Factors affecting AB conception rates in cattle

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ABSTRACT

Mating records from Dairy Board files for 1984 were analysed. First inseminations with liquid semen were considered, and the effect of several factors on conception analysed. Conception was scored as 1 if a calving occured 272 to 293d after insemination, and 0 if a calving occurred outside that interval. Only records from animals with a known calving date were included. The data were analysed by linear model techniques, with conception as a dependent variable.

The factors contributing to variation in conception were (in order of declining importance): herd, technician, post-partum interval, service sire and age of cow. The R^2 was 0.072 indicating that most of the variation is caused by binomial error.

Keywords Conception rate.

INTRODUCTION

Fertility of dairy cattle has been studied extensively by many investigators. Different parameters have been used to represent fertility. Frequently used parameters are: conception rate, non return rate, days open, calving interval and number of inseminations per conception.

Conception rate can be defined as the proportion of inseminated animals which calve 273 to 292 d after insemination. The interval of 273 to 292 d can be considered as a normal gestation length (Macmillan and Curnow, 1976). This definition however ignores all embryonic and foetal losses after 21d whereas most of the embryonic losses occur shortly after insemination (Ayalon, 1978).

In this study the effect on conception rate of the factors:age of cow, number of days after semen collection, post-partum interval, region, bull, breeding index of the cow, technician and herd are investigated for 1 years records of the Livestock Improvement Division of the New Zealand Dairy Board.

MATERIALS AND METHODS

Mating records from 1984 were selected. Only records from inseminations carried out by technicians operating on at least 10 herds were selected, and for each herd only records from the main technician. This selection was made because the general practice in New Zealand is to assign a number of herds to 1 technician, and these herds are not visited by other technicians. This nested design was adopted because it would be impossible to design a model in which technicians and herds could be cross-classified (as in a rotational schedule). The selection of technicians operating on at least 10 herds was made in order to exclude farmers inseminating their own and neighbouring herds.

The data were edited according to the following steps:

- From the initial dataset of 1,730,818 records, 321,916 were removed because they were from technicians operatong on fewer than 10 farms or because they were not the main technician.
- Only first inseminations with liquid semen were considered, so another 544,849 records were removed.
- Information about breed of the cow, date of birth, calving date in 1984, calving date in 1985, breeding index and reliability were merged with the data, and 341,923 records from cows other than Holstein-Friesian, Jersey and Holstein-Friesian x Jersey were removed.
- Another 2,332 records were removed from cows with an age less than 2 years, inseminations with semen older than 3 d after collection and inseminations from sires with fewer than 500 first inseminations.
- Only records from cows which had a recorded calving date in 1985 were included in the data, so a further 159,938 records were dropped.

There were 319,860 records in the final dataset. The dataset contained the following variables: age of cow(agecow) 2 to 11 years; semen age (semage) 0 to 3k; interval from calving to mating (intcalfi) 0 to 15 weeks; bull (bull) service number, n = 26; breeding index class (biclass) 1 to 5 (< 101, 101-110, 111-120, 121-130, >131).

RESULTS AND DISCUSSION

Significant features of the analysis are shown in Table 1 with the least squares estimates and standard

TABLE 1 Analysis of variance of significant effects.

Source of variation	df	SS	*F*	Probability	R^2
Agecow	10	81.50	37.68	**	0.072
Technician	886	1094.81	5.71	**	
Herd	4985	2787.71	2.58	*	
Semage	3	4.30	6.62	**	
Intcalfi	15	876.44	270.16	**	
Bull	25	108.85	20.13	**	
Biclass	4	3.56	4.12	*	
Error	313931	67965.33			

