

Sustainable Food Production through the Prevention and Control of Disease

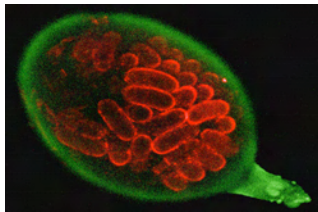
Introduction

Scientific research aimed to develop and implement sustainable control strategies for diseases of livestock and crops will result in significant economic, welfare, environmental and health benefits. Strategies to control disease include:

- Developing tools and reagents to detect and diagnose pathogens
- Analysis of disease epidemiology
- Understanding the host-pathogen interactions
- Disease prevention through vaccination
- Effective use of anti-microbials, anthelmintics and other treatments for pest/pathogen control
- Breeding for improved disease resistance
- Safeguarding human health through the control of zoonotic pathogens
- Minimising environmental contamination with pathogens

Genomics and proteomics

Application of new technologies in genomics and proteomics within important animal and plant pathogens have led to exciting new discoveries to help identify novel diagnostic antigens, vaccine candidates, biomarkers and resistance genes. This information helps us to understand how pathogens adapt to hosts, survive in the environment and cause disease.



A cyst of *Globadiera pallida*, the potato cyst nematode, with eggs containing juveniles.

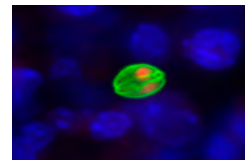
The genome of this pathogen is currently being sequenced to search for novel control strategies.



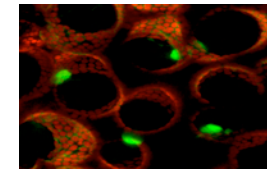
The genome of *Chlamydomonas reinhardtii*, one of the most common causes of abortion in sheep, has been sequenced and combined with proteomic information molecules involved in disease pathogenesis and host immunity are being identified.

Host pathogen interactions and development of vaccines

Research into the host-pathogen interactions helps us understand how pathogens invade and multiply within their hosts, resist host defences and how the hosts immune system fights back against the pathogen. Outputs from this research will lead to improved control strategies based on vaccination, identification of novel drug targets and identification of resistance genes.



Protective immunity against the protozoan parasite *Toxoplasma gondii* involves T-cell mediated immune responses. This has led to the development of a live vaccine to prevent disease in livestock.



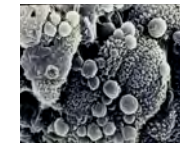
Proteins from plant pathogen (green) interacting with leaf to suppress host defence responses

Management of anthelmintic resistance

Emergence of anthelmintic resistance is a major problem in controlling gastrointestinal nematodes of livestock. Strategies to overcome this include development of genetic diagnostics for on farm surveillance, targeted selective treatments to delay the onset and spread of resistance, use of bioactive forages and development of vaccines as an alternative to drug based control.



Zoonoses and environmental contamination



Cryptosporidium parasites are a major contaminant in drinking water and are difficult to control as they are resistant to standard water disinfection processes.

Zoonotic infections such as *E.coli O157*, *Campylobacter*, *Listeria*, *Toxoplasma* and *Cryptosporidium* may be transmitted from animals to people and are also important environmental contaminants. Methods to diagnose and control these diseases are important to improve animal health, safeguard public health and minimise environmental contamination.

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