], BYK, Gulden Konstaz, Denmark). Eight ml of Nelex[®] stock solution (36%) were diluted with 200 ml of distilled water, warmed to body temperature and administered into the uterus using a rectovaginal method. Nelex[®] infusion was followed, 20 days later, by an intravulvosubmucosal injection of 500 µg of cloprostenol, a prostaglandin F_{2α} analogue, (Estrumate[®], Imperial Chemical Industries, Cheshire, England). The intravulvosubmucosal injection was carried out according to a method described by Chauhan *et al.* (1986). Nelex[®] infusion was repeated 24 hours after artificial insemination (AI). Group B (n=32) was treated in the same way as group A, except for Nelex[®] infusion 24 hours after AI. Group C (N=32) was treated with cloprostenol when animals were detected with a corpus luteum. In all groups, AI was performed upon

observation of oestrus or 72 hours after cloprostenol injection, whichever occurred first. A single inseminator carried out all inseminations using the rectovaginal method. Jugular blood samples for progesterone concentration determination were taken at the time of every treatment. All cows were observed for oestrous signs at least twice daily. Oestrus expression was graded as definite = 3, equivocal = 2 and unnoticed = 1. Grade 3 was given to all animals exhibiting a standing oestrus. Grade 2 was awarded to cows not seen with standing oestrus but exhibiting secondary oestrous signs, namely mucus discharge, congestion of vaginal mucosa and oedema of the vulva. Grade 1 was given to cows that did not show any of the above signs.

Blood sampling and laboratory analysis

Jugular blood samples for progesterone concentration determination were collected into heparinized vacutainer tubes.

The samples were cooled on ice immediately after collection and centrifuged at 4°C and 1500 revolutions per minute for 30 minutes. Plasma was then harvested within two hours of blood sample collection and stored at - 20°C until assays were carried out.

Progesterone concentration determination was carried out by radioimmunoassay using the solid phase coated tube system employing ^{125}I as tracer supplied in kit form by the Joint FAO/IAEA, Agriculture Laboratory, Seibersdorf, Austria. The sensitivity of the assay was 0.08 ng/ml while the intra- and inter assay coefficients of variation were 8.3 and 11.2%, respectively. These coefficients were within the range given by kit

suppliers.

For purposes of interpretation, a progesterone value of 1.0 ng/ml of plasma was taken as borderline for luteal activity. Progesterone concentration equal to or greater than 1 ng/ml of plasma indicated presence of luteal activity whereas progesterone concentration of less than 1 ng/ml indicated its absence.

Calculations and statistical analyses

Statistical analyses were carried out according to methods described by Snedecor and Cochran (1980). Chi-square tests, (X^2), were used to determine the significance of observed differences between groups.

RESULTS

Treatment results for animals remaining open until day 150 postpartum are shown in Table 1. Twenty eight animals (53.8%) in group A and B had a corpus luteum on the day of Nelex[®] infusion. Fifty cows (96.2%) in the two groups had a corpus luteum on the day of cloprostenol administration. Detection of a corpus luteum by rectal palpation was retrospectively confirmed by progesterone concentration determination. The mean plasma progesterone values in animals with a corpus luteum were 3.2 ± 0.15 and 4.3 ± 0.14 on the days of Nelex[®] infusion and cloprostenol administration, respectively. Twenty six (50%) cows in group A and B exhibited definite (grade 3) oestrous signs three days after cloprostenol administration. Eight 25% animals in group C exhibited definite oestrous signs and group differences were

significant ($X^2 = 5.48$, $p < 0.05$).

Pregnancy rates, determined between 54 and 60 days after the last insemination, were as also shown in Table 1. The difference in pregnancy rate, between groups A and B was not significant ($X^2=0.164$; $p > 0.05$). This difference approached significance when the pooled data for groups A and B was compared to group C ($X^2 = 3.48$; $p = 0.06$).

