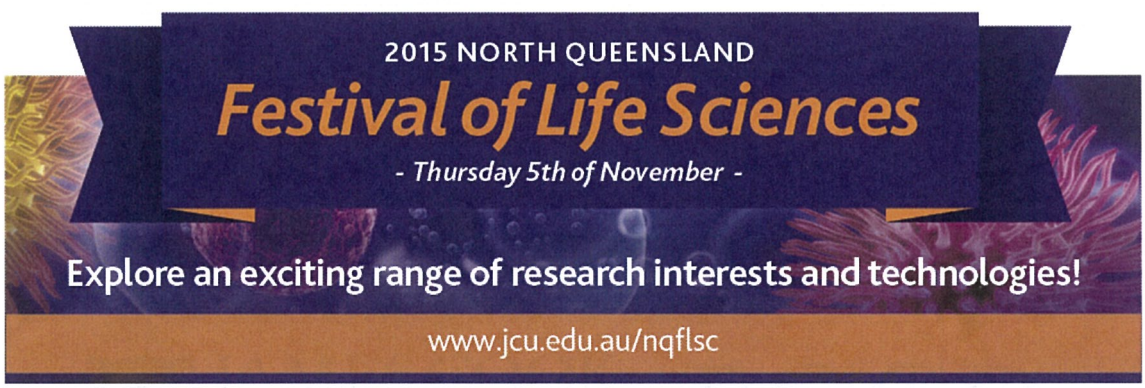
Festival of Life Sciences

Thursday 5th of November

Event program



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Baked Boars to Blame? Re-evaluating Summer Infertility in the Pig.

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Background and Aim: At 40% share, pork is the most widely eaten meat in the world (National Pork Board, 2011). As such, research efforts must focus on improving production and efficiency in the pig industry. However, heat stress in summer has a significant negative impact on pig fertility; causing embryonic death and decreased litter size that cost the industry millions in annual productivity losses (Paterson 1978; St-Pierre *et al.* 2003; Boma and Bilkei 2006; Auvigne *et al.* 2010; Hughes and van Wettere 2010). This problem is particularly prevalent in tropical regions where ambient temperatures rise beyond the animal's zone of thermal comfort. The boar is particularly vulnerable to the effects of heat stress due to its inefficient capacity to sweat; its non-pendulous scrotum; and the high susceptibility of boar sperm to temperature shock (Ingram 1965; Knox 2003; Whittemore and Kyriazakis 2006; Einarsson *et al.* 2008). Moreover, due to limited endogenous antioxidant systems inherent in mammalian spermatozoa and the loss of cytosolic repair mechanisms during spermatogenesis, the DNA in these cells are particularly susceptible to oxidative damage (Aitken and De Iuliis 2010). While a seemingly healthy looking sperm may swim and fertilize an oocyte normally, studies in mice demonstrate that heat stress-induced DNA damage can disrupt expression of key developmental genes in early embryos after fertilization and distort the formation of the blastocyst; resulting in implantation failure and pregnancy loss (Paul *et al.* 2008).

The aim or our study is to determine whether heat stress induces DNA damage to boar sperm that could significantly contribute to the high rates of embryo loss and pregnancy failure observed in the sow during summer infertility. **Methodology:** The quality of sperm obtained from six boars housed in the dry tropics of Townsville, North Queensland was evaluated across different seasons (summer, winter and spring). Sperm motility was characterised by Computer-Aided Sperm Analysis (CASA), and sperm DNA integrity evaluated by Terminal deoxynucleotidyl transferase dUTP Nick-End Labelling (TUNEL) assay. Twenty-thousand spermatozoa per boar per treatment were analysed using flow cytometry. **Results:** Sperm had equal motility across all seasons (total motility: 70.8 ± 5.5% *vs.* 71.3 ± 8.1% *vs.* 90.2 ± 4.2%, $P \geq 0.05$; progressive motility: 41.7 ± 2.8% *vs.* 35.4 ± 7.0% *vs.* 46.6 ± 4.0%, $P \geq 0.05$ for spring, summer and winter respectively). However, sperm in summer exhibited ~7-fold higher DNA-damage than that in winter and spring (13.7 ± 4.9% *vs.* 1.1 ± 0.2% and 1.8 ± 0.4% respectively; $P \leq 0.05$). **Conclusion**: Summer season negatively affects sperm DNA integrity in boars without depressing sperm motility. This means traditional methods of evaluating semen quality may not detect inherently compromised spermatozoa. Cryopreserved sperm samples will be used for *in vitro* fertilization studies to evaluate the effect of DNA damaged sperm on rates of fertilization, development and survival in pig embryos. Our study emphasizes the need for improved management practices and development of strategies to mitigate heat stress in boars during summer.

Changes in Clinical Laboratory Tests in Diabetic Foot Osteomyelitis: A case control study.

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Background/aims: Diabetic foot osteomyelitis is a common complication of diabetic foot ulcers. Osteomyelitis is an infection induced inflammation of the bone. There is limited research characterising laboratory value changes in diabetic foot osteomyelitis. The study aimed to determine any differences between patients with diabetic foot osteomyelitis and diabetic foot ulcers without osteomyelitis in commonly used clinical laboratory tests. **Method:** Patients with diabetes mellitus with proven diabetic foot osteomyelitis (cases) and a diabetic foot ulcer without osteomyelitis (controls) were drawn from The Townsville Hospital wards, High Risk Foot Clinic and Kirwan Podiatry Clinic into a case control study. **Results:** Demographic characteristics include a mean age of 67 years, 80.0% male, 25.0% identified as indigenous, 96.3% non-smokers, 73.3% injecting insulin and 65.5% taking oral hypoglycaemic medications. The case group (n= 18) had a lower mean albumin (28.8±6.3 vs 38.7±3.6, p<0.0001), a lower mean haemoglobin (110.0±21.2 vs 125.7±15.5, p=0.036), a higher mean C-reactive protein (115.7±85.1 vs 31.3±40.3, p=0.047) and a higher median fibrinogen (8.8 IQR 6.6-9.9 vs 4.0 IQR 3.8-4.1, p<0.0001) than the control group (n=12). The mean white cell count (7.9±2.3 vs 8.9±3.0, p=0.391) did not significantly differ. The median HbA1c (8.8 IQR 6.6-9.9 vs 7.9 IQR 7.5-10.3, p=0.9) did not significantly differ. **Conclusion:**