Discovering risk of IHD in microGravity

Team Member

AP Dr Fathinul Fikri (Molecular Imaging)

Ap Dr Cheah Yoke Kqueen(Molecular Biology & Bioinformatic)

Dr Noramaliza (Nuclear Physic)

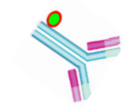
Background

Hormonal Imbalance during in flight microgravity is potentially influence physiological deconditioning
Lead to increased in cortisol level which could affect the changes on the central haemodynamic CVS system
Hypercholestrolaemia, hypertension, inflammatory scavengers would be among the clinical variables we are interested to examine

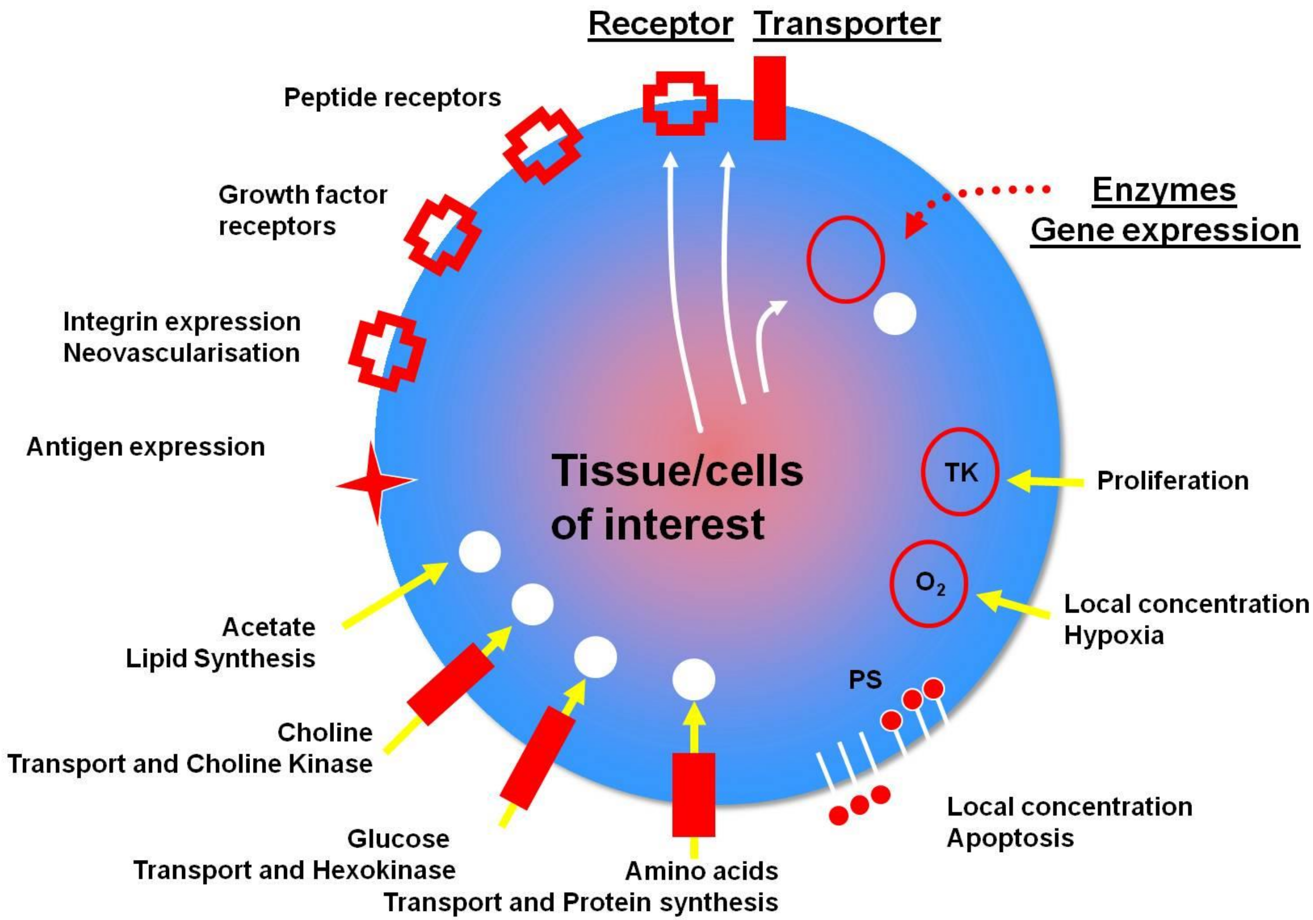
Research Question

Altered glucose metabolism is more pronounced in microgravity environmenent?

