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EFFECTS OF REPEATED SUPEROVULATION AND FLUSHING ON
REPRODUCTIVE PERFORMANCE OF BRAHMAN COWS

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SUMMARY

To determine the effect of repeated superovulation and flushing in *Bos indicus* cows, 1841 embryo collection records of 813 Brahman donor cows were analyzed. Number of flushes affected total number of ova collected per donor, number of transferable embryos, pregnancy rate in the recipient, number of embryos collected per donor, number of morulas and number of blastocysts recovered. Total ova recovered per donor cow decreased from 9.4 at the first flush to 2.9 at the fifth flush. Means of transferable embryos per flush ranged from 5.3 for the first flush to 2.2 on the fifth flush. Pregnancy rate in the recipients were higher (44.2%) during the fourth flush and then decreased (38.8%) after 6 or more flushes. The number of embryos collected ranged from 6.8 during the first flush to 3.0 for the fifth flush. Embryo production was higher (6.5) during the first flush than during the second flush (5.0). Numbers of blastocysts recovered per donor were higher (3.9) during the first flush and lower (2.2) during the fifth flush. Repeatabilities of the ovarian response to superovulation ranged from 0.10 to 0.17. These low levels of repeatability do not encourage any culling program based strictly upon ovarian response to superovulation. These data establish that repeated superovulation and flushing have a detrimental effect on embryo parameters, especially after the fourth flush, in Brahman donor cows.

INTRODUCTION

Embryo transfer in cattle can be of interest only if all donor cows can frequently produce a large number of fertilizable ova. Hence, all animals not only have to respond with a high number of ovulations, but they have to respond consistently after repeated superovulation. However, investigations into the repeated ovarian response to superovulation in Brahman cattle have not been conducted. Therefore, the basic objectives of this study were to: 1) determine effects of repeated superovulation and flushing on embryo transfer

results and 2) analyze repeatability of the ovarian response to successive superovulation of Brahman cows.

PROCEDURES

Embryo collection records were obtained from two embryo transfer units located in Central Texas for 2,015 nonsurgical embryo donor collections from 813 Brahman cows over a period of seven years (1978-1984). The embryos were evaluated and embryo transfer pregnancy results were recorded. All animals were maintained under the same management and embryo collection procedures at both embryo transfer units.

Animals. All donor animals utilized in the superovulation and embryo collection regimens were nonlactating, purebred Brahman cows and heifers. Recipient females were of diverse genetic background. All donor females were examined by palpation per rectum for evidence of possible reproductive problems and at least two estrous periods were observed prior to any superovulation treatment ($x = 64 + 5$ d).

Evaluation of Embryos. The stage of development of embryos was determined by examination of embryonic morphology. Only morphologically normal embryos were transferred to recipient cows. Embryos that showed gross structural abnormalities, degeneration or fragmentation, and embryos that were retarded in development as well as unfertilized ova were discarded.

RESULTS

Total Ova, Transferable Embryos and Total Embryos. Number of flushes affected total number of ova collected per donor ($P < 0.07$); number of transferable embryos ($P < 0.001$); and number of embryos collected per donor ($P < 0.003$). The effect of repeated superovulation, as reflected by total ova and embryos recovered per flush, showed that after four repeated superovulations and subsequent flushes the ovarian response decreased in Brahman donor cows (Figure 1). Brahman cattle, therefore, seem to be more sensitive to exogenous gonadotropins than European cattle.

The number of transferable embryos also decreased with number of flushes (Figure 1). The estimated least-squares means of transferable embryos per flush ranged from a high of 5.3 for the first flush to a

low of 1.8 on the fifth flush. Furthermore, when the average of transferable embryos obtained after the fourth flush in Brahman donor cows is compared with those reported in British and European breeds, the decrease is more dramatic in the Brahman cows. It is possible that breed differences in sensitivity to superovulation could be involved in this pattern exhibited by the Brahman donor cow.

Number of embryos recovered decreased with subsequent flushes (Figure 1). After the fourth flush the number of embryos recovered declined rapidly. The least-squares means of number of embryos recovered ranged from a high of 6.8 for the first flush to a low of 3.0 for the fifth flush. Similarly, when data from donor cows with one and two flushes were analyzed separately, the numbers of embryos recovered were higher (6.5) for cows flushed once than for cows flushed twice (5.0). Embryo production at the first collection was higher than it was from cows superovulated three or more times.

Pregnancy Rate per Donor. Pregnancy rate per donor cow was affected by number of flushes ($P < 0.03$). Number of flushes per donor affected pregnancy rate in the recipients (Figure 2). Pregnancies per donor cow increased from the first to the fourth collection, but it tended to decrease after the fourth flush. This trend is explained by the fact that both total embryos and number of transferable embryos recovered decrease with repeated flushing of Brahman donor cows.

