

# Investigation of High Fat Diet effects on Myocardial Trygliceride and Function in Mice

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## INTRODUCTION

Recent studies suggested that adiposity promotes deposition of triglyceride within cardiac muscle which may damage the myocardium [1]. It has been previously demonstrated in an animal model of extreme obesity that cardiomyocytes accumulate large amounts of triglycerides; this cardiac stenosis was shown to trigger pathological changes resulting in decreased left ventricular systolic function [2]. The aim of this study was to investigate the effect of high fat diet on myocardial metabolism and systolic function in a preclinical model.

## METHODS

**Animals and Treatment:** Male C57/Bl6 mice were maintained on a high (21%) fat diet (high in saturated fat), diet (HF n=6) or a normal (3%) fat diet (C, n=5). Diets were given for a period of 18 weeks.

**MR experiments** All MR experiments were performed on 9.4T DirectDrive Varian MRI system (Oxford, UK) using a birdcage RF coil (RAPID Biomedical GmbH). Mice were studied at 26 weeks of age with the average weights of 32g (+/- 2.8) and 30g (+/-1.4) for HF and C respectively. Mice were anaesthetized for a scan duration with a mixture of isoflurane and oxygen (1-1.5%). Commercial monitoring system (SA instruments, USA) was used for physiological monitoring and gating.

**MRI** Dynamic cine MRI short axis images of the heart were collected using a cine FLASH sequence with cardiac and respiratory gating. Following parameters were used: TR =18 ms, TE 1.26 ms, FOV 30mm x 30mm, matrix 192 x 192, 4 averages and 1mm thick slices; 8-10 consecutive slices were acquired to include the entire heart. Left ventricular ejection fraction (LVEF) was calculated as a ratio of the stroke volume (difference between of left ventricular (LV) volume in diastole and systole) to the LV volume in diastole [3]. Cardiac images were analysed manually with ImageJ (NIH, Bethesda, USA).

**<sup>1</sup>H MRS** For localized <sup>1</sup>H MRS the from the heart, the 1.7x0.7x1 mm voxel was placed in the ventricular septum as shown in Fig1. Spectra were acquired using PRESS sequence with TR=3000 ms, TE=13 ms, and 256 averages. Acquisition was cardiac and respiratory gated with dummy scans during respiratory gating to preserve steady state condition. Spectra were analysed using jmrui (www.mrui.uab.es/mrui). Lipid content was expressed as ratio to total water signal from the same voxel.

**RESULTS :** Fig 2 present example of the localized <sup>1</sup>H spectrum acquired from the VOI shown in the Fig.1. Lipid content (relative to water) was significantly increased in the HF group 0.0128 (+/-0.004) compared to C group 0.0057 (+/-0.003) (p<0.05, T-test) (FIG 3). LVEF values showed a trend to decrease in the HF group compared to the C group. 68.41% (+/-2.46) and 71.38% (+/-3.1) respectively with p=0.06 (T-test).(Fig4). There was no relation between myocardial lipid content and LVEF.

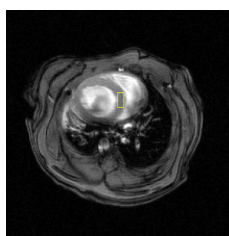


FIG.1

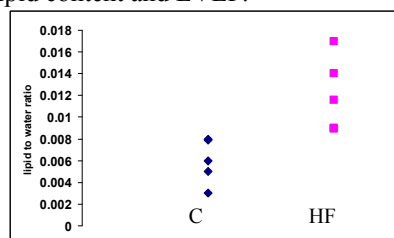


FIG. 3

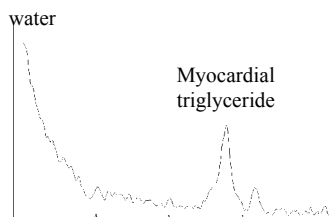


FIG.2

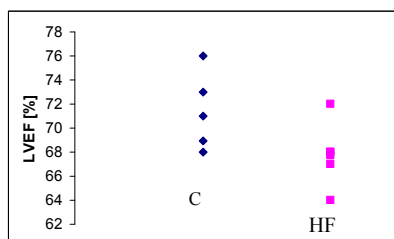


FIG.4

## Discussion and Conclusion

These preliminary results suggest that high fat diet (rich in saturated fats) may lead to increase in myocardial lipid content. Although only a trend is observed, the decrease in LV ejection fraction suggests decreased cardiac output. In addition body adipose tissue distribution is also currently processed. Further studies on the larger groups are needed to investigate the implications of high fat diet for cardiac function and general health.

## References:

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- 3.Chuang et.al. J Am.Coll Cardiol 35:477;2000