Genetic profiling in human (miRNA) would unveil more understanding in the potential progression of IHD among the astronauts



Molecular Imaging



Research Methods & materials

SIMULATION STUDY (MICROGRAVITY)

Raised hindleg in and immersion studies
MRI Spectroscopy : fat fraction of the liver and lower limbs muscles
Ultrasound assessment

INFLIGHT STUDY

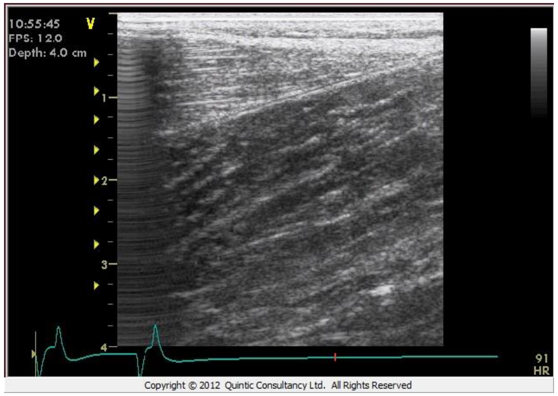
Assessment of abssorbed radiation dose (new materials fibreoptic TLD)
Genetic profiling (mRNA)

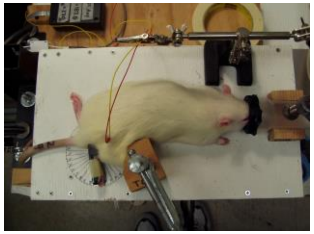
POTENTIAL STUDY
IN MICROGRAVITY
(MOLECULAR IMAGING)

SIMULATION STUDY

1. WATER SUBMERSION (RATS)

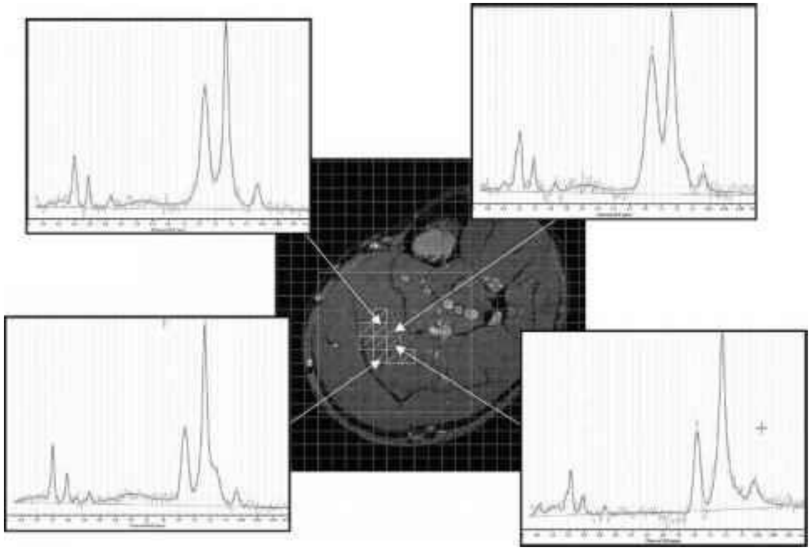
Utilisation of **ULTRASOUND** assessment on the muscle reconditioning





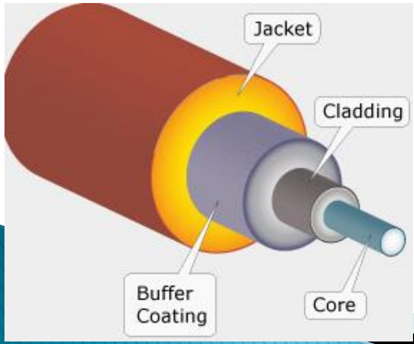
2. **MRI**

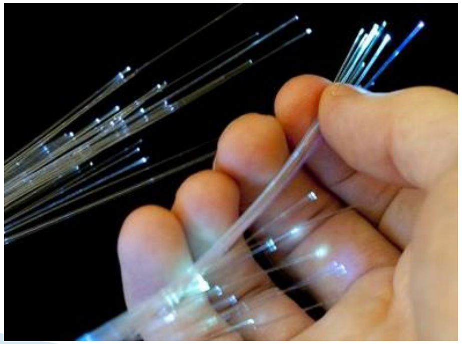
assessment on the lypolisis utilising SPECTROSCOPY for fat fraction (STRESS and PRESS sequences)



Why doped silica optical fibre?

