Campylobacter jejuni Infections – Investigations into Bacterial, Antibody, and Immune System Interactions

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Campylobacteriosis is one of the most frequently diagnosed bacterial zoonoses worldwide, representing a significant concern in both public health and poultry production. *Campylobacter jejuni* is the primary etiological agent of the disease, with poultry, particularly broiler chickens, serving as the major reservoir and source of human infections. Given the restrictions on antibiotic use and the lack of effective poultry vaccines, alternative strategies to limit intestinal colonization are being explored, including the application of immunoglobulin Y (IgY) antibodies derived from the egg yolks of immunized hens.

The aim of this study was to investigate the interactions between *C. jejuni*, IgY antibodies, and components of the immune response, as well as to evaluate the efficacy of inactivated antigens and IgY preparations in reducing colonization of poultry by this pathogen. Field isolates of *C. jejuni* were characterized phenotypically (biochemical tests) and genotypically (virulence gene profiling). The results confirmed consistency with literature data, supporting that the isolates examined are representative of *C. jejuni* typically found in poultry production systems.

IgY antibodies were isolated from egg yolks of hens immunized with a mixture of bacterial antigens, and purification methods were developed and optimized. The performance of different purification approaches (PEG precipitation, sodium chloride, ammonium sulfate, and affinity chromatography) was compared, and the quality of preparations was assessed, including their biological activity *in vitro*. The purification method influenced the preservation of IgY activity, with the highest antibody concentrations detected in water-soluble fractions (WSF) from intermediate stages of isolation, suggesting potential losses during subsequent purification steps.

In vitro assays included agglutination, ELISA, and growth inhibition tests. All IgY preparations demonstrated activity against the pathogen, with the highest observed efficacy corresponding to a 6-log reduction in bacterial counts. Even the weakest effect recorded, a 3-log reduction, represented approximately 99.9% growth inhibition.

In vivo studies using a poultry model evaluated the efficacy of different routes of inactivated antigens and IgY administration (oral and intramuscular) and their impact on the immune response and intestinal colonization by *C. jejuni.* Significant differences between groups were observed, including higher levels of serum IgY and intestinal IgA in birds receiving intramuscular preparations.

The findings indicate that IgY antibodies raised against a mixture of *C. jejuni* antigens may provide an effective tool for controlling campylobacteriosis in poultry. Further research should focus on optimizing antibody isolation and purification methods, developing stable formulations suitable for poultry production, and conducting extended *in vivo* trials under farm-like conditions.