Introduction
Chronic heart failure (HF) is a major cause of morbidity and mortality in humans and domestic animals. HF is a systemic condition characterised by chronic inflammation and functional changes in non-cardiovascular tissues; obesity is also associated with low level chronic inflammation, with adipose tissue (AT) exhibiting infiltration of macrophages and alterations in fatty acid (FA) profiles. Our hypothesis was that AT from animals with HF will display greater expression of inflammatory mediators and a fatty acid profile consistent with an inflammatory state.

Therefore the aim of this project was to investigate expression of regulators of lipid metabolism and inflammation and fatty acid profiles in AT from a rodent model of HF.

Methods
Rats with HF post myocardial infarction were compared with age matched non-failing controls. Intra-abdominal (IA) and subcutaneous (SC) adipose tissue depots were sampled after humane euthanasia, and then processed for analysis.

Adult male Sprague-Dawley rats (N=6) underwent proximal coronary ligation to induce chronic myocardial infarction. Sham ligation was used as control (N=6). Sixteen weeks later assessment of cardiac function completed and rat humanely euthanased and adipose tissue removed and stored at -80°C.

RNA extracted, reverse transcribed and subjected to QPCR. Rat specific primers for several inflammatory mediators and metabolic markers included stearoyl-CoA desaturase-1 (SCD1), interleukin 1 (IL1) and phosphoenolpyruvate carboxykinase (PCK1)

Lipid extracted (Folch method); triglycerides (TAG) measured colourometrically, fatty acid profiles assessed using gas chromatography. Statistical significance was assessed using ANOVA with post hoc Tukey tests.

Results
Triglycerides - Greater storage of TAG observed in HF intra-abdominal AT.
Gene Expression - Reduced expression of SCD1 (enzyme that catalyses desaturation to mono-unsaturates) in HF intra-abdominal AT.
Fatty Acids - FA analysis identified differences in several species; including reductions in C10, C15 and C17 in HF-SC. However, most interesting was a reduction of both C20:5n3 (EPA) and C22:6n3 (DHA) in HF-SC. Despite a reduction in SCD1 expression, we did not detect any difference in mono-unsaturated FA species in the HF rats.

EPA and DHA are omega 3 FAs with recognised anti-inflammatory and cardio-protective effects; a reduction in HF suggests altered uptake and metabolism in these animals.

Future Research
Possible areas for further research are:
• To investigate the impact of SERCA2 gene therapy and whether it can ameliorate the effects of HF on adipose tissue.
• To assess the impact of HF on brown adipose depots given. the emerging roles of BAT in adult mammals.
• To determine whether the FAs act as biomarkers of HF.
• Nutritional intervention

Conclusions
Despite a reduction in SCD1 expression, we did not detect any difference in mono-unsaturated FA species in the HF rats.

Reference

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Figure 1: Confirmation of heart failure in rats (HF)

Figure 2: Selected fatty acid profiles in adipose tissue

Figure 3: SCD1 expression in adipose tissue

Figure 4: Adipose tissue TAG content

Figure 5: Metabolic pathway for Omega-3 fatty acids