

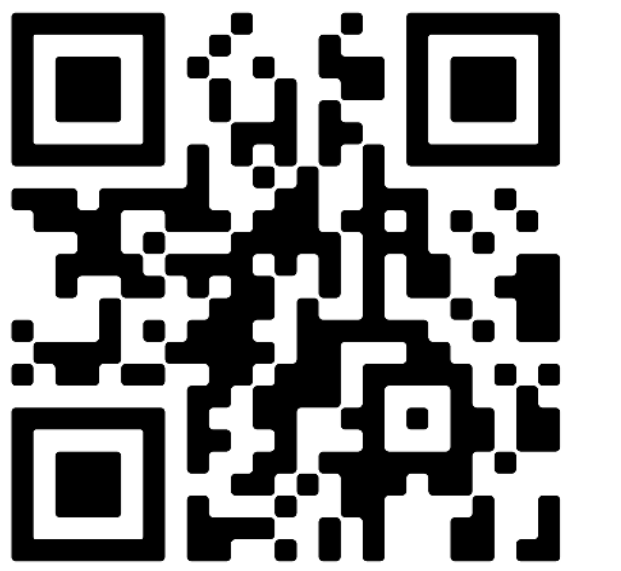
Abstract #2495 - Improving Antibody Titers in Milk Replacers with IgY

To view the presentation, scan here:

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See Poster #2199 - Measuring IgG and Specificity in Milk Replacers for related research

Introduction

Different sources of protein are used in Calf Milk Replacers (CMRs), such as whey, dried milk solids, or plasma, and these can provide the calf with additional IgG to boost passive immunity within the GI tract. However, as detailed in the poster "Measuring IgG and Specificity in Milk Replacers" (Abstract #2199), different CMRs can have significant variability in the amount of IgG they contain and in the specificity for enteric pathogens.

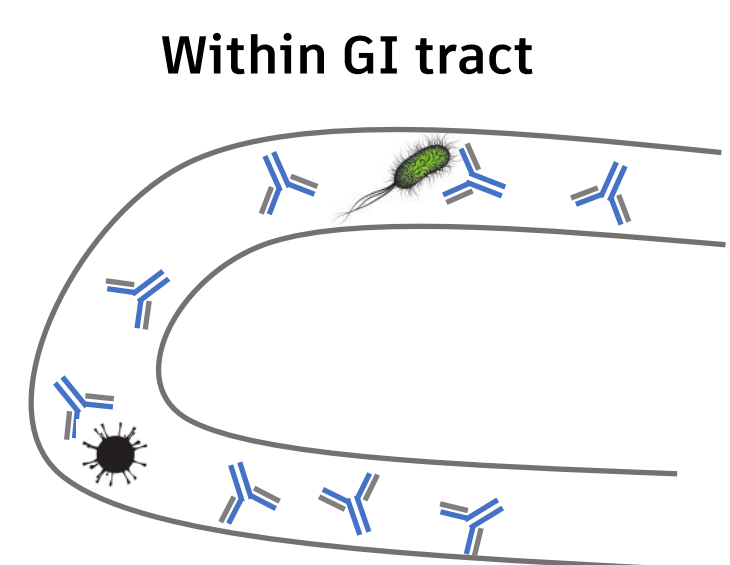
The Objective of this study was to determine if the addition of IgY, the avian equivalent of IgG, to CMRs can improve the specific antibody titers against common enteric pathogens. Five commercial CMRs without plasma were tested along with a 5% bovine plasma sample to approximate a CMR with plasma. The specific IgY tested was purified from EggTek®-C.

What is IgY?

IgY is the primary antibody type in birds and is found in both the blood and in the egg yolk. Upon hatching, chicks absorb the IgY from the yolk sack for passive immunity, in an analogous manner colostrum is provided to calves.

How does IgY work ?

