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The effects of milk matrices on the transit and digestion
of secretory immunoglobulin A in the gut

A thesis presented in partial fulfilment of requirements for the
degree of

Masters of Science
In
Animal Science

At Massey University, Palmerston North, New Zealand
and
AgResearch, Ruakura, Hamilton, New Zealand.

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2017

Abstract:

Bovine secretory immunoglobulin A (BSIgA) has the potential to provide protective effects to the gastrointestinal tract (GIT) when consumed orally. Oral administration of immunoglobulin (Ig) preparations has been explored and proven satisfactory in defence of a variety of enteric microbial infections in humans. Currently Ig preparations focus on bovine colostrum or whole milk. The effects of different milk matrices and how the overall composition may impact BSIgA transit and digestion have not been explored. In this study, an in vivo experiment was used to demonstrate the transit and digestion of BSIgA in two different milk matrices through the GIT of mice. The milk matrices of interest were whey protein concentrate (WPC) and skim milk powder (SMP). Mice were gavaged with 200 μ L of each treatment and groups were culled at four time points; 7 minutes, 20 minutes, 1 hour, and 4 hours. The GIT was dissected into four pieces; stomach, small intestine, large intestine, and caecum. These were flushed with phosphate buffered saline (PBS) and the amount of BSIgA in the washouts was measured on an ELISA. Bovine SIgA survived digestive processes in the GIT of mice in SMP and WPC, as it was detected at all time points. Intestinal washouts from mice that were fed SMP measured at 7 minutes, 20 minutes, 1 hour, and 4 hours detected 66.3%, 22.4%, 0.45%, and 0.97%, of BSIgA respectively. The corresponding values for mice that were fed WPC were 43.8%, 10.2%, 0.12%, and 0.14%, respectively. Overall, the results supported the hypothesis that the milk matrix affected transit and digestion of BSIgA through the GIT of mice. BSIgA was digested 10 fold faster in a WPC matrix than SMP matrix. The BSIgA in SMP appeared more protected from digestion than that in WPC. This is the first study to highlight different milk matrices affecting the transit and digestion of BSIgA. It gives an insight into manufacturing BSIgA into a commercial product and the potential benefits it may provide to the consumer.

Acknowledgements:

I am very grateful to everyone whom has assisted me whilst I completed my Masters. My research project would not have been possible without the support of many people. I am especially grateful for the financial support I have received throughout my thesis. I would like to thank all the scholarship committees that deemed me worthy of the following scholarships; Helen E Akers Postgraduate Scholarship, Taranaki Dairy Farmers Conference Scholarship, Post graduate Tainui grant, Post graduate Hauraki grant, Te Putea Whakatupu Whanui Scholarship, Harwood Farm Trust Scholarship, Margaret Bashford Scholarship, Royce Nichollos Trust Scholarship, Manawatu Graduate Women Scholarship, and Catherine Baxter Postgraduate Scholarship.

I would like to thank my supervisors at AgResearch; Julie Cakebread and Ali Hodgkinson, for giving me the opportunity to study IgA as a functional food product. Secondly, I would like to thank my Massey University supervisor Penny Back, for also making it possible for me to complete my thesis extramurally and giving me the internal support I needed. I am very thankful to my supervisors for the useful comments and engagement through the learning process of my Master's thesis.

I would also like to express my gratitude to the many people who shared their scientific skills with me. Thank you to Daralyn Hurford, Olivia Wallace, Simon Shirley, Bobby Smith, and Ric Broadhurst. Furthermore, thank you to Catherine Cameron and Harold Henderson for your assistance in statistical analysis.

Finally, thank you to my family and friends for your understanding, endless love, and support throughout the duration of my studies. A special thanks to my partner Harlee Overton for your continuous support and patience throughout my thesis.

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Abbreviations used

AA:	Amino acids
ANOVA:	Analysis of variation
BSA:	Bovine serum albumin
BSIgA:	Bovine Secretory Immunoglobulin A
ELISA:	Enzyme linked immunosorbent assay
GIT:	Gastrointestinal tract
HCL:	Hydrochloric acid
IgA:	Immunoglobulin A
IgG:	Immunoglobulin G
MSIgA:	Murine Immunoglobulin A
PBS:	Phosphate buffered saline
plgR:	Polymeric immunoglobulin receptor
PP:	Peyer's patch
P:	Probability
SC:	Secretory component
SEM:	Standard error of the mean
sed:	Standard error of the difference
SIgA:	Secretory IgA
SMP:	Skim milk powder
TBS:	Tris-HCL buffered saline
TBST:	1% Tween®20 in TBS
w/v:	weight per volume
WPC:	Whey protein concentrate