

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**THE EFFECTS OF LASALOCID ON MILK PRODUCTION
IN PASTURED SPRING-CALVING DAIRY COWS**

A thesis submitted in partial fulfilment of the requirements for the degree of
Master of Agricultural Science at Massey University.

NHAMO GEORGE GOZHO

1995

Massey University Library

Thesis Copyright Form

Title of thesis: THE EFFECTS OF LASALOCID ON MILK PRODUCTION IN
PASTURED SPRING-CALVING DAIRY COWS

- (1) (a) I give permission for my thesis to be made available to readers in Massey University Library under conditions determined by the Librarian.
(b) I do not wish my thesis to be made available to readers without my written consent for months.
- (2) (a) I agree that my thesis, or a copy, may be sent to another institution under conditions determined by the Librarian.
(b) I do not wish my thesis, or a copy, to be sent to another institution without my written consent for months.
- (3) (a) I agree that my thesis may be copied for Library use.
(b) I do not wish my thesis to be copied for Library use for months.

Signed 

Date . . . 16/02/95

The copyright of this thesis belongs to the author. Readers must sign their name in the space below to show that they recognise this. They are asked to add their permanent address.

NAME and ADDRESS

DATE

ABSTRACT

Ionophore supplements are widely used in the ration of fattening beef cattle, especially in the United States. Studies have indicated benefits in terms of a faster growth rate and live weight gain and a reduction in feed intake in beef cattle fed either monensin or lasalocid. In recent years interest has been growing on the possible use of ionophores in dairy cattle. This is because changes in rumen metabolism associated with ionophores could increase milk production in lactating ruminants and/or reduce health and reproductive problems.

Two experiments were conducted with dairy cows at grazing to evaluate the effects of Bovatec 20 (lasalocid) on milk production and performance in early and mid-lactation. In Experiment 1 thirty multiparous Friesian cows aged between three and nine years were assigned to two similar treatment groups of 15 cows balanced for age, previous lactation production, body weight and body condition prior to calving. Treatments consisted of no lasalocid (control) and 400 mg lasalocid per cow per day (drenched twice daily) and the experiment commenced 7 days postpartum. Milk yield and composition were measured at weekly intervals and the treatment continued for ten weeks. Gross energy content of milk was estimated from milk composition. Blood was sampled by tail venipuncture at weekly intervals during morning milking and serum harvested. Serum was analyzed for concentrations of non-esterified fatty acids, β -hydroxybutyrate, glucose, magnesium and calcium. Reproductive parameters (calving to first oestrus, calving to conception intervals and the number of services per conception) were calculated from farm records collected during the experiment.

No differences in milk, milk fat, protein, or lactose yields were observed. Significant ($P < 0.01$) lasalocid by period interaction was observed for milk fat yield. Gross energy content in milk did not differ between groups but period effects were significant ($P < 0.10$) during weeks 3, 6, 7 and 9. Period by

lasalocid interaction for gross energy content of milk was also significant ($P < 0.10$). Lasalocid treatment did not affect live weight changes of cows in early lactation. Lasalocid treated cows lost significantly ($P < 0.05$) more condition than control cows. Plasma concentrations of β -hydroxybutyrate, non-esterified fatty acids, glucose, magnesium and calcium were unaffected by lasalocid. Period by lasalocid effects for non esterified fatty acids and for magnesium were significant ($P < 0.05$ and $P < 0.10$, respectively). Reproductive parameters were unaffected by lasalocid supplementation.

In Experiment 2 forty-five multiparous Friesian cows in mid-lactation were divided into three groups using the criteria as in Experiment 1. The groups were randomly allocated to three treatments. Treatments consisted of a control group, a group treated with Bovatec 20 (lasalocid) as in Experiment 1, and a third group treated with Bloatenz (a bloat preventive formulation). Treatments lasted 10 weeks. Milk yield and composition, live weight and body condition scores were measured as in Experiment 1. Cows were also scored for intensity of bloat for two periods each of 7 days.

