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VITAMIN B<sub>12</sub>

AND

FOLIC ACID IN THE SHEEP

AND OTHER PAPERS

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# THESES PRESENTED FOR THE DEGREE OF DOCTOR OF SCIENCE

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## PREFACE

The papers which comprise the thesis presented for the Doctor of Science degree have all been written while the author was working in the laboratories of the Commonwealth Scientific and Industrial Research Organization.

Most of them deal with some aspect of the problems concerning the nutrition of the sheep which have occupied the attention of the Division of Biochemistry and General Nutrition, formerly known as the Division of Animal Nutrition, since its inception. They form part of the broad programme of research adopted by the Chief of the Division.

The first publication "Variations in the dry weight and iodine content of the thyroid glands of sheep under uniform and varying conditions" describes work which was planned by the late Professor Brailsford Robertson and carried out under his direction until his death in January, 1930.

The study published under the title "The substitution of methionine for cystine in the diet of growing rats" was undertaken at the suggestion of Mr. H.R. Marston in an attempt to determine unequivocally whether methionine could be converted into cystine in vivo. It was found that this conversion did take place thus giving the first direct proof of cystine formation in the animal.

Eleven papers are presented on the subject "Vitamin B12 and folic acid in the sheep."

The problem of "coast disease" in sheep has been studied continuously in this Division since it was founded. The discovery of the role of cobalt was a major advance and the later discovery that vitamin B12 contained cobalt focussed attention on this vitamin.

At the suggestion of Mr. H.R. Marston, Chief of the Division of Biochemistry and General Nutrition my assistants and I undertook the

measurement of vitamin B12 in the tissues of sheep. The first paper which was written on this subject "The excretion in the faeces of sheep of a factor possessing vitamin B12-activity" described the use of the rat as an assay animal. This work was not published. Seven papers were written later under the general title of "The determination of Vitamin B12-activity in the Organs and Excreta of Sheep".

1. "Microbiological assay methods"
2. "The influence of cobalt on the production of factors possessing vitamin B12-activity in rumen contents of sheep"
3. "The excretion of vitamin B12-active factors in the faeces and urine of sheep".
4. "The separation of vitamin B12-active factors from rumen contents by paper ionophoresis".
5. "The effect of cobalt deficiency on the vitamin B12 content of the blood plasma".
6. "Vitamin B12-activity in portal blood".
7. (Not yet published)  
"The effect of cobalt deficiency on the vitamin B12 content of the liver".

The investigation of folic acid followed. This work is still in its early stages but three papers are now ready for publication and are presented here. They are -

"Folic acid activity in the liver of sheep"

1. "The measurement of folic acid and citrovorum factor"
2. "The effect of "4-amino" -pteroylglutamic acid in vitro"
3. "The effect of vitamin B<sub>12</sub> deficiency on the concentration of folic acid and citrovorum factor"

During the war attention was turned to problems of human nutrition. In collaboration with Mr. H.R. Marston "Food Composition Tables" was written for the Department of the Army.

A review article -

"The effects of milling upon the nutritive value of wheaten flour and bread" was published in Nutrition abstracts and Reviews and two

original papers "The determination of thiamine in white bread by the thiochrome method" and "The thiamine content of white bread in Adelaide" were also published. These four papers are presented in support of my main thesis.

In all these papers the extent to which I have availed myself of the work of others is indicated in the "Acknowledgements" and the "References" to the literature at the end of each paper.

Except for the "Food Composition Tables" by Marston and Dawbarn in which I was the junior collaborator, all the papers were written by me. The co-authors were my junior assistants working under my direction though we discussed the papers together before publication. The work was shared by all of us.