Some Observations on Reproductive Performance in Beef Cattle in Western Canada

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INTRODUCTION

An essential aspect of any disease investigation must be to establish the extent of the problem. This usually means determining the prevalence of affected herds and the prevalence of disease within herds. The examination of suboptimal reproductive efficiency is no different than the examination of any other disease condition. Baseline data on factors decreasing percent calf crop, similar to that reported by Hanly and Mossman (3) would be useful to provide an estimate of lost production and to determine economical control programmes in commercial beef breeding herds. Although data for reproductive efficiency are available, it has been usually derived from experimental herds (1, 2, 5) or from research investigations (11, 12, 13). Questionnaire data has been effectively used to describe patterns of clinical syndromes or pathology (7, 8, 10). The purpose of this paper is to report the reproductive performance and factors associated with reproductive performance in some beef herds in Western Canada. This information was obtained by requesting participating veterinarians to supply results and a short history of herd reproductive examinations done in beef cattle in the autumn of 1975.

MATERIALS AND METHODS

A questionnaire was designed to obtain information on reproductive performance in beef herds. All practicing rural veterinarians in the Western provinces of Canada were contacted and the questionnaires were mailed to those who indicated a willingness to collect data. The information requested could be recorded in two ways. They could either submit total numbers of cows, grouped by diagnosis (4), or they could record each cow individually with clinical findings and diagnosis. They were also asked to provide a short history about the inventory and management of the herd.

Thirty-five veterinary clinics indicated that they would be willing to provide observations on fall reproductive examinations. Data from 19 respondents representing 166 herds were suitable for processing. The data were coded and processed onto the file of the University of Melbourne computer from the terminal at the Veterinary Clinical Center in Werribee. A package programme was used to construct tables and generate the statistics in this analysis (6).

RESULTS AND DISCUSSION

A total number of 16,484 beef females (mean number of 97 per herd), was reported to have been exposed to breeding at the beginning of the season (Table I). The total number of cows culled between the breeding season and the time of reproductive examination was 578; a mean of three cows per herd. A stocking rate of 1 to 5.9 acres per cow was reported on 62.6% of the ranches and less than one acre per cow on only 1.8% (Table II).

Analysis of the responses to questions on breeding methods and management indicated that the modal[1] breeding season length was greater than 125 days (Table III). It was less than 65 days on only 6.6% of the ranches. Natural mating alone, artificial mating alone or a combination thereof was used on 67.5, 2.4 and 28.9% of the herds respectively (Table IV). A total of 2,417 cows with a mean of 46 cows per applicable herd, were inseminated artificially of which 79% were done by a member of the ranch staff, 15% by A.I. unit personnel and 5.4% by others. Marker bulls, surgically altered to prevent insemination, were used for estrus detection on 47.2% of the ranches on which A.I. was used. This constituted 63.8% of the cows bred A.I. Estrus synchronization had been used in only one herd.

Where natural mating was used alone, 79% of ranches used bull ratios of less than 5% with the mode being 3 to 3.9% (Table V). In 11.4% of herds this ratio was increased with extra nondesignated breeding bulls, like yearlings or early calves. The average bull age on 83.7% of the ranches was less than 5.9 years with the mode falling into three to four year group (Table VI). A considerable number of ranches (13%) did not provide the ages of breeding bulls. Only 13.1% of ranches reported the use of a veterinarian to evaluate the breeding potential of bulls prior to the breeding season.

Reproductive performance was assessed by tabulation of results from rectal palpations. A summary of these data is presented in Table VII. The mean pregnancy percentage was 85.9, but most herds reported "greater than 95% pregnant"

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[1]Modal here referring to value occurring most frequently in a given series of observations.

(Table VIII). When cows were categorized as to appropriate trimester of pregnancy, it was found that 10.9, 73.5 and 1.4% were found in the first, second and third trimester respectively (Table VII). Although it was not always provided in herd histories, the high proportion of cows in the second trimester of pregnancy suggests all examinations were done at about the same time.

Nonpregnant cows were in some cases divided into nonpregnant normal (12.9% of total examined) and nonpregnant abnormal (1.4% of total examined) (Table VII).

