If you are interested in the following mini-projects, you must choose both and carry it out for rotations. Upon completion of the rotations, you will choose one of the 2 for the final thesis project.

### Research Theme
Metabolic Disorders

### Research Project Title
**Role of Zinc in the Prevention of Congenital Heart Defects in the Mouse Embryo**

### Principal Investigator
Assistant Professor Dinesh Kumar Srinivasan, LKCMedicine

### Collaborator(s)
To be confirmed

### Project Description
Cardiac malformations are frequently observed in infants of diabetic mothers. The prevalence of heart malformations in Singapore is approximately 8 cases per 1,000 live births. Metallothionein (MT) is a cysteine-rich protein that binds metal such as zinc (Zn) and acts as an antioxidant that is very efficient in scavenging various free radicals or reactive oxygen species (ROS). Our hypothesis is that overexpression of MT in response to Zn supplementation would prevent the malformation of the heart in the embryonic development. Mouse embryos of gestational ages from E9.5 to E15.5 will be used for the study. The antioxidant action of MT in the fetus heart will be examined by a series of parameters indicating oxidative stress and damages in the heart. These parameters include reduced glutathione (GSG) / oxidised glutathione (GSSG), lipid peroxidation, oxidative DNA and protein damage, nitric oxide (NO) and ROS accumulation. MT also will be evaluated to confirm the overexpression of MT in the heart tissue by immunohistochemistry, Western blot analysis and real-time RT-PCR. The findings would open up new avenues of research and the possible pharmaceutical approach to prevention of diabetes-induced cardiac malformations.

Students engaged in research in this laboratory can be expected to gain understanding of mouse and human genetics.

### References:
2. Kumar SD*, Vijaya M, Samy RP, Dheen ST, Ren M, Watt F, Kang YJ, Bay BH, Tay SS. (2012). Zinc supplementation prevents cardiomyocyte apoptosis and congenital heart defects in embryos of...


Contact Us

If you have questions regarding this project, please email the Principal Investigator.

Assistant Professor Dinesh Kumar Srinivasan, LKCMedicine
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### Research Theme
Metabolic Disorders

### Research Project Title
Investigation into the Antidiabetic and Antiobesity Effects of Fucoxanthin at Varying Doses with Standardized Extracts of *Momordica charantia* and *Lagerstroemia speciosa* in Diabetic and High Fat Diet-fed Mice

### Principal Investigator
Assistant Professor Dinesh Kumar Srinivasan, LKCMedicine

### Co-supervisor
Professor Bernhard Boehm, LKCMedicine

### Project Description
Type 2 diabetes mellitus (T2DM) accounts for 90% of people with diabetes. The development of T2DM is due to the combination of risk factors, including insulin resistance and obesity otherwise known as metabolic syndrome. All pharmacologic treatment options in use are synthetic drugs. These drugs have rare but serious and sometimes fatal side effects, hence, research into natural products, that are generally considered to have fewer side effects, has been recommended by WHO. Several natural products have shown potential for the treatment of T2DM. Fucoxanthin from *Undaria pinnatifida* (undaria) is known to have anti-obesity properties, while *Momordica charantia* (Ampalaya) and *Lagerstroemia speciosa* (Banaba) have been shown to exhibit hypoglycemic properties. Our preliminary studies have shown that combination of Ampalaya and Banaba at a 2:1 ratio by weight given orally significantly improved glucose tolerance in hyperglycaemia-induced Swiss ICR mice compared to the individual extracts. There has been limited evidence-based research to evaluate the effectiveness of traditional herbal medicines in the treatment of T2DM and obesity. It is hypothesis that the novel application of standardized fixed ratio extracts of Ampalaya and Banaba with varying amounts of Fucoxanthin may have synergistic effects as anti-hyperglycaemic and anti-obesity agents and so contribute to better management of T2DM.

The specific aims of this project are:

1. To determine the optimum amount of Fucoxanthin to be used with Ampalaya and Banaba to achieve decreases in post-prandial and fasting blood glucose levels in hyperglycaemic mice.
2. To demonstrate the specific effect(s) of Ampalaya and Banaba, with optimum amount of Fucoxanthin on the activity of enzymes in the adipocytic pathways.
3. To investigate the mechanisms of action of Ampalaya, Banaba, in combination with optimum amount of Fucoxanthin (determined in [2]), in *in-vitro* assays in diabetic and adipocyte cell lines.

**Contact Us**

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