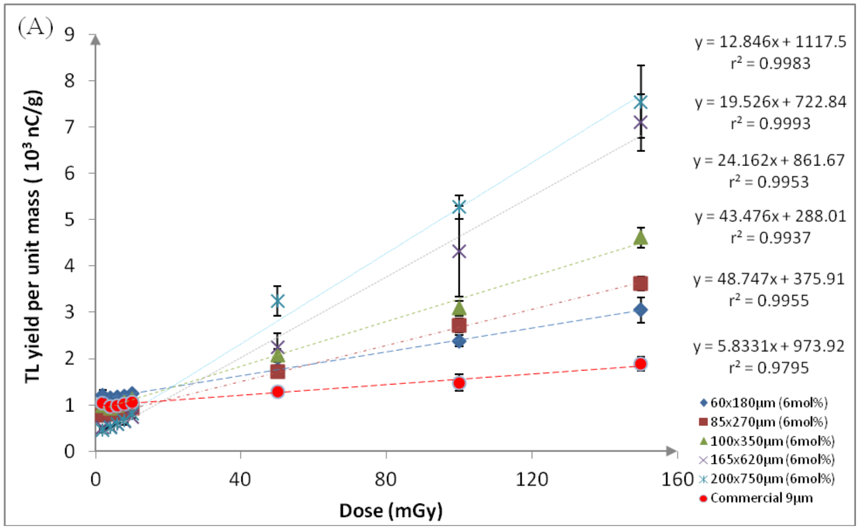
i. Modest cost (Bradley, 2012)
ii. Capable to provide excellent TLD characteristics to measure radiation dosage of the alpha particles (Suhairul et al, 2009), protons, photon (Noramaliza M.N et al 2014), electron, gamma and thermal neutron (Noramaliza M.N et al 2009, 2010, 2012)
iii. Good spatial resolution – small physical size (few tens of microns) (Bradley, 2011)
iv. Impervious to water (not affected by water) (N.H. Yaakob et al., 2011);
v. Provides comparable response to that of TLD-100 (Suhairul et al, 2014)





What has been done?

- Characterized the fabricated fibres in diagnostics application (40kvp–150kvp)



