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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 immunpoglobulin 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

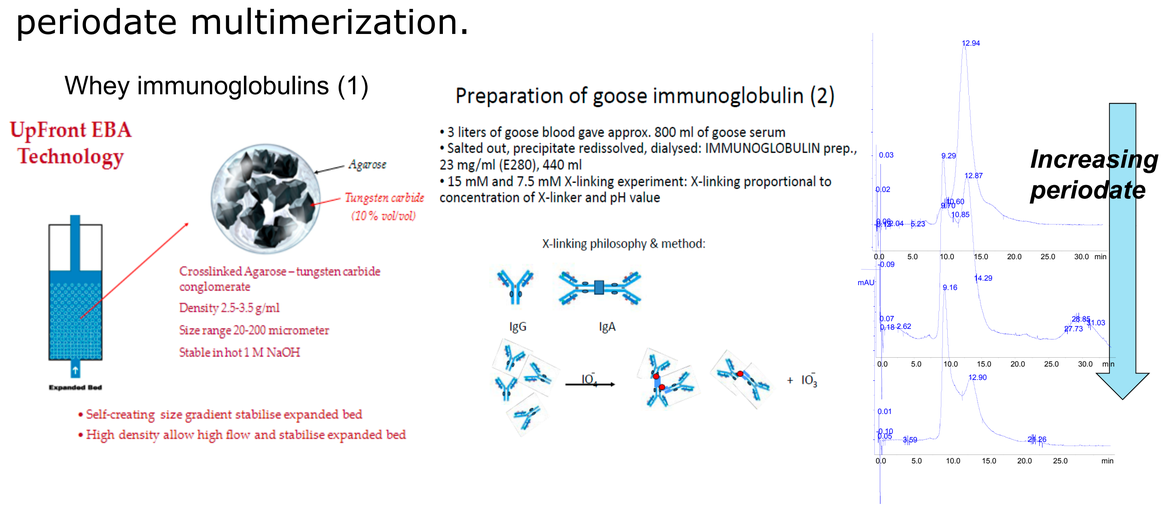
Background

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.

Materials & Methods

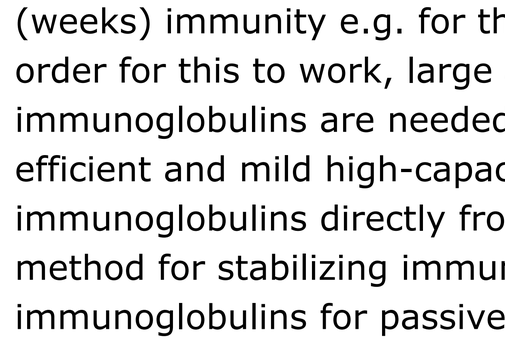
35,000 liters of bovine whey was obtained from a Danish cheese manufacturer and approximately 3 liters of goose blood was obtained from a local goose producer.

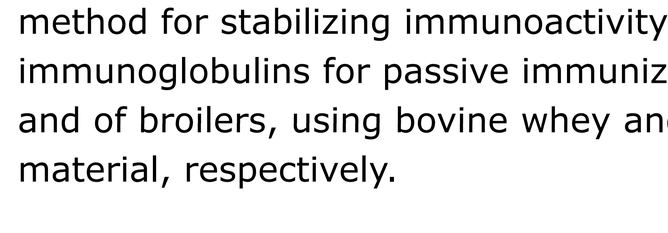
Whey immunoglobulins for the calf experiment were obtained by high-volume Expanded Bed Adsorption (EBA) using a proprietary mixed mode adsorbent operated at UpFront Chromatography A/S (Copenhagen). Goose immunoglobulins for the chicken experiment were obtained by salting out the goose serum. For the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

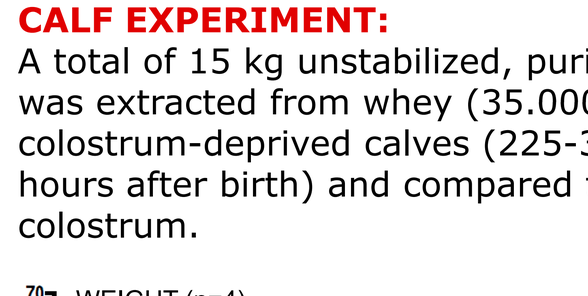


CALF EXPERIMENT:

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.







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.