Correlations between the various factors involved and pregnancy percentage were calculated (Table IX). Correlations for breeding pasture stocking rate, bull ratio or average bull age were 0.0128, 0.0852 and 0.0433 respectively. These were nonsignificant at all levels; failing to demonstrate

TABLE I

DISTRIBUTION OF HERD SIZE BASED ON THE TOTAL NUMBER OF COWS EXAMINED PER HERD

Herd Size (Number of Cows)	Absolute Frequency	Relative Frequency (%)
Less than 50	61	36.7
51 - 100	59	35.5
101 - 150	25	15.1
151 - 200	9	5.4
201 - 250	2	1.2
251 - 300	3	1.8
301 - 350	1	.6
351 - 400	4	2.4
Greater than 401	2	1.2
Total	166	100.0

TABLE II

DISTRIBUTION OF HERDS BY STOCKING RATE

Acres per Cow	Absolute Frequency	Relative Frequency (%)
Less than 1	3	1.8
1 - 2.9	45	27.1
3 - 5.9	56	33.7
6 - 10	16	9.6
11 - 15	7	4.2
16 - 20	4	2.4
Greater than 20	5	3.0
Not given	28	16.9
Total	166	100.0

TABLE III

DISTRIBUTION OF HERDS BY LENGTH OF THE BREEDING SEASON

Length of the Breeding Season (Days)	Absolute Frequency	Relative Frequency (%)
22 - 42	2	1.2
43 - 64	9	5.4
65 - 84	18	10.8
85 - 104	44	26.5
105 - 124	25	15.1
Greater than 125	66	39.8
Not given	2	1.2
Total	166	100.0

TABLE IV

DISTRIBUTION OF HERDS BY BREEDING METHOD

Method	Absolute Frequency	Relative Frequency (%)
Natural breeding	112	67.5
A.I. alone	4	2.4
Both A.I. and natural breeding	48	28.9
Other[a]	2	1.2
Total	166	100.0

[a]Includes hand-breeding alone or hand-breeding and A.I.

TABLE V

DISTRIBUTION OF HERDS BY RATIO OF BULLS TO COWS AND HEIFERS WHERE NATURAL BREEDING WAS USED ALONE

No of Bulls/100 Cows	Absolute Frequency	Relative Frequency (%)
Less than 1	1	0.9
1 - 1.9	16	14.2
2 - 2.9	20	17.8
3 - 3.9	32	28.6
4 - 4.9	20	17.9
5 - 5.9	8	7.1
6 - 6.9	4	3.6
7 - 7.9	5	4.5
Not given	6	5.4
Total	112	100.0

TABLE VI

DISTRIBUTION OF HERDS BY AVERAGE AGE OF BULL

Average Age of Bull (Years)	Absolute Frequency	Relative Frequency (%)
Less than 2	16	9.6
2 - 2.9	38	22.9
3 - 3.9	51	30.7
4 - 4.9	31	18.7
5 - 5.9	3	1.8
6 - 6.9	3	1.8
7 - 7.9	1	0.6
Greater than 8	1	0.6
Not given	22	13.3
Total	166	100.0

TABLE VII
SELECTED OBSERVATIONS FROM REPRODUCTIVE EXAMINATIONS MADE BY VETERINARIANS IN WESTERN CANADA IN THE FALL OF 1975

Variable	Total	Mean/Herd	Percent
1. No. of cows bred (exposed to breeding)	16,408	98.75	
2. No. of cows culled or died	578	3.48	
3. No. of cows bred by A.I.	2,417	14.56	
4. Total no. of cows examined	14,869	89.57	100.00
5. No. of cows diagnosed pregnant in first trimester	1,628	9.80	10.95
6. No. of cows diagnosed pregnant in second trimester	10,930	65.84	73.50
7. No. of cows diagnosed pregnant in third trimester	213	1.28	1.43
8. Total no. of cows diagnosed pregnant	12,771	76.93	85.89
9. No. of cows diagnosed nonpregnant and abnormal	212	1.27	1.42
10. No. of cows diagnosed nonpregnant and normal	1,926	11.60	12.95