Treatment with either Bovatec 20 or Bloatenz did not affect milk, fat, protein or lactose yields of cows in mid-lactation. Period effects for fat yield were significant ($P < 0.05$). Gross energy content in milk was unaffected by treatment. Live weight changes were unaffected by treatments but cows treated with Bovatec 20 and Bloatenz lost less condition compared to control cows. The pastures used failed to induce bloat and hence there were no data for this aspect of the study.

It was concluded that feeding lasalocid resulted in only small numerical increases in milk production in early lactation with no milk production responses in mid-lactation. Lasalocid had minor negative influence on body condition in early lactation and a significant positive influence in mid-lactation.

ACKNOWLEDGEMENTS

I would like to acknowledge the help of the following people in this study. My supervisors Dr G.F. Wilson and Professor C.W. Holmes who were a great help in both the planning and execution of the trial and in the preparation of the written text. Their technical expertise, critical advice, and patience have been invaluable in making this study an enjoyable and worthwhile learning experience, and for that I am grateful.

Mr G.S. Purchas, Ms M.F. Scott and Ms Y.H. Cottam for their assistance in the collection and processing of samples, and the staff at the Dairy Cattle Research Unit (DCRU) Massey, who assisted in running the trial.

Dr P.C.H. Morel and Professor D. Garrick for assistance and advice in statistical analysis, and Mrs B. Purchas for critically reviewing this manuscript every step of the way.

Thanks due to Dr Bob Elliott (Colborn–Dawes Ltd and Roche Ltd for their cooperation in undertaking the experiments and their sponsorship of the project.

I also thank my great Kiwi family that I have acquired over the two years of my stay, the Blackwell, the Dixon and the Purchas families and all the other students in the Faculty of Agriculture and Horticultural sciences.

I am also grateful to be the recipient of a Commonwealth scholarship from the New Zealand Vice–chancellors Committee.

Finally, I would like to thank my work colleague, Mr T. Mutsvangwa, for being a source of inspiration and encouragement all the way and my wife and daughter for making the sacrifice to allow me to come and study in New Zealand.

TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iv
TABLE OF FIGURES.....	vii
TABLE OF TABLES.....	viii
CHAPTER 1.....	1
1. GENERAL INTRODUCTION.....	2
CHAPTER 2.....	5
2. REVIEW OF LITERATURE.....	6
2.1 Introduction.....	6
2.2 Use of ionophores in cattle production.....	7
a) Beefcattle.....	7
b) Dairy cattle.....	9
2.3 Mode of action of ionophores.....	14
2.3.1 Rumen microbes.....	14
a) Bacteria.....	14
b) Protozoa.....	15
2.3.2 Mechanism of ionophore action on rumen microbes.....	16
2.3.3 Ionophore nutrient–interactions.....	17
a) Energy metabolism.....	18
i) Volatile fatty acid production.....	18
ii) Gas production.....	19
iii) Digestibility.....	20
b) Nitrogen metabolism.....	21
c) Mineral metabolism.....	22
d) Other effects of ionophores.....	25
i) Prevention of metabolic disorders.....	25
ii) Improved reproductive performance.....	27
2.4 Scope of the study.....	28

TABLE OF CONTENTS (CONTINUED)

CHAPTER 3.....	30
3. MATERIALS AND METHODS.....	31
3.1 Experiment 1: Early lactation.....	31
3.2 Experiment 2: Mid-lactation: The bloat study.....	32
3.3 Chemical analysis.....	33
3.4 Statistical analysis.....	33
CHAPTER 4.....	35
4. RESULTS.....	37
4.1 Experiment 1.....	37
4.1.1 Milk production.....	37
4.1.2 Live weight and condition score.....	42
4.1.3 Blood metabolites.....	46
4.1.4 Somatic cell counts and reproductive performance.....	50
4.2 Experiment 2.....	51
4.2.1 Milk production, live weight and body condition.....	51
CHAPTER 5.....	55
5. DISCUSSION.....	56
REFERENCES.....	63