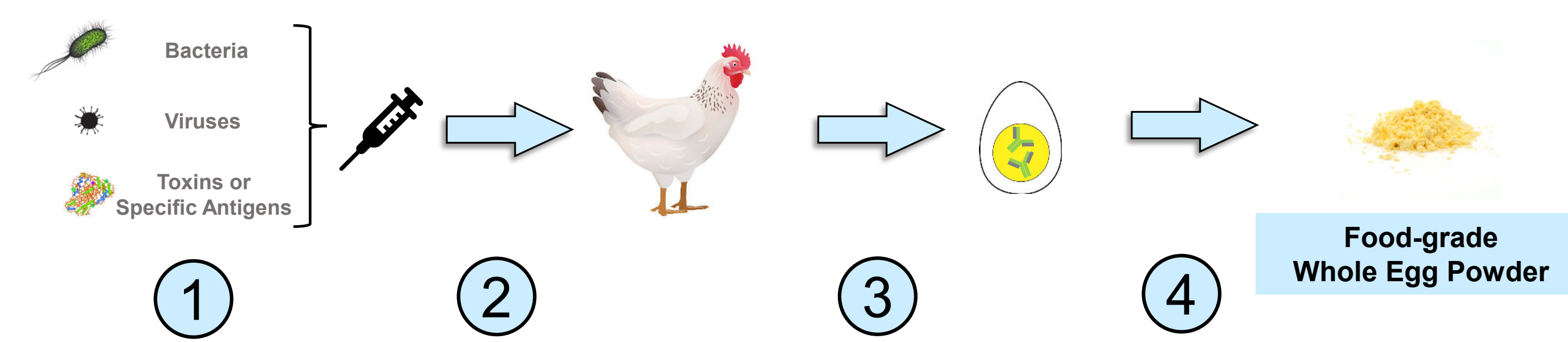
Egg powder is mixed with the milk replacer or milk and fed to the calf.



IgY will coat the **intestinal walls** and will **bind** to pathogens and toxins it recognizes. The bound pathogen or toxin are then **excreted** with other fecal matter.

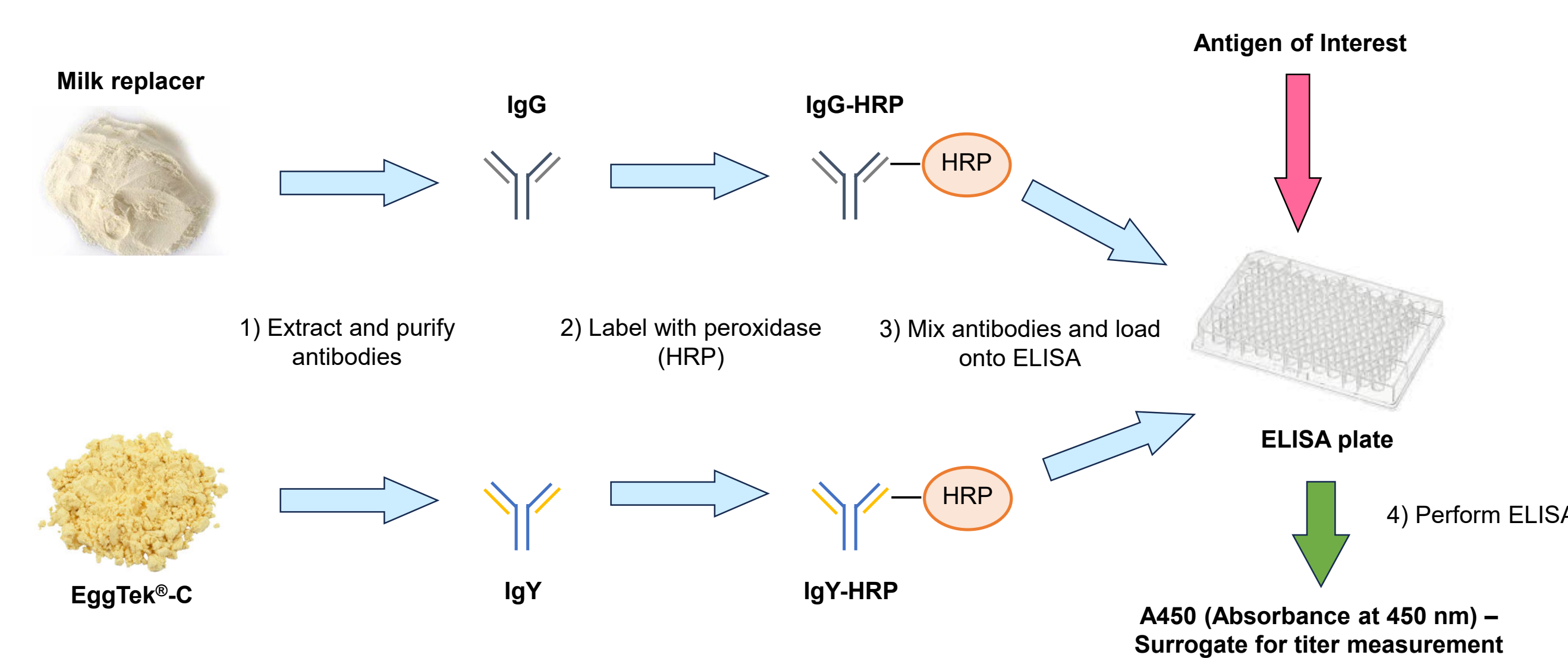
IgY does **not** cross the intestinal wall and does not offer systemic protection. The IgY must be continually fed to the calf in order to see positive benefits.

