STUDIES ON THE USE OF THE CIDR INTRAVAGINAL DEVICE FOR REPRODUCTIVE MANAGEMENT OF DAIRY CATTLE

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STUDIES ON THE USE OF THE CIDR INTRAVAGINAL DEVICE FOR REPRODUCTIVE MANAGEMENT OF DAIRY CATTLE

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GENERAL ABSTRACT

This study was undertaken as a series of projects which involved selected studies with the CIDR[1] intravaginal device in dairy cattle.

In the first project, a CIDR device was inserted at different stages of the oestrous cycle to characterize the dynamic changes of the follicles in the ovaries of cycling cows, the associated changes in plasma progesterone concentrations (PPC), and the effects of progesterone from the device on cycle lengths. The results demonstrated that the progesterone released by the CIDR appeared to enhance the development and maintenance of a dominant follicle. The reproductive responses after device removal were influenced by the follicular population, and by the stage of the follicular wave even in the absence of a corpus luteum (CL). The PPCs during CIDR insertion or after removal were influenced by the type of animal and the stage of the cycle when treatment was initiated. The stage of the oestrous cycle in which the device was inserted also influenced the average cycle length.

In the second project, the tailpainting and raddle technique combined with scoring and re-raddling gave a precise correlation with visual oestrus detection and with patterns in the onset of oestrus in groups of heifers and cows after different synchrony treatments. The average interval to oestrus was concentrated between 30 and 120 h after using different treatments for oestrus synchronization.

In the third project, a controlled breeding programme for cows in herds with a daily milk quota was investigated, with a view to improving reproductive performance through the strategic use of the CIDR intravaginal device. The study showed that the mean interval from Planned Start of Mating (PSM) to first insemination was shorter in all treated groups in year-round herds, and treated cows had fewer days open than control. Conception rate to first insemination differed statistically between groups, but not for second inseminations. As a consequence, the mean number of services per conception also differed significantly between groups.

Oestrous responses in all farms differed significantly in the treatment group compared with the control group (76% vs 63%; $P < 0.001$, respectively). The return to oestrus in treated cows was synchronized in 85% of non-pregnant cows on days 22 to 25 after first insemination. The average responses to the two doses of prostaglandin at CIDR removal was similar for half dose vs full dose (72% vs 68%, respectively). However, this management advantage was partly lost because of lower fertility and because of mistakes relating to the interpretation of the tailpainting system which were frequently made by the owners.

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[1] Controlled internal drug releasing device (Eazi-Breed CIDR™-B, Carter Holt Harvey Plastic Products, Hamilton, N.Z.

In the fourth project, the effectiveness of using a milk progesterone test to identify non-pregnant animals and consequently to improve oestrus detection rates was evaluated in a management system for dairy cows involving the use of CIDR devices for controlling return to service intervals. The average percentage of non-pregnant cows inseminated during the second period of artificial insemination (AI) was 63% and varied from 44% to 77.2% among individual herds. In general, the study showed that the identification of non-pregnant animals did not improve the percentage of animals inseminated over the second period of AI.

In the last project, the dynamic changes of follicles on the ovaries at two different post-partum periods was characterized as well as the post-treatment response rates in oestrus and ovulation in anoestrous dairy cows. The population of follicles in classes 1 (< 6 mm), 2 (6 to 9 mm) and 3 (> 9 mm) varied between cows in both post-partum periods, but the average number of follicles did not differ significantly between day 25 (early) and 50-55 (late) for treatment and control groups. In the late post-partum period, the average number of class 1 follicles increased in the animals of the treated groups ($P < 0.05$), and when the comparison in treatment groups was made between early and late post-partum period, the average number of class 2 follicles and the total number of follicles were both increased at CIDR removal ($P < 0.05$; $P < 0.01$, respectively). The average number of class 1 follicles in the early post-partum period increased significantly in the treatment group irrespective of whether or not animals displayed oestrus or ovulated with CL formation after treatment with CIDR/PMSG. The diameter of the largest unovulated luteinized follicle in treated cows which displayed oestrus and/or ovulated increased significantly during CIDR treatment, and its growth continued after the device was removed.

In both post-partum periods, normal and luteinized class 3 follicles were found in non-cycling cows, where some had large normal and others had large luteinized follicles. Only 25% and 33.3% of the treated cows in the early and late post-partum period displayed oestrus, respectively. However, 55% and 50% of the treated and control cows which had not displayed oestrus, actually ovulated and formed a CL in the early post-partum period.

From the results of this study, one can conclude that although insertion of a CIDR device into cycling cows synchronizes oestrus, there remains significant variation among animals in the precise time after device removal that oestrus commences. Moreover, some animals have reduced fertility at the synchronized oestrus. To overcome these two limitations on the benefits of synchronization, the duration of treatment programmes based on a progestagen will have to be adjusted to obtain high conception rates, and greater account will have to be taken of follicle wave patterns as a factor influencing precision of synchrony. These considerations apply also to the re-use of CIDRs after insemination, to reduce variation in return to oestrus and to improve fertility in cows which do not conceive to insemination at the first synchronized oestrus.

To ensure precise synchrony it is important to emphasize that the most common problem in breeding management in dairy cows is inadequate oestrus detection. The tailpainting system may be less satisfactory in herds with continuous calving patterns. It shows particular potential for further studies

between animals which may not display oestrus, and the associations of the tailpaint and raddle technique in animals with different coats and skeletal conformation.

In non-cycling cows, further studies have to be focused on the importance of identifying factors which affect the treatment response, the endocrinological characteristics of these animals, and the interactions of the nutritional status, body condition and ovarian function during the post-partum period.

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GENERAL INTRODUCTION

The present thesis was undertaken as a series of five projects in which selected studies were undertaken on the use of the CIDR intravaginal device in dairy cattle.

The first study was designed to characterize the interactions involving the dynamic changes of follicles in the ovaries of cycling cows, measured by ultrasound during and after CIDR insertion and until oestrus, and the associated changes in plasma progesterone concentrations at the different stages of the oestrous cycle in entire cows, and in ovariectomized animals.

The second study concerns an evaluation of the effectiveness of tailpainting combined with the use of an aerosol raddle technique in detecting oestrus in synchronized animals. Other aims were to compare the patterns of onset of oestrus with different synchrony treatment, duration of oestrus, and some observations of oestrous behaviour in animals forming sexually active groups.

The third study evaluated a reproductive programme in dairy herds with a daily quota, and its effects on oestrus detection rates and return to service intervals, oestrous responses to two dose rates of prostaglandin combined with CIDR, and the effect of progesterone supplementation on fertility.

The fourth study was designed to evaluate the effectiveness of using milk progesterone tests to identify non-pregnant animals, and consequently improve oestrus detection rates in cows previously synchronized in a controlled breeding management system involving the use of CIDR devices for controlling return to service intervals.

The fifth study concerns a study of dynamic changes of follicles in the ovaries by using ultrasonography during two different phases of the post-partum period (early and late), an examination of the effects of CIDR insertion and injection of PMSG, and measurement of post-treatment response rates in oestrus and ovulation in anoestrous dairy cows.