

RESEARCH PROJECTS COMPLETED 2007	Date Completed
<p><b>Dr. S. Gomis</b> University of Saskatchewan</p> <p><b>‘Formulation and Delivery of CpG-ODN against Bacterial Infections in Chickens’</b></p> <p>The emergence of antibiotic resistant bacteria has focused attention on immune based methods of disease protection. Vaccines are a well known method of directing the immune system to improve disease protection but they are not available for some diseases and are not effective when an immediate protective effect is required. . Dr. Gomis is attempting to develop DNA based immune system stimulants (CpG-ODN motifs) as alternatives to antibiotics against bacterial infections in chickens.</p> <p>In August, 2003, the Board approved funding of \$75,000 over three years for this project. Dr. Gomis was able to secure significant additional funding from other sources to enable the project to be expanded. Dr. Gomis demonstrated that CpG-ODN stimulates the innate immune system of broiler chicks against lethal bacterial infections following <i>in ovo</i> administration. He further demonstrated that CpG-ODN is an effective vaccine adjuvant against bacterial diseases. In the final year of the study, Dr. Gomis demonstrated that CpG-ODN formulated with different delivery systems enhanced systemic protection in broiler chicks against <i>E. Coli</i> infections. Presentations of the project’s findings were made at several national and international conferences.</p> <p><i>Journal Articles</i></p> <p><u>Avian Disease</u> Protection of chickens against a lethal challenge of <i>Escherichia coli</i> by a vaccine containing CpG oligodeoxynucleotides (CpG-ODN) as an adjuvant. Avian Diseases 51:78-83 2007</p> <p><u>Developmental and comparative immunology</u> (submitted) Oligodeoxynucleotides containing CpG motifs (CpG-ODN) induced cytokine and chemokine gene expression in neonatal chickens.</p> <p><u>Infection and Immunity</u> (in preparation) Delivery of CpG-ODN in embryonating eggs to protect neonatal chickens against <i>Salmonella typhimurium</i> infection.</p> <p><u>Curr. Drug Deliv.</u> (in preparation) Formulation of CpG-ODN with polyphosphazines for <i>in ovo</i> delivery and enhancement of immunoprotective effect against <i>Escherichia coli</i> septicemia in neonatal chickens.</p>	2007/02/25
<p><b>Dr. J. Prescott</b> University of Guelph</p> <p><b>‘Vaccine Based Control of Necrotic Enteritis’</b></p> <p>Necrotic enteritis is an important disease of broiler chickens which is currently controlled by antimicrobial drugs. If drugs are banned for this purpose in Canada, as they have been in Europe, alternative strategies to control the disease will need to be developed. One approach is by immunization and this project, which was approved in August 2003 for \$51,000 over three years, provided three years of stipend funding for a PhD student to develop a vaccine against necrotic enteritis. The approach was to (i) identify the differences in genes between strains of the causative agent, <i>Clostridium perfringens</i>; virulent (disease causing) strains which cause the chicken to become immune to the disease and non-virulent strains</p>	2007/02/18

derived from the parent that do not cause the chicken to become immune. (ii) clone and purify the different genes identified and confirm through challenge studies, their role in immunity. (iii) produce a live oral vaccine either by cloning or mutation. The first two objectives have been met and a number of proteins that could be used to immunize birds have been identified. Funding to continue the project for a fourth year and beyond has been obtained from the Canadian Poultry Research Council, matched by NSERC and Agriculture Canada. Although a vaccine was not produced in the three year time frame, it appears that there is a good possibility that the research funded by SCIDF will eventually lead to the development of one. The research resulted in the publication of two articles in refereed journals and three presentations at international conferences.

*Journal Articles:*

Veterinary Microbiology (in press)

Live attenuated vaccine-based control of necrotic enteritis in broiler chickens

<http://dx.doi.org/10.1016/j.vetmic.2005.10.015>

Clinical and Vaccine Immunology

*Clostridium perfringens* proteins recognized by broiler chickens immune to necrotic enteritis.

December 2006, p. 1358-1362, Vol. 13, No. 12

**Dr. C. Ruiz-Feria**  
**McGill University**

2007/07/31

**'Plant Phenolics and Prebiotics as Alternatives to Antibiotics in Poultry Production'**

The project intended to determine whether lignin could be used as an alternative to antibiotic growth promoters or a commercially available prebiotic, and was approved in February, 2005 for \$30,000 over two years. The effects of a purified form of lignin, a compound found naturally in plant cell walls and available as a by- product of paper manufacturing, was evaluated on: (i) growth performance (ii) gut development and microbial populations in gut and feces (iii) susceptibility to *E. coli* and *Salmonella* invasion and (iv) cellulites. For each on these parameters, the effectiveness of lignin was to be compared with an antibiotic growth promoter and a commercially available prebiotic. The general conclusion was that the prebiotic and to a lesser extent low levels of lignin could potentially replace antibiotic growth promoters since: broiler growth was not significantly affected, the prebiotic increased the concentration of beneficial bacteria in the cecum and reduced *E. coli* load in the cecum and in the litter. The research demonstrated the superiority of the prebiotic and resulted in a second study to add to the understanding of the effects of the prebiotic. The project resulted in two journal articles

*Journal Articles:*

Poultry Science

Effects of purified lignin and mannan oligosaccharides on intestinal integrity and microbial populations in the ceca and litter of broiler chickens. B. Baurhoo, L. Phillip, C. A. Ruiz-Feria.  
2007 86:1070-1078

Poultry Science

Cecal populations of *Lactobacili* and *Bifidobacterial* and *Escherichia coli* Populations after *in vivo Escherichia coli* challenge in birds fed diets with purified lignin or mannanoligosaccharides. B. Baurhoo, A. Letellier, X. Zhao, C. A. Ruiz-Feria.  
2007 86: 2509-2516