Epidemiology of childhood diabetes - type 1, type 2, CFRD, monogenic (clinical/epidemiological project)

Type 1 diabetes is one of the most common chronic childhood illnesses. We have shown its incidence is increasing in Australia by ~3% per year, in keeping with global trends. The rise is unexplained, but has occurred to rapidly to be explained by genetics and suggests a significant role for the environment in diabetes pathogenesis. Young onset type 2 diabetes has also increased, in parallel with the rise in childhood obesity; more than 10% of adolescents with new onset diabetes now have type 2 diabetes. Other forms of diabetes are also increasingly recognized, including genetic defects of the beta cell and cystic fibrosis related diabetes (CFRD). This project will investigate epidemiological trends and associations with childhood onset diabetes, including ethnicity, birth weight, family history, seasonality and geographical patterns.

Selected articles:
- Tran F, Stone M, Craig ME. I: Increase in type 1 but not type 2 diabetes in NSW Paediatric Diabetes (*in press*)
- Garnett SJ, Srinivasan S, Birt S, Ambler G, Lawrie E, Cowell CT, Craig ME. Evaluation of glycemic status in young people with clinical insulin resistance; *Clin Endocrinol (Oxf)*. 72(4), 475-480, 2010

Viral triggers of type 1 diabetes (basic science or clinical project)

(*collaboration with Professor Bill Rawlinson at POWH*)

Infection with enteroviruses, one of the most common viruses affecting children, is a major environmental factor that has been linked to type 1 diabetes. We have found enteroviruses in children who develop diabetes associated autoantibodies (an early marker for diabetes) and at onset of diabetes. This study will investigate the role of virus infection and other environmental triggers in the development of autoimmunity and type 1 diabetes, in a longitudinal birth cohort of children at genetic risk of type 1 diabetes. Furthermore, little is known about the mechanisms by which the viruses induce apoptosis and/or functional impairment of pancreatic beta-cells. A second (basic science) project is available, which will apply a wide range of molecular techniques to investigate the how enteroviruses induce cellular and functional damage beta-cells.

Selected articles:
- Nair S, Akil A, Craig ME. Enteroxirus infection, β-cell apoptosis and type 1 diabetes. *Microbiology Australia*: 1-4, September 2013
Diabetes complications (clinical and epidemiological project)
(collaboration with Prof Kim Donaghue, Children’s Hospital at Westmead)
The Diabetes Control and Complications Trial demonstrated that improved glycaemic control resulted in reduced risk of microvascular complications. However the majority of participants in this study were adults, with only a small adolescent cohort. In addition to glycaemic control, risk factors for complications in youth include age of onset, diabetes duration, puberty and blood pressure. This project will investigate predictors of complications in youth with type 1, type 2 and other forms of diabetes.

Selected articles:
- Benitez P, Craig ME et al. Retinal Vascular Geometry Predicts Incident Retinopathy in Young Persons with Type 1 Diabetes: A Prospective Longitudinal Study from Adolescence. Diabetes Care 2011
- Craig ME et al. Plantar Fascia Thickness, a Measure of Tissue Glycation, Predicts the development of Complications in Adolescents with Type 1 Diabetes. Diabetes Care 31(6) 1201-6, 2008
- Gallego PH, Craig ME, Hing SJ, Donaghue KC. The Role of Blood Pressure in the development of Early Retinopathy in Adolescents with Type 1 Diabetes: British Medical Journal. 337:a918, 2008

Vitamin D deficiency in childhood (clinical and epidemiological project)
Vitamin D deficiency is increasingly recognized in pregnant women and children. Severe deficiency leads to rickets in children and osteoporosis in later life. Vitamin D deficiency has also been linked to type 1 diabetes. Children at greatest risk of Vitamin D deficiency are those who have limited sun exposure due to chronic illness or physical disability. This project will investigate the association between vitamin D deficiency and bone health in children with developmental delay and obesity.

Selected articles:

Infectious agents of stillbirth and congenital infection (basic science or clinical project)
(collaboration with Professor Bill Rawlinson at POWH)
Stillbirth is an enormous personal, family, community, and medical loss. Despite investigation by routine autopsy, around half of stillbirths are unexplained. Evidence is emerging that viruses (eg. Cytomelagovirus) and other difficult to culture agents may be responsible for many cases of stillbirth. This project will investigate the role of congenital CMV infection in stillbirth.

Selected articles: