

Technical University of Denmark



Enabling Passive Immunization as an Alternative to Antibiotics for Controlling Enteric Infections in Production Animals

Heegaard, Peter Mikael Helweg; Hald, Birthe; Madsen, M.; Hoorfar, Jeffrey; Larsen, Lars Erik; Breum, Solvej Østergaard; Bisgaard-Frantzen, K.; Bendix Hansen, M.; Lihme, A.

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Heegaard, P. M. H., Hald, B., Madsen, M., Hoorfar, J., Larsen, L. E., Breum, S. Ø., ... Lihme, A. (2012). Enabling Passive Immunization as an Alternative to Antibiotics for Controlling Enteric Infections in Production Animals. Poster session presented at International Symposium: Alternatives to antibiotics (ATA), Paris, France.

DTU Library

Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Enabling Passive Immunization as an Alternative to Antibiotics for Controlling Enteric Infections in Production Animals

Peter M. H. Heegaard^{*1}, Simon Bahrndorff^{1,2}, Birthe Hald^{1,2}, Mogens Madsen³, Jeffrey Hoorfar², Lars E. Larsen¹, Solvej Breum¹, Kirsten Bisgaard-Frantzen⁴, Marie Bendix Hansen⁵, Allan Lihme⁵

¹National Veterinary Institute, Technical University of Denmark (DTU), ²National Food Institute, DTU, ³Dianova A/S, ⁴Multimerics ApS, ⁵UpFront Chromatography A/S. *pmhh@vet.dtu.dk

Objectives

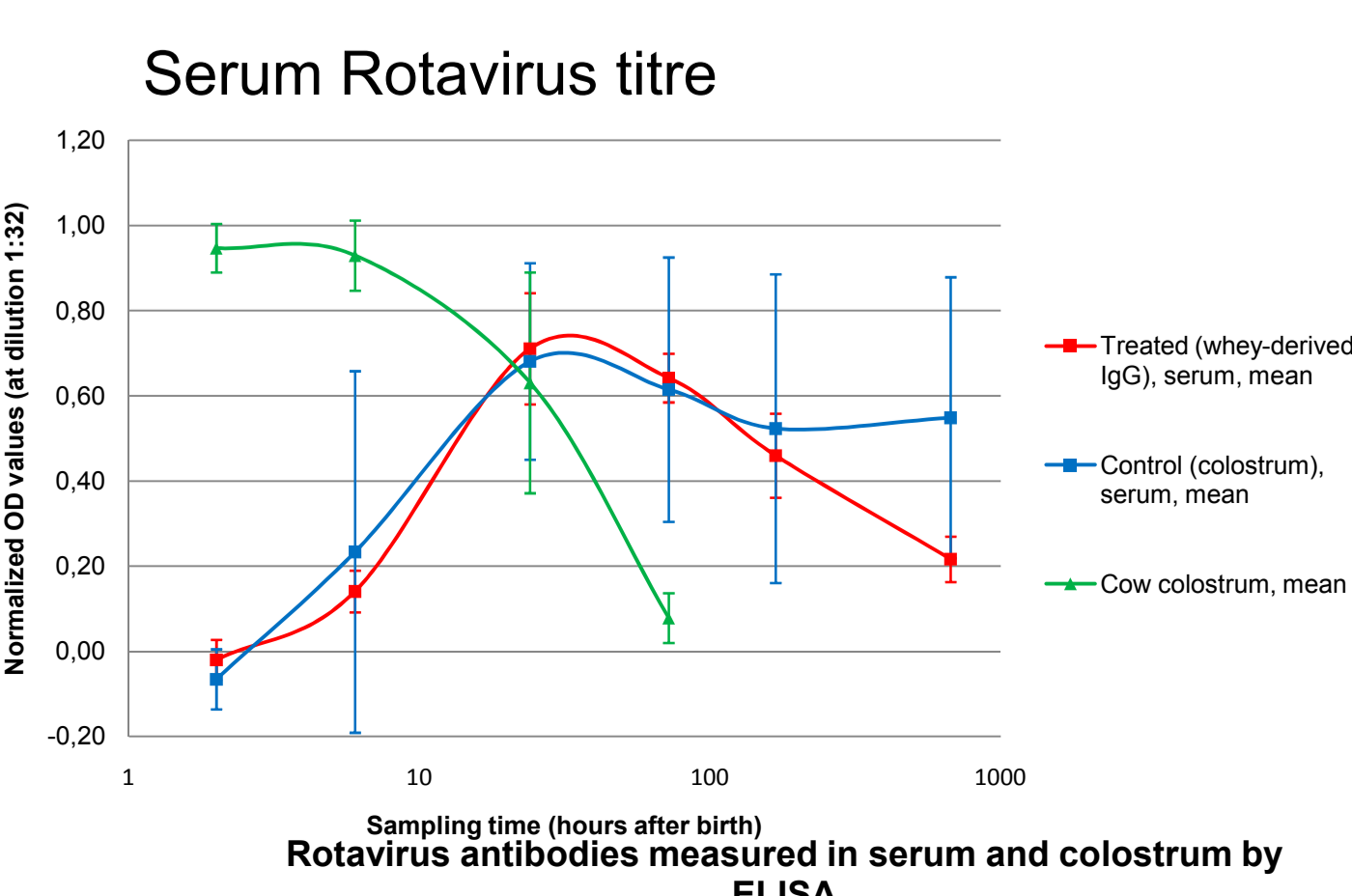
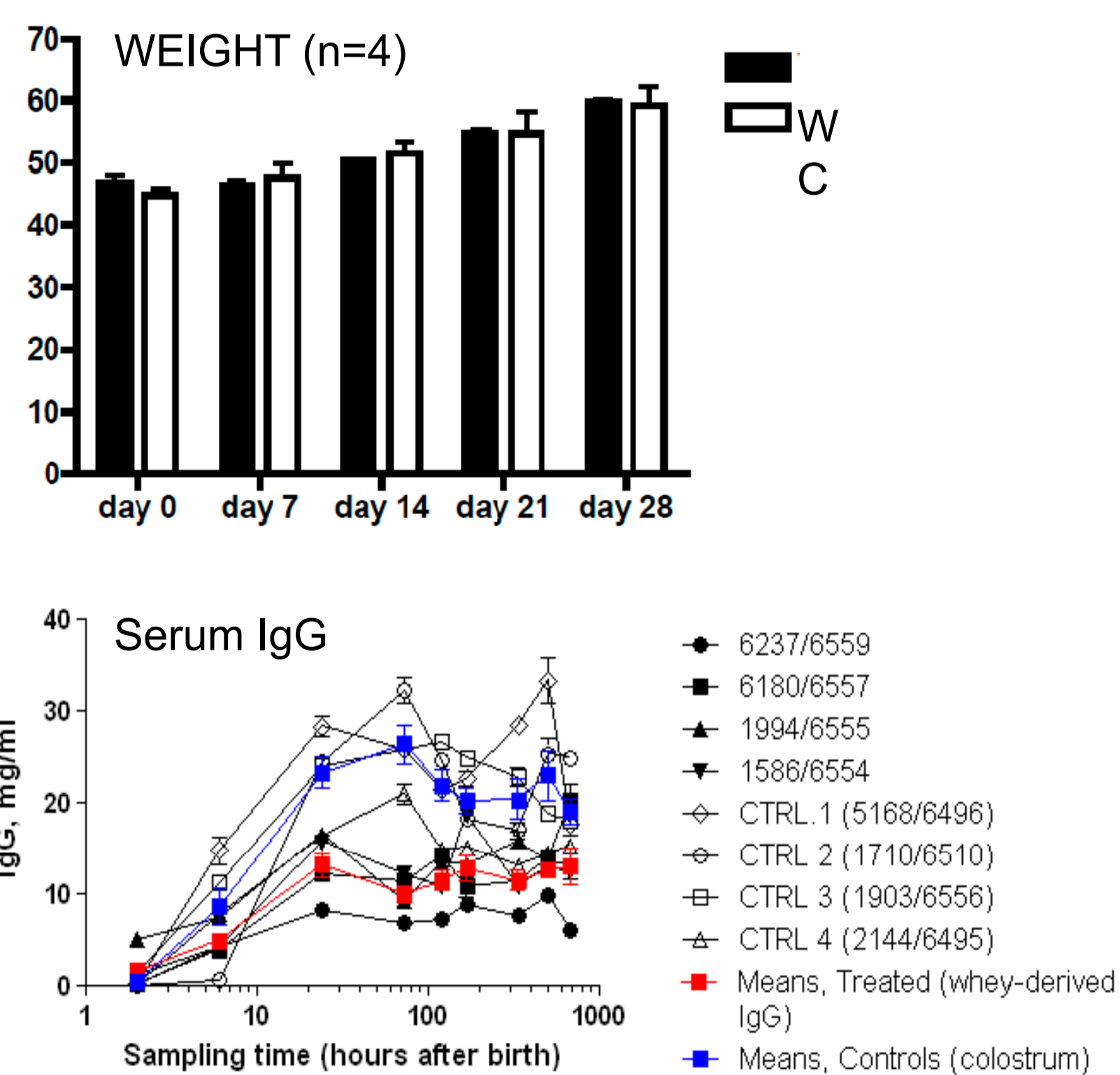
1. To show that immunoglobulin can be produced from renewable sources at a price enabling passive immunization as a viable strategy for control of infectious diseases in the intensive animal production
2. To demonstrate that purified immunoglobulin can be stabilized by multimerization.
3. To show that purified immunoglobulin is taken up by the newborn intestine and that the newborn animal is able to survive on the immunoglobulin preparation.
4. To show that purified, stabilized immunoglobulin will provide protection against experimental enteric infection in a broiler campylobacter infection model

