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Functional Pathogenomics of Mucosal Immunity

Status	Past
Competition	II
Sector	Health and Agriculture - Animals
Genome Centre	Genome Prairie and Genome British Columbia
Project Leader	Lorne Babiuk and Robert Hancock

Project Description

Pathogenomics is the study of human or animal host genes involved in reaction to infection by microbes such as bacteria and viruses. The initial step in infectious diseases involves the interaction of these microbes with surfaces of mucous membranes, including the gut, respiratory and urinary tracts. This is commonly known as the early or “innate” immune response. Understanding the genes involved in host-pathogen interactions have enabled us to design and test new approaches to overcome infections.

Our goal was to use the tools developed by the Human Genome Project, such as DNA micro-arrays, and computational analysis to study which host genes are turned on or off when cells are infected by bacteria or viruses. We also studied the effect of compounds called host-defence peptides, as well as vaccines, on host immunity and the ability to protect against infection. Current antibiotic therapies to treat infectious diseases have led to the increased occurrence of antibiotic-resistant pathogens and a new approach is required urgently. Unlike antibiotics, host defence peptides act on the host (human or animal) cell rather than the microbe, thereby avoiding the problem of antibiotic resistance. A major asset of our study was our use of both human and animal cells, as well as live animals, for example, mouse and cattle.

Using DNA micro-arrays, we determined which genes are important in the innate immune response. We compared these genes in mice, humans and cattle. Several patents were filed for new host-defence peptides that appear to have the ability to boost the host immune response without developing the harmful effects of inflammation. New computational methods of analysis were developed and are freely available to the research community. These include ArrayPipe, for gene array analysis, Ortholuge, which enables comparison of similar genes from different species and ProbeLynx, which automatically updates information about specific genes that are used in gene arrays.

Fast Facts

<i>Highlighted outcome:</i>	New knowledge was gathered about genes involved in the immune response to infections in both human and bovine species, leading to new targets for development of therapeutics. New compounds were developed which have the ability to treat microbial infections by boosting the host innate immune response.
<i>Number of research personnel employed by the project:</i>	200 person-years
<i>Number of peer reviewed publications published:</i>	38
<i>Number of patents in process or obtained:</i>	4
<i>Resources generated:</i>	DNA micro-arrays (3), software tools (3)
<i>Number of public outreach Events held:</i>	Presented 74 public lectures, participated in 9 public forums