New Zealand General Surgery Trainee Dr Lisa Brown is not only undertaking PhD research into novel methods to help treat acute pancreatitis, she is also studying the physics of fluid dynamics at the University of Auckland to help advance that research. A 2012 recipient of a Foundation for Surgery Scholarship, Dr Brown is comparing the effectiveness of approved enzymes as well as searching for previously unidentified enzymes that could selectively accelerate the break down of necrotic pancreatic tissue while leaving healthy tissue intact.

As part of that search, Dr Brown is investigating the effects of enzymes excered by particular species of maggot using a unique bank of necrotic tissue samples collected through an international collaborative research program between surgeons in Auckland, Christchurch and Indianapolis in the US.

Dr Brown said that acute pancreatitis causes necrosis of the pancreas in up to 30 per cent of patients. The severity of acute pancreatitis is determined by both infection of pancreatic necrosis and multiple organ failure.

The treatment of infected pancreatic necrosis has been an open surgical intervention until recently, yet this is a major physiological insult, increasing the risk and severity of organ failure, as well as requiring patients to undergo repeated, extensive high-risk operations that are required for repeated, extensive high-risk operations that are associated with an appreciable mortality.

“The pancreas gland is difficult to access with a number of important structures nearby and open surgery itself presents a further risk to patient outcomes,” Dr Brown said.

“There has been a recent significant trend away from open surgical management towards manually invasive necrosectomy with evidence of improved outcome while another notable trend has been away from using percutaneous drainage as a secondary treatment, to using it as the first and sometimes sole treatment.

“Previous research has indicated that while only one-third of patients with infected pancreatic necrosis were successfully treated using only percutaneous drainage, they ultimately did much better than the two-thirds who needed further treatment, which indicates that if we can improve drainage we could improve patient outcomes.

“However, despite the shift in treatment to drainage as first line, there are still many problem areas with this approach. The inefficient and often ineffective, passive approach to drainage often results in drain blockage by solid material.

“The goal is to improve the treatment of infected pancreatic necrosis by increasing the effectiveness of percutaneous drainage. This will involve determining a way to break down necrotic tissue in situ through the use of enzymatic irrigation solutions to accelerate liquefaction. If this can be achieved, it will result in further improvements in patient outcomes.”

Dr Brown said that while various enzymes had been used to treat loculated collections in other tissue locations and with some success (such as streptokinase and urokinase in the treatment of empyema), there may be more effective and selective enzymes to be found in nature.

“Some types of maggots, such as Lucilia sericata, have the remarkable ability to selectively debride necrotic tissue while preserving viable tissue, killing bacteria and promote wound healing,” she said.

“This is not accomplished by the mechanical effects of chewing, but due to the maggot excretion altering the pH of the microenvironment to allow activation of enzymes within the maggot secretion.

“Using our bank of stored human necrotic tissue samples, we are now testing a range of commercially available enzymes on their ability to liquefy pancreatic necrosus while we are also investigating the digestive components in maggot secretions which have not yet been identified, using proteomics techniques, and comparing them to known enzyme combinations in their ability to degrade human pancreatic necrosis.”

Dr Brown is undertaking her PhD as a member of the Pancreas Research Group at the Department of Surgery at the University of Auckland and is working under the supervision of Dr Anthony Phillips, Professor John Windsor, Mr Richard Flint and Dr Max Petrov.

She said one of the reasons she became drawn to the research was that Maori women had one of the highest rates of acute pancreatitis in the world, with incidence rates of 46 per 100,000 compared to the European population of 19 per 100,000.

She said they were often some of the sickest patients presenting at hospitals in NZ with many developing severe complications such as multiple organ failure.

Dr Brown has so far studied six enzymes, all of which act on collagen, the most prevalent constituent of pancreatic necrosis.

She said that while she had to overcome an initial distaste for working with maggots, she was now becoming something of an expert.

“Obviously, for scientific research purposes we have to grow and cultivate them in the most sterile environment possible and while I did find that difficult at the start, I am used to them now and even think they are quite remarkable,” she said.

“The ultimate aim of this work is to find the enzyme that works the best and then...”
Successful Scholar

A successful scholar:

- Oral presentation
- Awarded AMRF Project Grant
- Awarded New Zealand Health Awards.

CDHB Quality & Innovation

enzymes.

pancreatic necrosis through accelerating liquefaction of extrapancreatic New Zealand. A systematic review of the extrapancreatic infectious complications in acute pancreatitis.

Fellowship 2012

College of Surgeons Research for 2013/2014

An academic surgeon.

Hepatobiliary surgeon.

change current practices in which drainage lines are flushed with a saline solution, to flushing them with the enzyme solution.