Background

Passive immunization, i.e. the administration of active immunoglobulins, is an efficient way of providing short-term (weeks) immunity e.g. for the control of enteric infections. In order for this to work, large amounts of active, non-expensive immunoglobulins are needed for oral administration. Here an efficient and mild high-capacity method for extracting immunoglobulins directly from the source material and a novel method for stabilizing immunoactivity was applied for providing immunoglobulins for passive immunization of newborn calves and of broilers, using bovine whey and avian blood as source material, respectively.

CALF EXPERIMENT:

A total of 15 kg unstabilized, purified bovine immunoglobulin was extracted from whey (35.000 liters) and administered to colostrum-deprived calves (225-300 g pr calf during the first 24 hours after birth) and compared to calves allowed full access to colostrum.

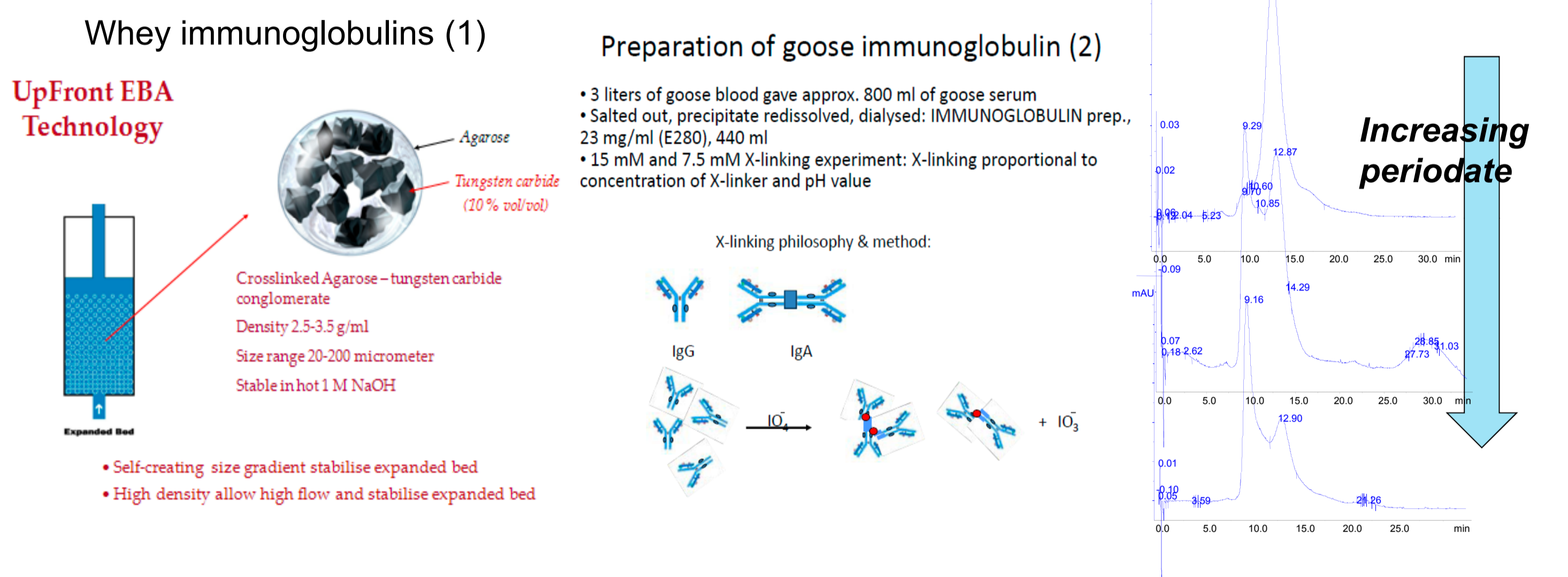


Materials & Methods

35,000 liters of bovine whey was obtained from a Danish cheese manufacturer and approximately 3 liters of goose blood was obtained from a local goose producer.

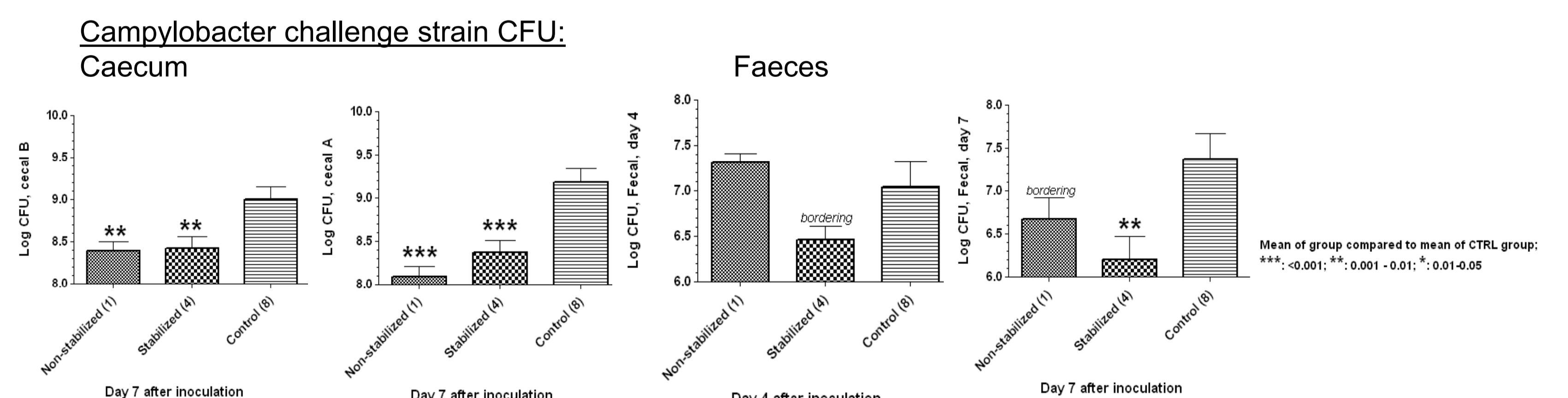


Whey immunoglobulins for the calf experiment were obtained by high-volume Expanded Bed Adsorption (EBA) using a proprietary mixed mode adsorbent operated at UpFront Chromatography A/S (Copenhagen). Goose immunoglobulins for the chicken experiment were obtained by salting out the goose serum. For the chicken experiment, a stabilized immunoglobulin fraction was also produced, by controlled periodate multimerization.



CHICKEN EXPERIMENT:

In an oral Campylobacter challenge model, birds were given 200 mg avian immunoglobulins orally together with the challenge campylobacter strain (at day 21 of age) compared to a placebo group receiving immunoglobulin with no reactivity against campylobacter together with the campylobacter challenge strain.



Conclusions

No difference in resulting immunoglobulin serum concentration, weight gain or disease frequency were seen IgG-fed calves compared to a control group given full access to high-quality colostrum. The effect of orally administered bovine immunoglobulin is currently being tested in a calf herd with persistent diarrhea problems. In the Campylobacter challenge model in chickens caecal and faecal counts of Campylobacter were between 0.5 and 1.0 logs lower in birds given 200 mg avian immunoglobulins orally together with the challenge (at day 21 of age) compared to a placebo group receiving immunoglobulin with no reactivity against Campylobacter. A stabilized IgG preparation was indicated to be superior for short-term suppression of Campylobacter faecal counts.