

**Five possible Honours projects are described below:**

- **Development of the Sucrose Breath Test in the Horse**
  - **Iberogast as a potential new treatment for inflammatory bowel disease**
  - **Development of the Sucrose Breath Test in the Pig**
  - **A novel zinc-chelating agent as a potential new treatment for inflammatory bowel disease**
  - **Traditional Chinese Medicine as a potential new treatment for inflammatory bowel disease**
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**Development of the Sucrose Breath Test in the Horse**

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**Aims and Significance:**

The sucrose breath test (SBT) is a novel technique developed by Adelaide-based scientists. The SBT allows the function of the small intestine to be determined by the simple collection of expired breath following ingestion of a small volume of sucrose. The test has been applied to rodents and humans where it can be used to monitor the deleterious effects of chemotherapy on the intestine. The SBT has further potential in that it could be used to non-invasively identify and monitor intestinal disorders in other animals such as horses. In the current project, the student will develop the SBT in groups of normal horses to establish baseline parameters for the test.

**Background:**

Performance horses commonly suffer from gastrointestinal ulceration. This is particularly true in horses receiving non-steroidal anti-inflammatory drugs (NSAIDs). The non-invasive sucrose breath test has the potential to identify horses suffering from this serious problem by a simple breath test. However, before the SBT can be applied to these horses, a normal range must be established for the SBT. This will require the SBT being conducted in groups of normal horses in order to identify the effects (if any) of differing feeding regimens and housing conditions on the SBT.

**Techniques to be used:**

Groups of normal horses from different farms will be given a drink of a sucrose solution and then samples of breath collected over a three hour period. The breath samples will then be transported to the Women's and Children's Hospital for analysis by an Isotope ratio Mass Spectrometer.

**Reference:**

**GS Howarth**, KL Tooley, GP Davidson and RN Butler. A Non-Invasive Method for Detection of Intestinal Mucositis Induced by Different Classes of Chemotherapy Drugs in the Rat. *Cancer Biol Therap.* 5(11): 1189-1195 (2006).

## Iberogast as a potential new treatment for inflammatory bowel disease

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### Aims and Significance:

Iberogast is a plant-based extract sourced from 9 different plants. In Europe it is used for the treatment of intestinal disorders such as dyspepsia. However, much of the health claims for Iberogast have relied primarily on anecdotal indications of therapeutic benefit. There have been relatively few rigorously-conducted scientific studies to underpin its use health-related purposes. In a previous Honours project (now submitted for publication) we have identified indications that Iberogast may be protecting the small intestine from injury, however, the potential for Iberogast to treat disorders of the large bowel remain unexplored. The current study will investigate Iberogast for its capacity to decrease the severity of inflammatory bowel disease (IBD), a serious idiopathic and, so-far, incurable condition affecting approximately 1 in 8000 individuals in Australia.

### Background:

Inflammatory bowel disease (IBD) comprises two variants, ulcerative colitis and Crohn's disease. The histopathological features of Crohn's disease are similar to Johne's disease, a debilitating condition that affects livestock. IBD is known to have genetic and environmental components, and there is a dysregulation of the intestinal immune system such that the colon (large bowel) is constantly inflamed. The cause of IBD is unknown and current therapies (eg steroids) attempt to reduce the inflammation but are often ineffective. To date, Iberogast has not been scientifically tested for its potential to reduce the severity of IBD. In the current project, the student will investigate Iberogast for its potential to protect the large intestine from the effects of IBD.

### Techniques to be used:

Rats housed in metabolism cages will be administered Iberogast and then provided with dextran sulphate sodium in the drinking water to induce features of colitis (one of the forms of IBD). The severity of disease will be monitored to determine if TCM is having a beneficial effect. Analyses, at and after kill, will include gastrointestinal and other organ weights and lengths, intestinal histology (villus height/crypt depth), qualitative scoring of histology, sucrase activity (jejunum and ileum), myeloperoxidase activity (colon) and enterocyte kinetics (proliferation/apoptosis).

### Reference:

MS Geier, RN Butler, PM Giffard and **GS Howarth**. *Lactobacillus fermentum* BR11, a potential new probiotic, alleviates symptoms of colitis induced by dextran sulfate sodium (DSS) in rats. *Int J Food Micro* 114(3):267-274 (2007).

## Development of the Sucrose Breath Test in the Pig

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### Aims and Significance:

The sucrose breath test (SBT) is a novel technique developed by Adelaide-based scientists. The SBT allows the function of the small intestine to be determined by the simple collection of expired breath following ingestion of a small volume of sucrose. The test has been applied to rodents and humans where it can be used to monitor the deleterious effects of chemotherapy on the intestine. The SBT has further potential in that it could be used to non-invasively identify and monitor intestinal disorders in other animals such as pigs. In the current project, the student will develop the SBT in groups of normal pigs to establish baseline parameters for the test. The SBT will be conducted at different developmental stages, from neonatal through to young adult.