“This is where the Physics course, which has a component on fluid dynamics, has been invaluable.”

Dr Brown said that once she had identified the enzyme that was most effective, animal trials would be conducted to study the effects of it upon surrounding healthy tissue with human trials some years away.

“A recent review found that patients with necrotising pancreatitis require two to 16 catheter changes per hospital stay while 33 per cent of patients required additional surgical necrosectomy with a mortality rate of 13.4 per cent,” she said.

“Yet it has been reported that a successful first line treatment by percutaneous drainage would reduce annual costs of pancreatitis treatment in the USA by $185 million.

“This project could also offer innovative advances relevant to the ever increasing range of minimally invasive drainage procedures being targeted by radiologists, including all other deeply sited collections such as in the pelvis or thorax.”

Now with ongoing funding from the NZ Health Research Council, Dr Brown hopes to finish her PhD in 2014 at which time she will return to her surgical training program with the eventual aim of becoming a Hepatobiliary surgeon.

She said she particularly enjoyed both scientific research and her teaching role as a Research Fellow at the University of Auckland and hoped to develop a career as an academic surgeon.

“I have greatly enjoyed the opportunity to add to the knowledge behind evidence-based medicine and the support of the College from the onset was wonderful, not only in providing the financial means to allow me to concentrate on this work, but also because of the belief in the research that such support signifies,” Dr Brown said.

“I have seen a number of patients who have been extremely sick with acute pancreatitis and others who have died from the disease which I found difficult to deal with.

“This is a particularly difficult disease to treat, not just physiologically but emotionally because it doesn’t just affect the patients, but also their families and communities and I would be thrilled if I could find a way to improve the treatment of it and reduce the risks and suffering such patients now face.”

With Karen Murphy

The Section of Academic Surgery Annual Meeting of Academic Departments will be held in Adelaide on Thursday 14 November 2013

This year Day 1 of this meeting will consist of two workshops. We have excellent and interesting speakers who will be presenting during the day, with time to spend on discussion after each session and during the small group workshops which will occur at the end of the day.

ACADEMIC ACHIEVEMENTS

- Awarded New Zealand Health Research Council Scholarship for 2013/2014
- Awarded AMRF Project Grant for PhD Project 2013/2014
- Awarded Royal Australasian College of Surgeons Research Fellowship 2012
- Commendation Prize 2008 CDHB Quality & Innovation Awards.

PRELIMINARY NOTICE – SURGICAL RESEARCH SOCIETY ANNUAL MEETING

The Surgical Research Society 50th Annual Scientific Meeting will be held in Adelaide on Friday 15 November 2013

This meeting is open to those involved in or interested in research, including surgeons, surgical or medical trainees, researchers, scientists and medical students.

JEPSON LECTURER:

Professor Guy Maddern

Dept Surgery, Queen Elizabeth Hospital, Woodville, South Australia.

“50 years of the Surgical Research Society”

ASSOCIATION FOR ACADEMIC SURGERY GUEST SPEAKER:

Dr Chris Breuer

Professor of Surgery and Director of the Tissue Engineering Program Nationwide Children’s Hospital, Columbus and Ohio State University.

“The development of tissue engineered vascular grafts for use in children”

SOCIETY OF UNIVERSITY SURGEONS GUEST SPEAKER:

Professor David J Hackam, MD, PhD FACS

Professor of Surgery, University of Pittsburgh School of Medicine Children’s Hospital of Pittsburgh of UPMC.

“Small cells for small patients: the interaction of the innate immune system with intestinal stem cells in necrotizing enterocolitis”

FOR FURTHER INFORMATION CONTACT:

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9.00am – 12.30pm

MID-CAREER WORKSHOP FOR SURGICAL LEADERS

SESSION 1: Being an Academic Surgeon

SESSION 2: Academic Surgery and the World

1.30pm – 5.00pm

WORKSHOP: UNIVERSITY HOSPITALS AND SURGICAL SERVICES

SESSION 1: Models of Care – Academic Strengths and Weaknesses

SESSION 2: General Workshop on Academic Health Centres

After these workshops you are invited to attend the

SURGICAL RESEARCH SOCIETY 50TH ANNIVERSARY DINNER

The Adelaide Club

7.00pm.

THE SURGICAL RESEARCH SOCIETY ANNUAL SCIENTIFIC MEETING

Friday 15 November 2013

You are encouraged to stay overnight and attend Day 2 of this meeting which will be held at the same venue in Adelaide. This meeting is open to those involved in or interested in research, including surgeons, surgical or medical trainees, researchers, scientists and medical students.

CONTACT

For further information, please telephone Sue Pleass on +61 8 8219 0900 or email academic.surgery@surgeons.org.