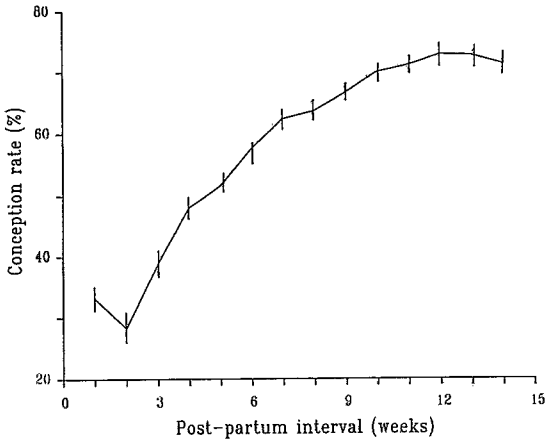

FIG. 1 Conception rate at different post-partum intervals.

errors for the classes of the main effects shown in Figs 1, 2 and 3.

The low R^2 value for the model is typical of models with a binomial variable as a dependent variable (Taylor *et al.*, 1985). The reason for this is the high error on every observation which can only have a value of either 0 or 1. Factors which significantly affected conception rate were: technician; herd; interval from calving to first insemination; bull; age of cow; semen age and breeding index class. Technician and herd were the most important factors affecting conception rate. These 2 factors accounted for 0.014 and 0.038 of total variation compared to 0.02 for all other factors combined.

rate has been documented by Ron *et al.* (1984) and Williamson *et al.* (1980). Both sources report a lower conception rate in the first period of lactation as found in this study (Fig. 1).

Shannon *et al.* (1984) reported small differences in non-return rate for inseminations carried out with semen 1, 2 and 3 d after collection, with a fall of 0.6% from day 1 to day 2, and a fall of 0.9% from day 2 to day 3, but these were not significant. The differences between these classes in this study were of the same order.

The trend found in conception rate for the classes of breeding index (Fig. 2) may be attributed to differences in fitness between animals of different breeding index. Under New Zealand dairying conditions there is a lot of competition between cows, and selection on breeding index may include a correlated response on fitness. As fertility can be

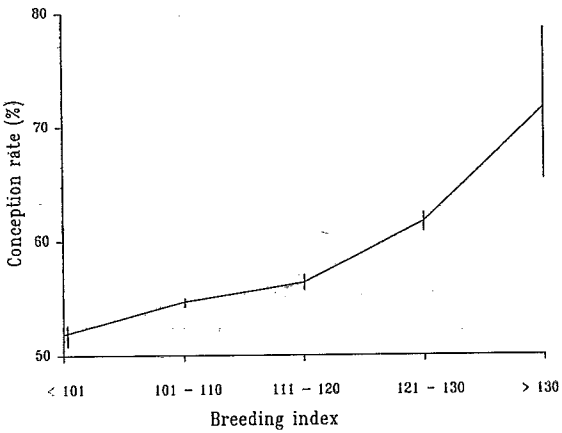

FIG. 2 Conception rate for different classes of breeding index.

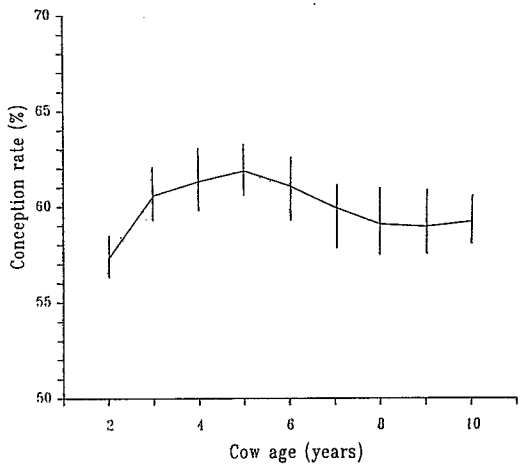

FIG. 3 Conception rate for cows of different ages.

considered to be a fitness related quality, animals with a higher breeding index could have a better fertility than animals with a low breeding index.

Age of cow also affected conception rate (Fig. 3). Fertility increased by 6% from 2 to 5 years, and then declined by 3% at ages 8 to 10 years.

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