Total number of herds reporting = 166

TABLE VIII
DISTRIBUTION OF HERDS BY PERCENTAGE DIAGNOSED PREGNANT

Percent Pregnant	Absolute Frequency	Relative Frequency (Percent)
Less than 60	6	3.6
61 - 65	3	1.8
66 - 70	2	1.2
71 - 75	7	4.2
76 - 80	14	8.4
81 - 85	9	5.4
86 - 90	22	13.3
91 - 95	40	24.1
Greater than 95	63	38.0
Total	166	100.0

an association with pregnancy percentage. Similarly, there was no significant relationship between breeding method and pregnancy percentage. The use of A.I. was weakly associated with decreasing breeding season length ($r = 0.31166$, $P = 0.001$). Size of herd examined did not appear to account for any of the variation in pregnancy percentage in these reported observations.

Length of breeding season did not appear to influence the percentage of cows pregnant ($r = 0.1104$, $P = 0.078$). A regression line fitted to these data failed to demonstrate a linear relationship between length of breeding season and pregnancy percentage (Table IX).

In this analysis the percent of cows pregnant at the time of pregnancy diagnosis in one year was used as a measure of reproductive performance. Veterinarians reported that in 50% of herds visited they were not asked to examine all the cows that had been exposed to breeding during that season. The number of cows which were culled explained only 38% of the difference between cows exposed and cows examined (Table VII).

These observations do not include components of reproductive inefficiency other than failure to conceive. Losses associated with gestation, parturition and preweaning growth must be added to this to assess percent calf crop (9). A conception failure of 14.1% is a considerable loss of pro-

TABLE IX
MULTIPLE REGRESSION THAT MEASURES THE INFLUENCE OF VARIABLE FACTORS ON PERCENT COWS PREGNANT

Dependent Variable: Percent Cows Pregnant of All Examined Cows
Summary Table

Step	Variable Entered	F to Enter or Remove	Sig.	Multiple R	R Square	Simple R	Overall F	Sig.
1	Bleng[a]	3.07602	0.081	0.11040	0.01219	0.11040	1.10349	0.363
	Beval	1.01532	0.315	0.11983	0.01438	-0.04317		
	Acow	0.04531	0.832	0.12048	0.01452	-0.01277		
	Bremeth	1.52484	0.219	0.14942	0.02233	0.04625		
	Bage	0.43610	0.510	0.15217	0.02316	-0.04334		
	Brat	2.78582	0.097	0.19994	0.03998	0.08518		

[a]Bleng = Breeding season length
Beval = Use of bull evaluation
Acow = Acres of breeding pasture per cow
Bremeth = Method of breeding
Bage = Average bull age
Brat = Ratio of bulls to breeding females

duction, especially in view of the observation that 82.5% of herds reported a breeding season longer than 65 days. Individual factors did not appear to be correlated with this conception failure. In practice, herd owners elected to have their herds examined for pregnancy. This method of sample selection may have biased the data to the extent that significant associations between pregnancy rate and influencing factors were not demonstrable. Therefore, the statistics compiled in this study cannot be used to describe the population of cow-calf herds in Western Canada. Similarly, the inferences that can be drawn are limited to a very narrow range of herds.

The prevalence of failure to conceive with its associated factors must be examined more critically than a survey by veterinarians can provide. Several alternate methods of assessment exist. These include a system designed to collect periodic inventory data on a sample of herds preselected by size, location and area population. A study should include all of the events in one production cycle, so that inferences drawn would not be dependent on "a good or a bad year". A project such as this could be dependent on personnel in various locations but central direction should be maintained in order that generalized patterns of reproductive events may emerge.

SUMMARY

In the autumn of 1975, veterinarians were surveyed for the results of reproductive examinations of beef herds. Information about herd inventories, breeding management and beef cow performance was accumulated and analyzed. The mean herd size was 97 breeding females but only an average of 89 were examined. There was a mean pregnancy rate of 85.9% even though cows were exposed to the bulls for periods longer than three estrous cycles on 93.4% of the ranches. Artificial insemination was used in 31.3% of herds. The modal bull ratio and age was 3 to 3.9% and three to four years respectively. Significant associations between percentage of pregnant cows and possible influencing factors were not demonstrated. The derived statistics only represent herds where owners choose to have veterinarians make reproductive examinations in the fall of the year.

