A STUDY

OF

SOME OF THE FACTORS AFFECTING THE TRANSFER OF IMMUNOGLOBULINS FROM COWS TO CALVES

A thesis presented in partial fulfilment of

the requirement for the degree of

Master of Agricultural Science

in

Animal Science

at

MASSEY UNIVERSITY

BASERY MOHAMAD

1975

ACKNOWLEDGEMENTS

I acknowledge my deepest respect and thanks to my supervisor, Dr D.D.S. Mackenzie for his encouragement, guidance and assistance throughout the experiment and advice during the preparation of this manuscript.

I would also wish to thank:

Mr I.J. Steffert for his helpful discussion and interest;

Professor A.K. Lascelles, Dairy Research Foundation, Canberra, Australia. for kindly providing monospecific antisera to bovine IgA and IgM;

Dr D. Newstead, D.R.I., for providing skim milk;

Professor R.J. Townsley for advice on statistical analysis;

The staff of Massey University Library, No. 1 Dairy Unit, Small Animal Production Unit and the Central Photographic Unit for their assistance;

My wife for her help with the experiments;

and

Mrs J.A. Jepson for typing this thesis.

SUMMARY

The yields of colostral immunoglobulins were estimated from the four quarters of 18 cows soon after birth (Experiment A). The concentrations of IgG, IgG2, IgA and IgM were found to be similar between the four quarters with means ranging from 82-88 mg/ml for IgG, 4.8-4.9 mg/ml for IgG2, 9.6-11.1 RSA/ml for IgA (RSA = relative to concentration of serum IgA) and 7.1-7.4 mg/ml for IgM. The calculated total yields of the four immunoglobulins were (means $\pm$ S.E.) 411$\pm$44 g, 23.4$\pm$3.0 g, 42.6$\pm$4.9 (RSA) and 35.0$\pm$4.8g for IgG, IgG2, IgA and IgM respectively. These amounts were considered adequate for the requirements of passive immunity in newborn calves. Most calves which were allowed to suckle their dams for the first two days were able to absorb high levels of these immunoglobulins in their sera. The means $\pm$ S.E. of the 24-hour serum levels of the immunoglobulin in these calves were 37.1$\pm$5.3 mg/ml for IgG, 1.3$\pm$0.1 mg/ml for IgG2, 3.2$\pm$0.4 RSA/ml for IgA and 2.1$\pm$0.2 mg/ml for IgM (Experiment C).

The apparent absorption efficiencies of the four immunoglobulins by newborn calves fed with colostrum within 6 hours of birth were similar at (means $\pm$ S.E.) 33.3$\pm$2.7% for IgG, 26.8$\pm$3.5% for IgG2, 32.8$\pm$3.1% for IgA and 36.0$\pm$3.8% for IgM. However sheep IgG2 was absorbed at lower efficiency (18.5-1.6%) by ten of these calves ($P < 0.05$) (Experiment B). In contrast the apparent absorption efficiency of sheep IgG2 was significantly greater (26.0$\pm$1.4%) in 20

calves which were allowed to remain with their dams for two days ($P < 0.01$) (Experiment C). This indicates that the absorption efficiency of immunoglobulins by calves which were allowed to nurse their dams was superior to the calves which were removed from their dams and fed from a nipple feeder.

The results obtained in the present studies were discussed in relation to relevant data reported in the literature.

CONTENTS

LIST OF TABLES

LIST OF TABLES - continued

LIST OF FIGURES

APPENDICES

APPENDICES - continued