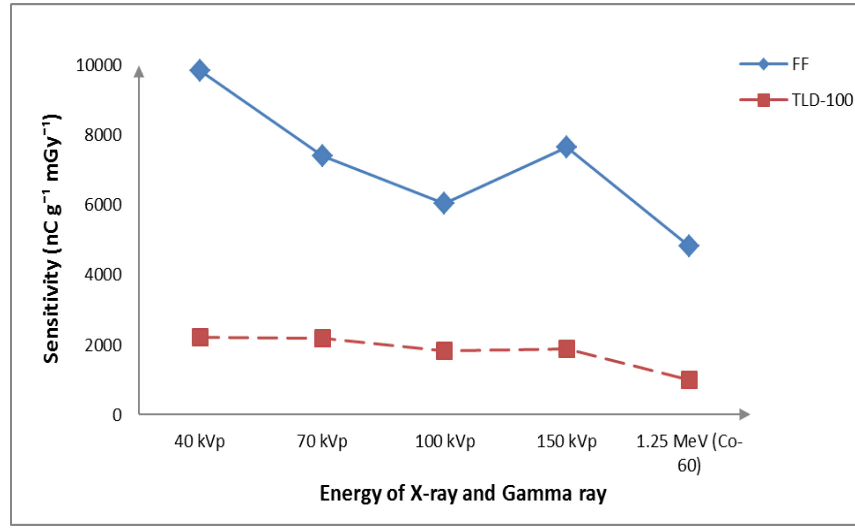
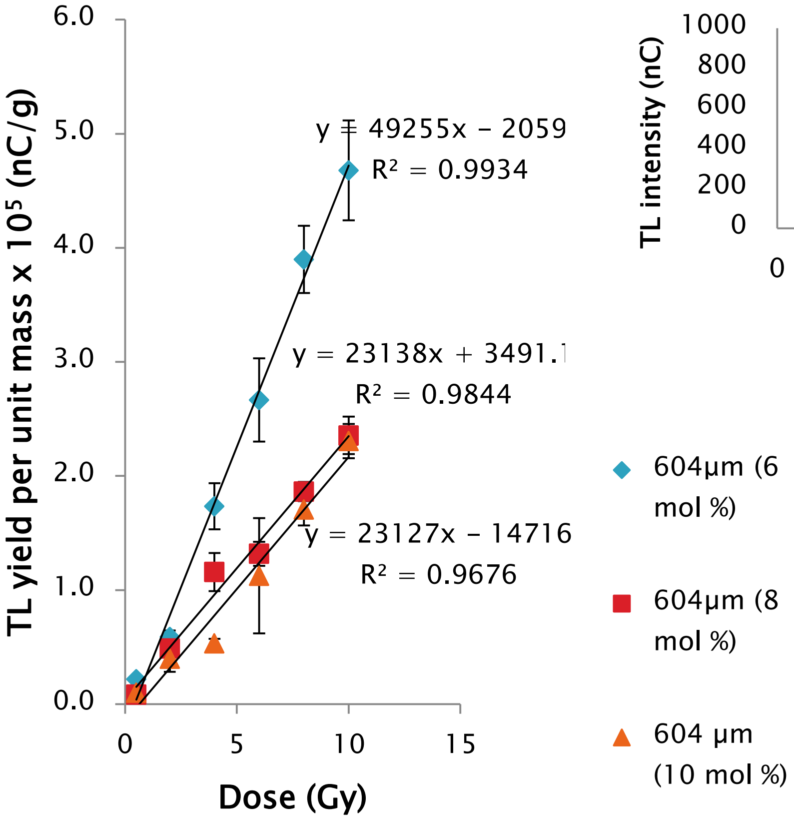


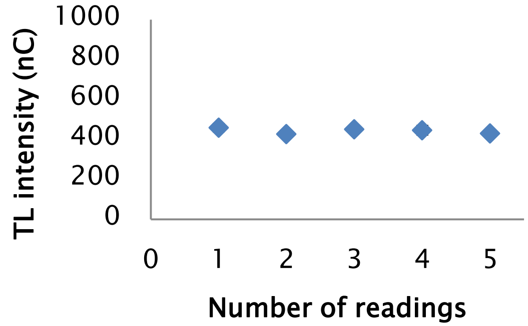
Table 1 Dose reproducibility at 60, 80, 100 and 150 kVp					
Nominal tube potential (kVp)	Dose (mGy)	No. of fibre	TL yield per unit mass (nC/g)		
			Mean	SD	SD in %
60	0.955	5	2123.66	58.19	2.74
80	0.990	5	2285.00	16.23	0.71
100	1.064	5	2131.33	62.50	2.93
150	0.957	5	2101.46	30.08	1.43

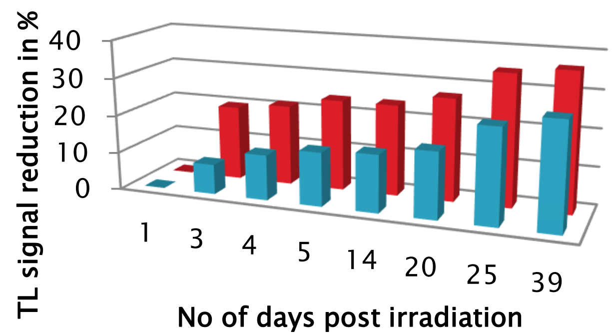
❖ Characterized the fabricated fibres in radiotherapy application (6MV-15MV)