### Background:

Pigs may suffer from gastrointestinal ulceration resulting from infective enteritis. The non-invasive sucrose breath test has the potential to identify pigs suffering from enteritis by a simple breath test. However, before the SBT can be applied to these pigs, a normal range must be established for the SBT. This will require the SBT being conducted in groups of normal pigs at different stages of development..

### Techniques to be used:

Groups of normal neonatal pigs will be given a drink of a sucrose solution and then samples of breath collected over a three hour period. The breath samples will then be transported to the Women's and Children's Hospital for analysis by an Isotope ratio Mass Spectrometer. The SBT will be repeated fortnightly as the pigs develop into young adulthood.

### Reference:

**GS Howarth**, KL Tooley, GP Davidson and RN Butler. A Non-Invasive Method for Detection of Intestinal Mucositis Induced by Different Classes of Chemotherapy Drugs in the Rat. *Cancer Biol Therap.* 5(11): 1189-1195 (2006).

## **A novel zinc-chelating agent as a potential new treatment for inflammatory bowel disease**

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### Aims and Significance:

University of Adelaide scientists have developed a new zinc-chelating agent that may be able to improve zinc availability to the intestine and protect from bowel disease. The current study will investigate the zinc-chelating agent for its capacity to decrease the severity of inflammatory bowel disease (IBD), a serious idiopathic and, so-far, incurable condition affecting approximately 1 in 8000 individuals in Australia.

### Background:

Inflammatory bowel disease (IBD) comprises two variants, ulcerative colitis and Crohn's disease. The histopathological features of Crohn's disease are similar to Johne's disease, a debilitating condition that affects livestock. IBD is known to have genetic and environmental components, and there is a dysregulation of the intestinal immune system such that the colon (large bowel) is constantly inflamed. The cause of IBD is unknown and current therapies (eg steroids) attempt to reduce the inflammation but are often ineffective. To date, the new zinc-chelating agent has not been scientifically tested for its potential to reduce the severity of IBD. In the current project, the student will investigate its potential to protect the large intestine from the effects of IBD.

### Techniques to be used:

Rats housed in metabolism cages will be administered the novel zinc-chelating agent and then provided with dextran sulphate sodium in the drinking water to induce features of colitis (one of the forms of IBD). The severity of disease will be monitored to determine if the zinc-chelating agent is having a beneficial effect. Analyses, at and after kill, will include gastrointestinal and other organ weights and lengths, intestinal histology (villus height/crypt depth), qualitative scoring of histology, sucrase activity (jejunum and ileum), myeloperoxidase activity (colon) and enterocyte kinetics (proliferation/apoptosis).

### Reference:

MS Geier, RN Butler, PM Giffard and **GS Howarth**. *Lactobacillus fermentum* BR11, a potential new probiotic, alleviates symptoms of colitis induced by dextran sulfate sodium (DSS) in rats. *Int J Food Micro* 114(3):267-274 (2007).

## Traditional Chinese Medicine as a potential new treatment for inflammatory bowel disease

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### Aims and Significance:

Traditional Chinese Medicine (TCM) has had a long history for the treatment of a range of human health disorders. Although there is a relatively widespread acceptance of TCM, much of the health claims have relied primarily on anecdotal indications of therapeutic benefit. There have been relatively few rigorously-conducted scientific studies to underpin the use of TCM for health-related purposes. The current study will compare three commonly-prescribed TCMs for their capacity to decrease the severity of inflammatory bowel disease (IBD), a serious idiopathic and, so-far, incurable condition affecting approximately 1 in 8000 individuals in Australia.

### Background:

Inflammatory bowel disease (IBD) comprises two variants, ulcerative colitis and Crohn's disease. The histopathological features of Crohn's disease are similar to Johne's disease, a debilitating condition that affects livestock. IBD is known to have genetic and environmental components, and there is a dysregulation of the intestinal immune system such that the colon (large bowel) is constantly inflamed. The cause of IBD is unknown and current therapies (eg steroids) attempt to reduce the inflammation but are often ineffective. To date, Traditional Chinese Medicine (TCM) has not been scientifically tested for its potential to reduce the severity of IBD. In the current project, the student will investigate three TCMs selected on the basis that they are provided to human IBD-sufferers by TCM specialists. Using an established rat model of IBD, the student will compare the 3 TCMs for their potential to protect the intestine from the effects of IBD.

### Techniques to be used:

Rats housed in metabolism cages will be administered TCM and then provided with dextran sulphate sodium in the drinking water to induce features of colitis (one of the forms of IBD). The severity of disease will be monitored to determine if TCM is having a beneficial effect. Analyses, at and after kill, will include gastrointestinal and other organ weights and lengths, intestinal histology (villus height/crypt depth), qualitative scoring of histology, sucrase activity (jejunum and ileum), myeloperoxidase activity (colon) and enterocyte kinetics (proliferation/apoptosis).

### Reference:

MS Geier, RN Butler, PM Giffard and **GS Howarth**. *Lactobacillus fermentum* BR11, a potential new probiotic, alleviates symptoms of colitis induced by dextran sulfate sodium (DSS) in rats. *Int J Food Micro* 114(3):267-274 (2007).