Number of Blastocysts and Morulas Recovered. Number of flushes affected both number of blastocysts ($P < 0.10$) and number of morulas ($P < 0.08$) recovered per donor cow (Figure 3). The numbers of blastocysts recovered decrease rapidly after the fourth flush. Similarly, the numbers of morulas recovered per donor decreased with repeated flushes. The numbers of morulas recovered during the first and second flush were higher (1.5 and 1.2, respectively), than during the fifth flush (0.4). A similar tendency was previously observed in the numbers of embryos recovered per donor cow. Therefore, repeated superovulation in Brahman donor cows seems to have a detrimental effect on both embryo production and quality of embryos recovered per flush.

Number of Unfertilized Ova. Number of unfertilized ova recovered per donor was affected by number of flushes ($P < 0.04$). Number of unfertilized ova tended to decrease with repeated flushing (Figure 4).

In addition, significant ($P < 0.01$) differences were detected between the first and second flush. Numbers of unfertilized ova were higher (2.5) during the first flush than during the second flush (1.7).

Repeatability of Ovarian Response. Repeatabilities of the ovarian response to superovulation as measured by number of ova recovered in each collection were estimated. The range of repeatabilities obtained was between 0.10 and 0.17 (Table 1).

TABLE 1. ESTIMATES OF REPEATABILITY OF THE OVARIAN RESPONSE MEASURED BY TOTAL OVA RECOVERED.

Variable	Repeatability	SEM ^a
Pregnancy Rate	0.10	0.03
Total Ovulations	0.17	0.03
Total Embryos	0.11	0.03
No. Blastocysts	0.10	0.03
No. Morulas	0.03	0.03
Transferable Embryos	0.11	0.03
Unfertilized Ova	0.18	0.03

^aStandard error of the mean.

The repeatability of total ova produced was 0.17 and the repeatability of pregnancy rate obtained by the total number of embryos transferred from each collection was 0.10. Likewise, low repeatabilities were obtained in all the other characteristics evaluating the ovarian response. With this level of repeatability, a culling program based upon ovarian response would not be advisable.

In summary, a definite effect of repeated flushing was detected in all parameters evaluated in this study. Brahman donor cows had the lowest performance with regard to ovarian responsiveness to superovulation during the fourth flush as reflected by number of ovulations and number of transferable embryos per flush. This effect was consistent with lower pregnancy rates in the recipient. Number of blastocysts and number of morulas recovered per flush decreased after the fourth flush. These findings suggest that Brahman donor cows tend

to have a decrease in embryos quality after the fourth flush. Further, these results show that both the number and viability of embryos are affected by repeated superovulation in Brahman donor cows.

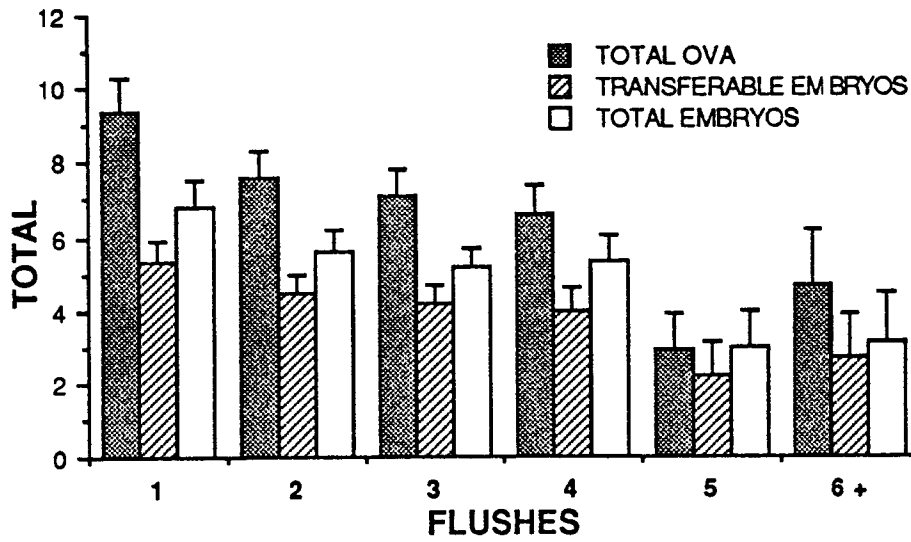


Figure 1. Least-squares means and standard errors of total ova, transferable embryos and total embryos recovered per donor per flush.

