2014/2015 Summer Studentship Project Application Form

Send to: Research Office, University of Otago Christchurch, PO Box 4345, Christchurch, by 5pm on **4 July** 2014

Supervisor Information (First named supervisor will be the contact):	
Supervisor's Name(s): Dr Helen Lunt, Dr Ruth Hughes, Associate Professor Chris Florkowski and Dr Guy Mulligan	
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Research Category (Choose one category only – to be used for judging the students' presentations):		
Clinical x	**Laboratory**	**Community**

Project Title (20 words MAXIMUM):

Improving the diagnosis of gestational diabetes though better analysis of laboratory plasma glucose

Project Description:

The Departments of Obstetric Medicine (Dr Ruth Hughes) and Diabetes (Clinical Associate Professor Helen Lunt) will be working with the Canterbury Health Laboratories (Associate Professor Chris Florkowski) and Southern Community Laboratories (Dr Guy Mulligan) on the below project. Although most of the work will be based within CDHB premises, some of it will be undertaken within Southern Community Laboratory premises in Christchurch.

Background

Untreated and undetected GDM (gestational diabetes mellitus) is associated with adverse outcomes for both the mother and her baby. In New Zealand, all pregnant women are offered a diabetes screening test using a 50g oral glucose challenge at around 26-28 weeks of pregnancy. If this is positive, they undergo a formal 75g OGTT (oral glucose tolerance test). If this is also positive, they are offered treatment for their GDM at the Christchurch diabetes antenatal clinic.

We consider that we are under-diagnosing GDM both in New Zealand and also internationally, because of a problem with blood sample processing, which occurs before the sample reaches the laboratory for glucose analysis. In brief, one of the outputs of a previous summer student project was a publication showing that the test tubes that are used specifically for glucose samples (fluoride tubes) do not do the job they are designed to do and do not prevent loss of glucose in the test tube within the critical first hour after blood collection i.e. the time when the test tubes are being transported to the laboratory (1). This causes an artefactual lowering of glucose ("pre-analytical error"), so glucose results look 'better than they really are'. This in turn will cause an under-diagnosis of GDM and potentially cause harm to the baby.

We think the solution to this problem is to use a 'new' type of glucose test tube that is thought to be good at stabilising glucose. (They are already commercially available in New Zealand. They are made by a reputable international company Terumo and contain citrate as the stabiliser). There is limited experience of the effects of these test tubes on glucose stabilisation, in New Zealand. What limited experience exists is in the research setting only. Also, there is little international published information about their use. These tubes do however seem popular in Europe. They are slightly more expensive than the 'old' tubes.

Proposal

In brief, following the obtaining of Ethics Committee permission to collect extra blood volume from pregnant women undergoing a diagnostic 75gm OGTT, we will compare glucose results obtained using the 'old' test tube, with those using the 'new' test tube and see what the difference is. If we manage to obtain enough OGTT results, we may even be able to assess formally, the degree of diagnostic misclassification i.e. how many women who seemed OK using the 'old' test tube system actually have diabetes based on results from the new system. We have already held preliminary discussions about this project with many of the clinical stakeholders, who are uniformly positive about this idea.

The laboratories are one of the main stakeholders with this project. They will 'hide' the glucose results obtained from the new test tubes, so that clinicians can continue to work with results from the familiar 'old' test tube system.

In addition to the main question as to whether the 'new' test tubes work in terms of abolishing pre analytical glucose loss, a couple of extra questions will be asked. We will look at HbA1c results and compare these with the OGTT results. We will also look at the degree of pre-analytical loss of glucose at the three time points of the OGTT (baseline , one hour and two hours) and see if this loss is the same for most women. If the loss is indeed the same, then a 'fudge factor' can be applied to 'old' OGTT results to convert them to 'new' results – this would be very convenient indeed! If however there is large between and within subject variability in the degree of glucose loss, then the clinical community will need to think more carefully about how it defines and detects GDM, in the future.

Role of the summer studentship (medical) student

The first month of the ten week summer studentship is likely to focus predominantly on 'set up' tasks, including liaison with community midwives, ensuring that the phlebotomists at the blood collection points understand the project and liaison with 'core biochemistry' staff at Canterbury Health Laboratories and Southern Community Laboratories about processing the 'new' test tubes. This will be followed by 5 weeks of data collection and analysis, with the final week being for 'tidy up' of data and related tasks.

Likely longer term outcome

If the 'new' citrate test tubes do indeed improve analysis of glucose in GDM, we propose introducing these test tubes in selected settings in the CDHB, where pre analytical error in the measurement of plasma (blood) glucose may be resulting in suboptimal diagnosis and treatment. If we are able to convince the rest of the country and also the international medical community, that our study findings are robust (this is usually done through peer reviewed publication), take up of this idea is likely to spread beyond the CDHB, both nationally and also internationally.

1. *Chan H, Lunt H. Thompson H, Heenan H, Frampton C, Florkowski C. Plasma glucose measurement in diabetes: Impact and implications of variations in sample collection procedures with a focus on the first hour after sample collection. Clin Chem Lab Med. 2014; 52: 1061-8. doi: 10.1515/cclm-2013-1059*.