

# Cardiac Ageing & Exercise

Moderate Exercise

Cardiovascular Health

Maintaining Fitness

Cardiac Adaptation

## Why does an Old Heart Fail?

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### The Investigation

#### Objectives

- To examine the effects of healthy progressive ageing on ventricular heart muscle.
- To identify changes in important regulatory proteins with normal ageing.
- To compare the effects of ageing in males and females.
- Observe the adaptive response to exercise across age and gender.
- Use the information to develop models of how to support the ageing cardiovascular system

#### Plan

- Progressive ageing of C57/Bl6 mice from the young animal to advanced old age (~24 months) is being followed. Cardiac function in terms of pumping capacity and ability to respond to stress is being characterised for male and female animals. This information is providing a view of how cardiac performance changes during healthy ageing.
- A subgroup of animals at each age also undertake a moderate exercise-training program (three times per week for 30 minutes). This ten week programme enables us to look at the capacity for exercise adaptation at differing ages. Exercise throughout the lifespan also allows us to look at how life-long regular exercise benefits the heart.
- The mechanisms behind identified differences in cardiac performance with age are being followed by studying the protein composition of the heart.

#### Resources

The project has already led to the establishment of a colony of healthy ageing mice for ageing research, obtained equipment for characterising cardiac function and begun to gather data on the changing parameters of cardiac function with age.

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### Potential Benefits

#### For older people

This work is generating an improved knowledge of why cardiac performance declines with age and how exercise can intervene to moderate this decline in males and females. The data has so far shown changes in the calcium channel, a regulator of cardiac function, with age. This data will help us understand the changing effectiveness of drugs used to treat high blood pressure and cardiac arrhythmias in the elderly and offers insight into how novel treatments for these conditions, prevalent in the elderly, could be developed for greater effect.

#### Initial Data

Data have already shown that with increasing age the expression of different calcium channels in the heart is changing. These regulate the strength of contraction of the heart and are targeted by several drugs commonly used in the elderly to treat high blood pressure and prevent cardiac arrhythmias.

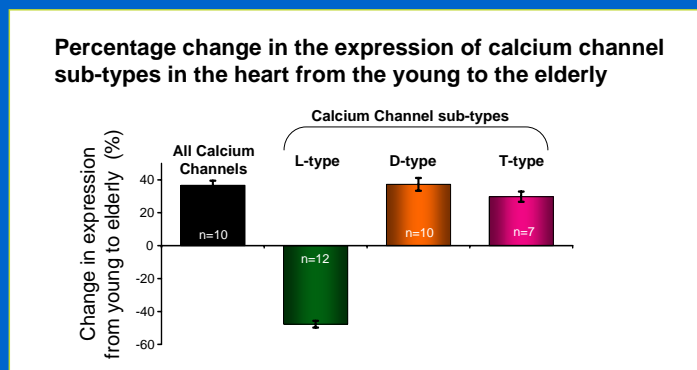


Figure: Expression of the differing calcium channel sub-types in the cardiac ventricle with age.

Overall the total channel expression increases. However this hides a fall in the normally dominant L-type calcium channel, and increases in other minority sub-types to produce this net effect ( $p < 0.05$ , young vs. old). Protein levels were identified by selective antibodies to the differing proteins.

#### Collaborators

Thanks to Dr Anne McArdle of the University of Liverpool for support in establishing this project.