TABLE OF FIGURES

Figure 4.1: Milk (a), fat (b), protein (c), and lactose (d) yields of control and lasalocid-treated dairy cows in early lactation.	43
Figure 4.2: Gross energy in milk of control and lasalocid-treated dairy cows in early lactation in Experiment 1.	44
Figure 4.3: Live weight and body condition scores in control and lasalocid-treated dairy cows in early lactation in Experiment 1.	46
Figure 4.4: Plasma β -hydroxybutyrate (β OHB), non-esterified fatty acids (NEFA) and glucose concentrations of control and lasalocid-treated dairy cows in early lactation.	49
Figure 4.5: Plasma calcium and magnesium in control and lasalocid-treated dairy cows in early lactation.	50
Figure 4.6: Milk yield (a), fat yield (b), protein yield (c), and lactose yield (d) of control, lasalocid and Bloatenz-treated dairy cows in mid-lactation in Experiment 2.	54

TABLE OF TABLES

Table 2.1: Effects of feeding lasalocid on milk yield, composition and feed intake.	13
Table 4.1: Significance of effects of lasalocid treatment, period of treatment and lasalocid by period interaction on milk yield, fat yield, protein yield, lactose yield and gross energy in milk (GE_{milk}) for Experiment 1.	38
Table 4.2: Covariate adjusted least square means of milk yield (kg/day) for the first ten weeks of lactation for control and lasalocid treated dairy cows (Experiment 1).	39
Table 4.3: Covariate adjusted least square means of fat yield (kg/day) for the first ten weeks of lactation for control and lasalocid treated dairy cows (Experiment 1).	39
Table 4.4: Covariate adjusted least square means of milk protein yield (kg/day) for the first ten weeks of lactation for control and lasalocid treated dairy cows (Experiment 1).	40
Table 4.5: Covariate adjusted least square means of lactose yield (kg/day) for the first ten weeks of lactation for control and lasalocid treated dairy cows (Experiment 1).	40
Table 4.6: Significance of effects of lasalocid treatment, week of lactation and lasalocid by week of lactation interaction on per cent fat, per cent protein and per cent lactose for Experiment 1.	41
Table 4.7: Milk composition of control and lasalocid treated cows for the first ten weeks of lactation.	41

TABLE OF TABLES (CONTINUED)

Table 4.8: Significance of effects of lasalocid (L), stage of lactation (month) and lasalocid by month of lactation interaction on body weight and condition of cows during the first 3 months of lactation (Experiment 1).	44
Table 4.9: Significance of effects of lasalocid (L), week of lactation and lasalocid by week of lactation interaction on plasma concentrations of glucose (GLU), β -hydroxybutyrate, (β OHB), non-esterified fatty acids, (NEFAs), magnesium, (Mg) and calcium, (Ca).	46
Table 4.10: Least square means for plasma levels of β -hydroxybutyrate (mM), non-esterified fatty acids (mEq/l), glucose (mM), calcium (mg/dl) and magnesium (mM) in early lactation.	47
Table 4.11: Effects of lasalocid treatment on somatic cell counts (SCC) resumption of ovarian activity and conception in pasture-fed dairy cows in early lactation.	50
Table 4.12: Significance of effects of lasalocid or Bloatenz treatment, stage of lactation and treatment by stage of lactation interaction on milk, fat, protein and lactose yield (kg/d), body weight and body condition score (CS) and gross energy content of milk (GE_{milk}) in pasture-fed dairy cows in mid-lactation for Experiment 2.	51

TABLE OF TABLES (CONTINUED)

Table 4.13: Least square means for milk, fat, protein and lactose yields (kg/d) and milk composition and gross energy content of milk for control, lasalocid and Bloatenz treated dairy cows in mid-lactation for Experiment 2.	52
Table 4.14: Initial and final body weight and condition score means (\pm SE) for control, lasalocid and Bloatenz treated cows in mid-lactation for Experiment 2.	54