Pregnancy rates in relation to oestrus expression were as shown in Table 2. Plasma progesterone values in all 34 cows exhibiting definite oestrous signs were < 1 ng/ml. Among 24 cows exhibiting equivocal oestrous signs, 18 had progesterone values < 1 ng/ml, two had borderline values (1.2 and 1.4 ng/ml, respectively), whereas the other four had values greater than 2 ng/ml. In 26 cows with unobserved oestrus, 19 animals had progesterone values < 1 ng/ml at the time of insemination. Three other cows had borderline values (1.3, 1.5 and 1.4 ng/ml) whereas four others had concentrations greater than 2 ng/ml.

DISCUSSION

In this trial, a significantly larger number of animals treated with Nelex[®] on day 1 were found with a corpus luteum and high progesterone values on the day of cloprostenol treatment. This implied that Nelex[®] was effective in inducing the development of a corpus luteum that could respond to a cloprostenol treatment.

There were more animals in the treatment groups which exhibited grade three oestrous signs after cloprostenol

treatment. In addition, the percentage of animals coming in oestrus was comparable to that of the two prostaglandin $F_{2\alpha}$ treatment regimen recorded for the tropics (Adeyemo, 1987; Mukasa-Mugerwa *et al.*, 1989).

These findings imply that a Nelex[®] and a single prostaglandin $F_{2\alpha}$ treatment could substitute the above mentioned two prostaglandin $F_{2\alpha}$ treatment regimen.

In this, and in other tropical studies, oestrus response following prostaglandin $F_{2\alpha}$ treatment was lower than the ones reported from temperate studies (Stevenson *et al.*, 1984; Wenkoff, 1987). Reasons for such a low response are often not clear. In this study, however, among the fifty cows not exhibiting or/incomplete luteolysis. Progesterone values in these animals were > 1 ng/ml plasma.

Irrespective of the treatment group, oestrus grade was found to significantly influence pregnancy rate with grade one having the lowest. Similar observations were made by other tropical studies (Landivar *et al.*, 1985; Voh *et al.*, 1985). Low pregnancy rate in animals inseminated after showing none or equivocal oestrous signs could be due to untimely insemination.

All in all the treatment results indicated that intrauterine infusion of Nelex[®] in combination with intravulvosubmucosal injection of prostaglandin $F_{2\alpha}$ could improve fertility results of postpartum cows. Nelex[®] had the advantage of being cheap, readily available, easily replaced by other disinfectants and, therefore, highly economical.

Table 1: Trials with Nelex[®] and cloprostenol as a treatment for fertility of postpartum cows.

| Group | Cows with CL on day ^a | | Cows with Oestrus grade ^b | | | Pregnancy rate (%) |
|----------|----------------------------------|----|--------------------------------------|----|----|--------------------|
| | 1 | 20 | 1 | 2 | 3 | |
| A (n=20) | 10 | 20 | 6 | 4 | 10 | 65.0 |
| B (n=32) | 18 | 30 | 9 | 7 | 16 | 59.4 |
| C (n=32) | - | 32 | 11 | 13 | 8 | 40.6 |
| Total | 28 | 82 | 26 | 24 | 34 | 44.2 |

a = Day of Nelex[®] infusion and cloprostenol injection, respectively.

b = Oestrus grade (1 = unnoticed; 2 = equivocal and 3 = definite).

Table 2. Pregnancy rates in relation to oestrus expression

| Cows with oestrus grade | Total | Preg-nant | Pregnancy rate (%) |
|-------------------------|-------|-----------|--------------------|
| unnoticed | 26 | 6 | 26.9 |
| equivocal | 24 | 13 | 54.2 |
| definite | 34 | 26 | 76.5 |
| Total | 84 | 45 | 44.2 |

$X^2 = 16.89$, significant at $p < 0.01$.

Pregnancy rate = % cows pregnant 50-60 days after breeding.

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