

Towards Active Ageing

Exercise

Lipoprotein function

Adaptation to exercise

Oxidative stress

The Effects of Exercise on Lipoprotein Oxidation in Ageing

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The Investigation

Objectives

- To identify changes to lipoprotein oxidation and nitration in aged individuals following a single bout of moderate exercise
- To assess the possible adaptive effects of a moderate programme of physical activity upon lipoprotein oxidation and nitration

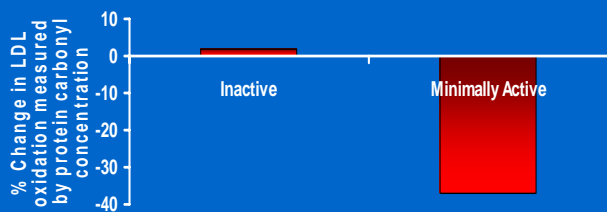
Plan

The aim is to assess individuals between the ages of 65 and 75 years of age. All volunteers will be asked to perform a graded sub-maximal test, which will be used to estimate their maximal aerobic capacity, and a steady state exercise test for 30 min at an intensity eliciting 50% of their own individual performance. Food will be provided for the evening meal prior to this test in order to control dietary influences upon lipoproteins. Small blood samples will be drawn after each laboratory exercise bout.

Male and female volunteers will be randomly assigned to a control group, who will be asked to remain sedentary in the following 8 weeks or to an exercise-group. The exercise group will attend a 30-min walking session three times a week for the following 8 weeks. After completion of the 8-week period, all volunteers are asked to come back to the laboratory to perform the graded sub-maximal test and the 30 min test again to allow post 8 weeks blood samples to be taken.

Blood samples will be analysed for markers of lipoprotein oxidation (carbonyl formation) and protein nitration (3-NT adducts) in addition to analysis of lipid peroxidation concentrations, in order to gain an insight into mechanisms of lipoprotein oxidation and protection.

Change in LDL oxidation status in healthy young volunteers following an acute bout of moderate exercise (40 min @ 60% Wmax)



Habitual physical activity grouping (IPAQ)

Figure. Lipoprotein changes after exercise in active and inactive young healthy individuals

Potential Benefits

For older people

Oxidative damage to lipoproteins, in particular low density lipoprotein (LDL), is known to play a role in a number of diseases associated with ageing such as cardiovascular disease, rheumatoid arthritis, diabetes and dementia. Exercise can alter the balance of oxidative and anti-oxidative species within the human body and can stimulate adaptations which can reduce potential damage to lipoproteins, thereby reducing the risk of onset of these diseases, which are often associated with ageing. If the adaptive effects of exercise are seen in aged individuals, then the results of the proposed research may impact on advice given about the level of physical activity to be undertaken by ageing populations.

Previous data

Pilot work to assess the effect of habitual physical activity upon lipoprotein status following an acute bout of exercise showed that circulating lipoprotein oxidation levels measured by protein carbonyl formation was dependent on the habitual physical activity undertaken by the subject. Subjects who undertook moderate physical activity as measured by the IPAC physical activity questionnaire showed less protein carbonyl formation on low density lipoprotein than was seen in subjects who undertook no physical activity. Protein carbonylation represents a stable marker of protein oxidation.

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