Linearity

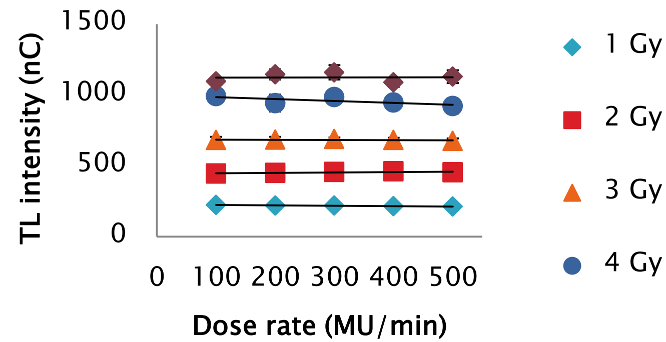


Reproducibility

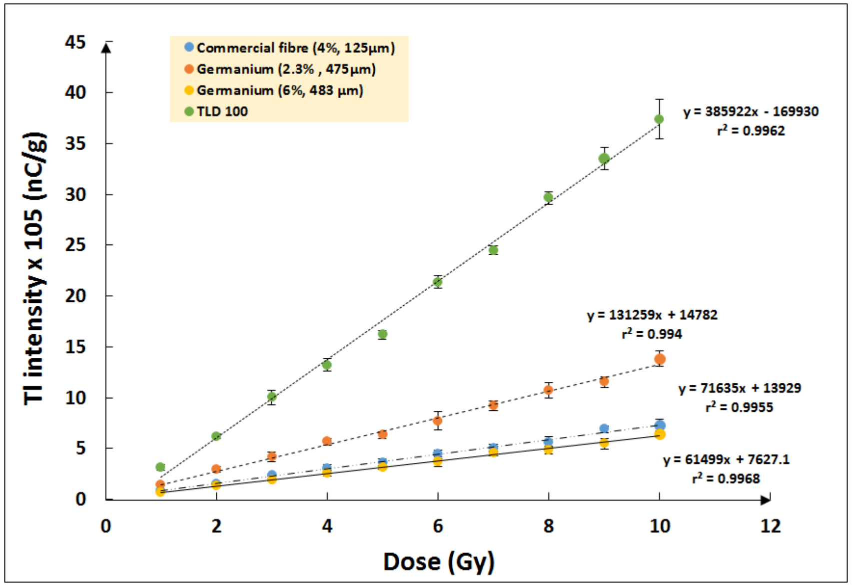




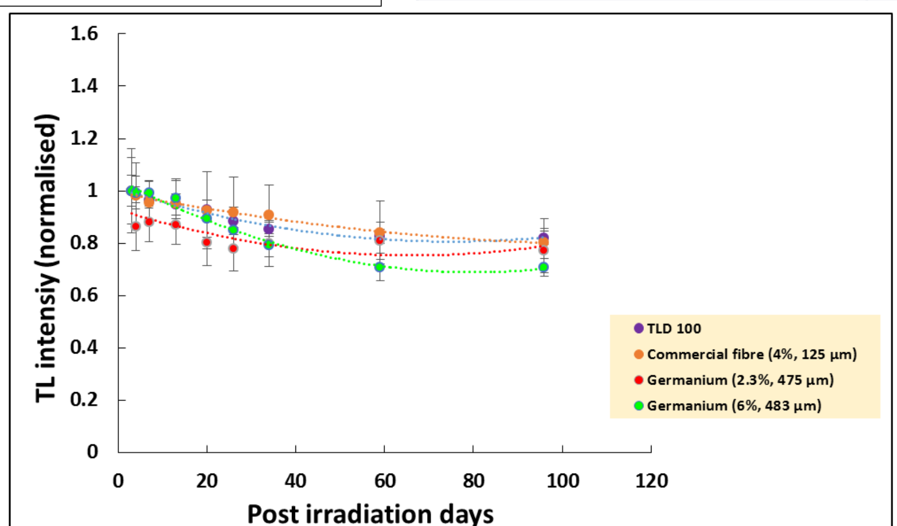
Dose rate



❖ Characterized the fabricated fibres in proton application (150-210 MeV)



Dosimeter/ Fibre	TL yield per unit mass (nC/g)		
	Mean	SD	SD in %
TLD 100	1716493	27626	2
Commercial fibre (4%, 125 µm)	321926	12048	4
Germanium (2.3% , 475 µm)	633584	10696	2
Germanium (6% ,483 µm)	348260	19143	5



- Thank you