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VARIATION IN pH, VOLATILE FATTY ACID CONCENTRATION
AND PROPORTIONS OF THE INDIVIDUAL ACIDS
WITHIN THE RUMEN OF THE DAIRY COW.

A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF AGRICULTURAL SCIENCE
IN THE MASSEY UNIVERSITY OF MANAWATU.

by
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PART I

THE EFFECT OF LEVEL OF INTAKE OF
PASTURE AND VARIATION WITH
TIME AFTER FEEDING.

INTRODUCTION

An increased interest in rumen physiology and metabolism has resulted in the accumulation of a mass of data on the subject over the last two decades but information, particularly on quantitative aspects, is far from complete. It is now well established that the main non-nitrogenous end-products of rumen fermentation, the volatile fatty acids (VFA) acetic, propionic and butyric play a major part in the energy metabolism of the ruminant. They provide the major energy source for the animal and the amounts and proportions of the acids absorbed influence the efficiency with which the diet is used for fattening and can affect the milk composition of the lactating cow. Thus a knowledge of the type of fermentation produced is necessary, as a contribution to the assessment of the nutritive value of feedstuffs and the efficiency with which they are converted to animal products.

The results obtained by different investigators are seldom strictly comparable as the pattern of rumen fermentation and the concentration and proportions of the VFA s may be considerably modified by factors other than the composition of the diet. Such factors are the level of intake, the feeding régime and sampling techniques adopted.

The present experiment followed the observations of Bryant (1961) and Davey, Robinson and Campbell (1962), that differences occurred between days in rumen pH and VFA concentration and proportions of the individual acids in cows grazing pasture. It was thought that some of these differences could be accounted for by variations in the level of intake between days.

In much of the work on rumen fermentation carried out overseas, mainly hay and concentrates have been used and there is limited information on rumen fermentation in relation to changes in the composition of pasture.

The main experiment reported here was designed as a 3 x 3 latin square, primarily to obtain information on the effects of different levels of intake of pasture fed indoors on the pH and on the concentration, proportions and total weight of VFA's produced in the rumen of three dairy cows, and as an aid to the design and interpretation of future experiments. It was also possible to collect additional information on the changes that occurred in pH and VFA concentration proportions with increased time after feeding. This information aided the interpretation of the results of the experiment dealing with intake.

The 3 x 3 latin square used, was repeated three times over a period of three months to assess possible variations in rumen fermentation caused by changes in pasture composition. From time to time the cows were grazed on pasture similar to, or different from that used in the indoor feeding experiment and rumen pH, VFA concentration and proportions of the acids were measured.

Although the experiment was not designed specifically to this end, the yield and composition of the milk of the cows was recorded in all experiments.

Part I of this report presents the review of literature and results and discussion on the effects of level of intake of pasture and time after feeding on rumen fermentation.

Part II contains the review of literature, results and discussion on variations in rumen fermentation over the season with grazing cows and with cows fed indoors and the chemical and botanical composition of the pasture.

Part III contains a brief discussion of the results obtained on milk yield and composition in relation to the proportions of the individual acids in the rumen liquor. The general discussion and conclusions are also included in this part.

For ease of reference the outline of the experiments and organisation of the thesis are given in Figure A. (facing Page 4.).

FIGURE A: OUTLINE OF THE EXPERIMENTS AND ORGANISATION OF THE THESIS

VARIATION IN pH, VFA CONCENTRATION AND PROPORTIONS OF THE INDIVIDUAL ACIDS
WITHIN THE RUMEN OF THE DAIRY COW