RÉSUMÉ

Au cours de l'automne de 1975, l'auteur demanda à des praticiens de remplir un questionnaire relatif au travail qu'ils avaient effectué dans des troupeaux d'animaux à boeuf, concernant la reproduction. Il colligea et analysa ensuite les renseignements qui portaient sur l'inventaire de ces troupeaux, le mode d'accouplements et la performance des vaches. Chaque troupeau comptait en moyenne 97 vaches reproductrices, dont une moyenne de seulement 89 étaient impliquées dans l'expérience. Le taux moyen de gestation s'établissait à 85.9%, même si dans 93.4% des troupeaux, on laissait les taureaux au pâturage avec les vaches pour une période plus longue que trois cycles oestraux. La proportion des taureaux par rapport à celle des vaches se situait entre 3 et 3.9%; l'âge de ces taureaux variait de trois à quatre ans. L'auteur ne décela pas de relation appréciable entre le pourcentage de vaches en gestation et les facteurs susceptibles de l'influencer. Les statistiques dérivées de cette éxperience ne concernent que des troupeaux dont les propriétaires demandent à leur vétérinaire d'effectuer des examens de reproduction, à chaque automne.

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BOOK REVIEW/ ANALYSE DE VOLUME

An Introduction to Veterinary Immunology. I.R. Tizard. Published by W.B. Saunders Limited, Toronto. 1977. 367 pages. Price $19.80.

This book is written specially for students of veterinary medicine. There are 21 chapters included in the three main sections. From chapter one to chapter ten, the features of the immune response are described: phagocytosis, antigenicity, antibodies and the theories of their generation, and the methods for their detection. Chapters 11 to 15 concern the role of the immune response in resistance to infectious diseases. The last six chapters explain diseases of immunological origin: the different types of hypersensitivity and autoimmunity.

Chapters 10 (immunity in the fetus and newborn animal), 11 (immunoprophylaxis) and 21 (defects in the immune system) are very interesting, bringing very useful new data. The figures are numerous, appropriate and informative.

In chapter 12, the choice of leptospirosis as a disease where immunity is related to a strain specificity and an autogenous vaccine is the way of overcoming this difficulty, is questionable. In chapter 19, the infectious agent responsible for glanders is named *Actinobacillus mallei*, but the accepted term is now *Pseudomonas mallei*.

This book is strongly recommended to veterinarians of different sectors who wish to be acquainted with recent developments in the field of immunology.

La grande qualité de ce livre est qu'il s'adresse principalement aux étudiants en médecine vétérinaire. Il comprend 21 chapitres que l'auteur a disposé selon trois grandes idées principales. Les chapitres un à dix expliquent les principes de la réponse immunitaire. La phagocytose, l'antigénicité, les anticoprs et leur fabrication et les méthodes pour les détecter, sont décrits avec des exemples typiquement vétérinaires. Les chapitres 11 à 15, décrivent le rôle de la réponse immunitaire dans les diverses maladies infectieuses. Enfin, les six derniers chapitres abordent les manifestations pathologiques attribuables à la réponse immunitaire, qu'il s'agisse des différents types d'hypersensibilité ou des maladies auto-immunitaires.

Les chapitres 10 (l'immunité chez le foetus et le nouveau-né), 11 (principes généraux de la vaccination et les vaccins), sont particulièrement intéressants, car ils apportent des données récentes des plus utiles. Les figures sont nombreuses et claires.

Au chapitre 12, le choix de la leptospirose comme exemple de maladie où l'immunité est spécifique de "souche" et qu'un vaccin autogène est la solution à ce problème, est très discutable. De plus, l'agent de la morve est appelé *Actinobacillus mallei*, alors que le terme accepté présentement est *Pseudomonas mallei*.

Ce livre est recommandé fortement aux vétérinaires des différents secteurs, qui désirent se remettre à date dans le domaine de l'immunologie. *R. Higgins.*