Production of EggTek-C



Step	Activity
1	Proprietary vaccine is formulated from killed pathogens, specific antigens, and toxins
2	Hens are vaccinated periodically to generate specific IgY
3	Food-grade eggs are collected and stored
4	Eggs are processed (broken, homogenized, pasteurized and spray dried) into a whole egg powder at a USDA-inspected food-grade facility

How Analysis was Performed



Materials and Methods

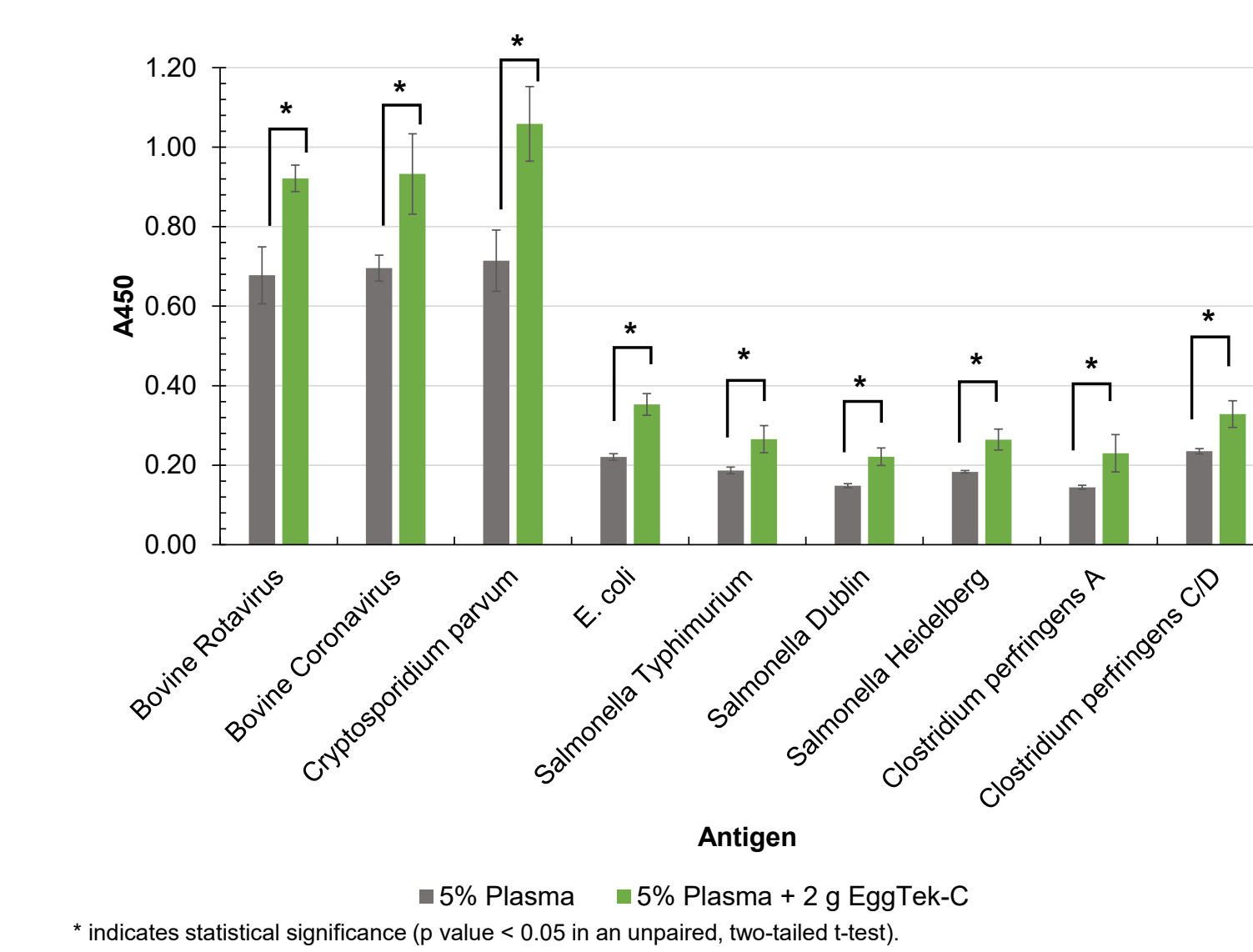
Five commercial CMRs were acquired, randomized, and reconstituted according to the manufacturer's directions. A bovine plasma sample was also acquired and a 10% (wt/vol) solution was generated in water. First, the total IgG titers were determined using a commercial ELISA kit. Second the IgG was purified from each sample by: 1) acidifying the sample and centrifuging, 2) precipitating the IgG with ammonium sulfate, 3) purification through a Protein A column, and 4) dialysis against PBS. IgY was purified from EggTek-C by first making a 10% (wt/vol) solution, then defatting the sample by acidification, precipitating the IgY with ammonium sulfate, and finally dialysis against PBS. The purified antibodies (both IgG and IgY) were then coupled to a horseradish peroxidase (HRP) enzyme and used in direct ELISAs against:

Bovine rotavirus
 Cryptosporidium parvum
 C. perfringens Type A
 Salmonella Typhimurium
 Salmonella Heidelberg

Bovine coronavirus
 E. coli (mix of K88, K99, 987P, and F41)
 C. perfringens Type C and D
 Salmonella Dublin

Results are reported as the absorbance at 450 nm (A450). The A450 value is the raw output from the ELISA and is a measure of how much antibody is bound to the specific antigen. Each sample was run in triplicate.

Results - Bovine Plasma Comparison

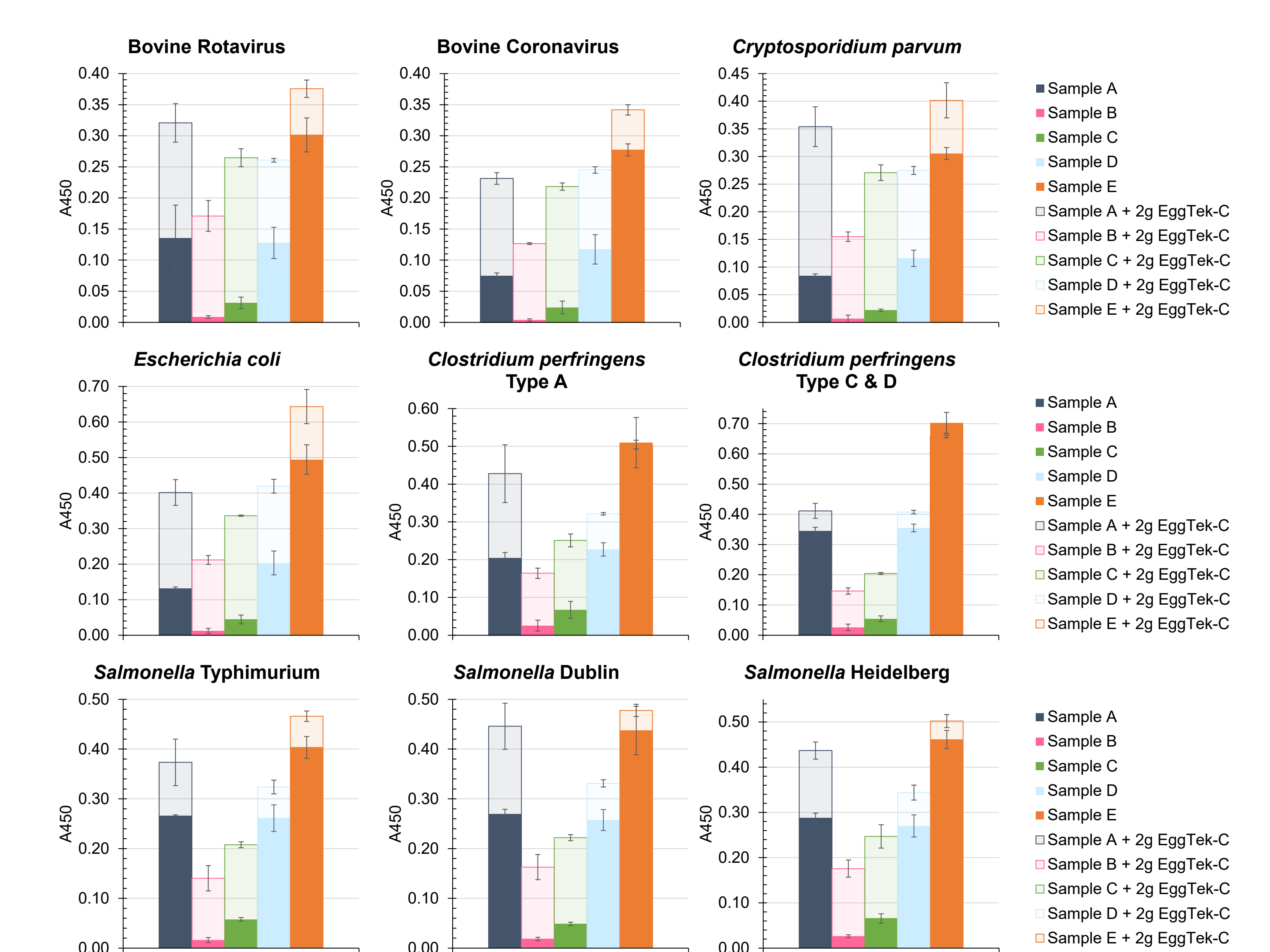


Simulated a 12 oz dose of CMR with 5% plasma without and with 2 grams of EggTek-C.

Inclusion of EggTek-C **statistically improved** A450 values for all antigens.

This means adding IgY to plasma-based CMRs can further improve titers and deliver more protection to the calf.

Results - CMR Comparison



Each CMR was tested as a 10 oz dose without or with 2 grams of EggTek-C.

The addition of IgY to the CMRs statistically improved the A450 values (p-value < 0.05, t-test) for all antigens except for three in Sample E: *C. perfringens* Type A, *C. perfringens* Type C & D, and *Salmonella* Dublin. The A450 values actually did not improve for *C. perfringens* antigens in Sample E with IgY because of the already high A450 value of the CMR.

Conclusion

When IgY from EggTek-C was added to commercial milk component-only CMRs or a 5% bovine plasma sample, the titers against common enteric pathogens were statistically higher. This demonstrates that the addition of just 2 grams of EggTek-C to any commercial CMR, even ones with bovine plasma, can increase the number of antibodies present to bind to and neutralize pathogenic challenges to the calf. The magnitude of the titer increase depended on the starting level in the CMR. For Sample B, which had low initial titers, the average increase was >1,000%, while for Sample E, the average increase was 16%. Surprisingly, the average improvement over bovine plasma was almost 50%. By supplementing CMRs with EggTek-C, producers can increase the amount of passive immunity the calf receives, and thus reduces the chances of serious diseases or death.

