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**NOVEL POUR-ON TECHNOLOGY IN  
CATTLE**

**A thesis presented in partial fulfilment of the requirements  
for the Degree of Master of Philosophy in Veterinary  
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## GENERAL ABSTRACT

To date the majority of commercially available pharmaceutical pour-on formulations have been used for the control of internal and external parasites in cattle. The objective of this research was to design pour-ons with novel applications, using cattle as the model species.

Serum and liver  $\alpha$ -tocopherol concentrations following topical application of  $\alpha$ -tocopherol were investigated using 30 mixed age non-lactating Friesian cows. Cows were randomly allocated to 1 of 5 groups and were treated on day 0 with 1 of 4 formulations or left untreated. Formulations were designed using combinations of permeation enhancers that have been shown to promote the absorption of lipophilic substances. All formulations contained equal quantities of  $\alpha$ -tocopherol and were applied at a dose of 0.95 g dl- $\alpha$ -tocopherol acetate / 50 kg live weight. Concentrations of  $\alpha$ -tocopherol in serum and liver were monitored for 20 days following treatment. Serum  $\alpha$ -tocopherol concentration was significantly increased in 1 group on day 2 and in 2 groups on day 6. It is concluded that  $\alpha$ -tocopherol can pass through the skin into the systemic circulation when applied topically.

Thirty Hereford yearlings were used to investigate the concentration of vitamin B<sub>12</sub> in plasma and liver following the topical administration of 2 vitamin B<sub>12</sub> pour-ons. Animals in the 2 treatment groups received a dose of 6mg cyanocobalamin per 50 kg live weight of their allotted pour-on on the first and seventh days of the trial. Control animals received no treatment. Blood samples were collected from all cows on days 0, 2, 7, 9, and 14 for assay of plasma vitamin B<sub>12</sub> concentration. Liver samples were collected from 5 of the cows in each group on days 0, 7, and 14 and were also analysed for vitamin B<sub>12</sub> concentration.

Differences between treatment groups in plasma and liver vitamin B<sub>12</sub> concentrations were not significant. It was concluded that cyanocobalamin did not cross the skin in high enough concentrations to elicit a statistically significant blood or liver response.

The dermal permeability of 3 selenium pour-on formulations was examined over 24 hours using an *in-vitro* calf skin permeation model. Pour-on formulation A, made up of selenium dioxide and butyl dioxitol, had a statistically greater rate of absorption than formulations B (made up of sodium selenate, butyl dioxitol and water) or C (made up of selenium sesquitrato, butyl dioxitol and water) for the entire 24 hour period. The absorption rates of formulations B and C were not statistically different. The results obtained from the *in-vitro* experiment were then compared with those from an *in-vivo* experiment using the same pour-on formulations, each applied to 6 cattle. Comparison of the 2 data sets indicates that the *in-vitro* model was useful in ranking the formulations in terms of *in-vivo* permeability.

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# TABLE OF CONTENTS

<b>General Abstract</b> .....	ii
<b>Acknowledgements</b> .....	iv
<b>Table of Contents</b> .....	v
<b>List of Figures</b> .....	vi
<b>List of Tables</b> .....	viii
<b>Chapter 1: Literature Review</b> .....	1
<b>Chapter 2: Serum and liver concentrations of <math>\alpha</math>-tocopherol in cows following topical application of four vitamin E pour-on formulations</b> .....	25
<b>Chapter 3: Serum and liver concentrations of vitamin B<sub>12</sub> after the application of two vitamin B<sub>12</sub> pour-on formulations</b> .....	36
<b>Chapter 4: <i>In-vitro</i> and <i>in-vivo</i> examination of three selenium pour-on formulations</b> ....	45
<b>General Discussion</b> .....	60
<b>References</b> .....	65

## LIST OF FIGURES

<b>Figure 1.1.</b> Possible pathways of penetration of a chemical through intact skin. ....	6
<b>Figure 1.2.</b> Schematic representation of the two possible pathways of penetration for a chemical diffusing through the intact stratum corneum .....	7
<b>Figure 1.3.</b> Location of enhancers on a conceptual diagram .....	14
<b>Figure 2.1.</b> Least squares means (LSM) of serum $\alpha$ -tocopherol for treatment groups A and B and for untreated control group D plotted against sampling dates .....	31
<b>Figure 2.2.</b> LSM for serum $\alpha$ -tocopherol for treatment groups C and E and untreated control group D plotted against sampling dates.....	32
<b>Figure 3.1.</b> LSM of liver vitamin B <sub>12</sub> concentration (nmol/kg) for yearling cattle treated with a vitamin B <sub>12</sub> formulation (groups A and B) and an untreated control group C. ....	41
<b>Figure 3.2.</b> LSM of plasma vitamin B <sub>12</sub> concentration (pmol/l) in yearling cattle treated with vitamin B <sub>12</sub> pour-on formulation A or B and an untreated control group C. ....	42
<b>Figure 4.1.</b> Diffusion cell developed to examine the diffusion of 3 selenium pour-on formulations through cattle skin. ....	49
<b>Figure 4.2.</b> LSM of selenium concentration in saline for <i>in-vitro</i> cells treated with 1 of 3 selenium pour-on formulations.....	55
<b>Figure 4.3.</b> LSM of serum selenium concentration for cows treated topically with 1 of 3 formulations of selenium, and an untreated control group D, for the first 24 hours.. ....	56

<b>Figure 4.4.</b> LSM of serum selenium concentration for cows treated topically with 1 of 3 selenium pour-on formulations, and an untreated control group D, for days 1 to 60..	57
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## LIST OF TABLES

<b>Table 2.1.</b> Formulations used in the vitamin E pour-on treatment trial .....	28
<b>Table 2.2.</b> Least squares means (LSM) for serum $\alpha$ -tocopherol (mg/l) for cows treated topically with 1 of 4 formulations of vitamin E, and untreated control group (group D). .....	30
<b>Table 2.3.</b> LSM for hepatic $\alpha$ -tocopherol concentration (mg/kg) for cows treated topically with 1 of 4 formulations of vitamin E, and untreated cows (group D).....	31
<b>Table 2.4.</b> LSM of skin scores for treatment groups.....	32
<b>Table 3.1</b> Formulation of pour-on treatments A and B .....	40
<b>Table 3.2.</b> LSM of liver vitamin B <sub>12</sub> concentrations (nmol/kg) in yearling cattle treated with vitamin B <sub>12</sub> pour-on formulation A or B and an untreated control group. ....	40
<b>Table 3.3.</b> LSM of blood plasma vitamin B <sub>12</sub> concentration (pmol/l) in yearling cattle treated with vitamin B <sub>12</sub> formulation A or B and untreated control group. ....	41
<b>Table 4.1.</b> Formulations used for the <i>in-vivo</i> and <i>in-vitro</i> selenium pour-on trials. ....	51
<b>Table 4.2.</b> LSM of saline selenium for <i>in-vitro</i> cells treated with 1 of 3 selenium pour-on formulations. ....	53
<b>Table 4.3.</b> LSM of serum selenium concentration for cows treated topically with 1 of 3 selenium pour-on formulations, and an untreated control group D. ....	54
<b>Table 4.4.</b> LSM of albumin concentration for <i>in-vitro</i> cells treated with albumin solution (50 g/l) and an untreated control group.....	54