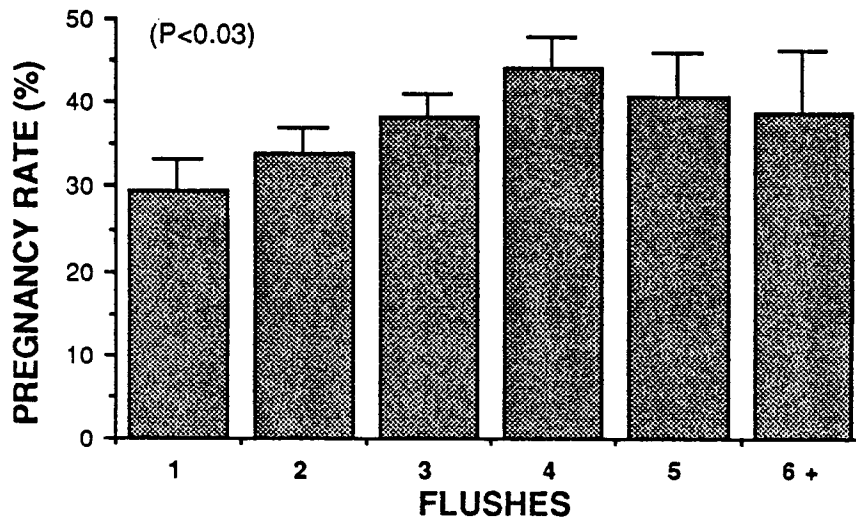


Figure 2. Least-squares means and standard errors of pregnancy rate per donor per flush.

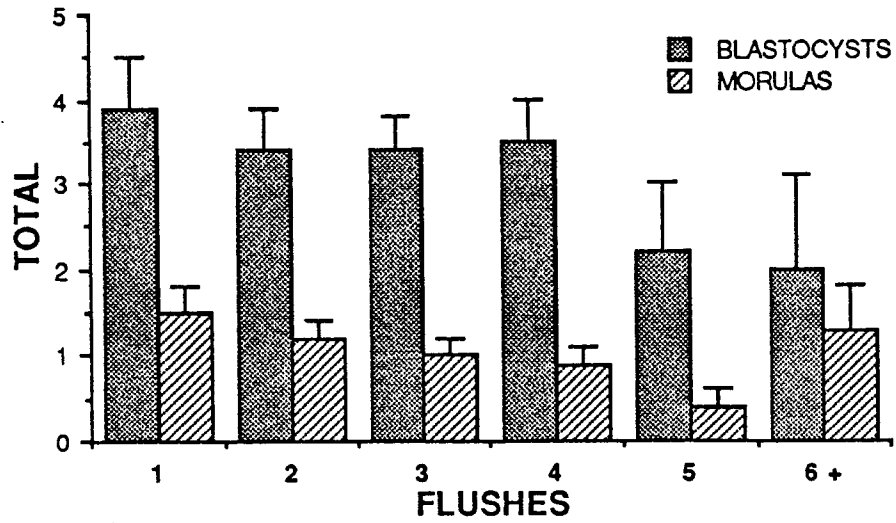


Figure 3. Least-squares means and standard errors of number of blastocysts and morulas recovered per donor per flush

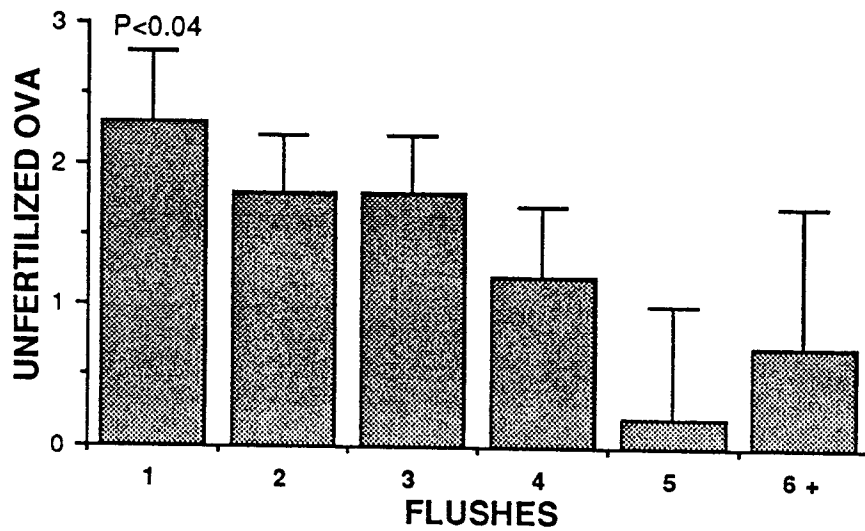


Figure 4. Least-squares means and standard errors of unfertilized ova per donor per flush.