



Strategic Promotion of Ageing Research Capacity

The Beneficial Effects of Calorie Restriction on Ageing Dianne Ford & Luisa Wakeling

*Meeting the challenges of
an ageing society*

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Dr Dianne Ford & Luisa Wakeling
University of Newcastle

The Background

The DNA within a cell contains all the instructions needed to make that living organism. Cells make use of the instructions encoded within DNA by first converting it into a molecule called RNA, then using that to make proteins, which are the building blocks of life. This process of converting DNA to RNA is known as **transcription**.

DNA methylation is a naturally occurring event that affects cell function by altering the expression of a gene (i.e. by turning it on or off). It is essential because it helps cells maintain their regular functions. During DNA methylation, a methyl group attaches to a gene, preventing it from beginning the transcription process.

In general, DNA methylation as a whole is known to reduce with ageing in a variety of tissues. However, specific genes may have either increased or reduced DNA methylation during ageing.

Calorie restriction (eating a diet complete in all regards but deficient in calories) is known to slow the biological ageing process, thereby helping you live longer. In humans, calorie restriction has been shown to lower cholesterol and blood pressure. It is not currently known how and why this process works.

Sirt1 is an enzyme (from the gene *sirt1*) which has been shown to be increased during calorie restriction in other species. Sirtuins, such as Sirt1, are known to interfere with the transcription of genes by preventing the initiation of transcription. It is thought that they might be involved in the lifespan-extending effects of calorie restriction in humans.

The Issues

The reasons why calorie restriction appears to have an effect on lifespan are unknown. Understanding the reasons behind this process should help in our understanding of ways in which we can achieve a longer, healthier life.

Changes in DNA methylation as we age could be having an effect on cellular function and therefore contributing to some of the problems associated with ageing. Is the relationship between DNA methylation and ageing cause or effect?

The Aims

The overall aim of this project was to establish whether increasing the amount of Sirt1 can alter DNA methylation.

The Study

Experiments to measure global DNA methylation and site-specific DNA methylation were developed and carried out in human cells.

Results and Implications

This research has shown that increased Sirt1 activity in human cells can lead to an increase in DNA methylation. This finding supports the idea that changes in DNA methylation brought about by Sirt1 may play a role in the beneficial effects of calorie restriction on lifespan.

Over the longer term this research may contribute to dietary strategies or pharmacological interventions to mimic the effects of calorie restriction, potentially benefiting the general population.

The Research Team



Dr Dianne Ford

Institute for Cell and Molecular Biosciences
Newcastle University, Medical School
Framlington Place
Newcastle Upon Tyne, NE2 4HH
dianne.ford@ncl.ac.uk



Dr Luisa Wakeling

Researcher

The Study

The study received financial support from SPARC of £43,888 and ran for 8 months ending in June 2007. Additional support was provided by Newcastle University.

More information about the study can be found on the SPARC website www.sparc.ac.uk and obtained directly from Dr Ford.

Bibliography and Key References

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SPARC

SPARC is a unique initiative supported by EPSRC and BBSRC to encourage the greater involvement of researchers in the many issues faced by an ageing population and encountered by older people in their daily lives. SPARC is directed, managed and informed by the broader community of researchers, practitioners, policy makers and older people for the ultimate benefit of older people, their carers and those who provide services to older people.

SPARC pursues three main activities:

Workshops to bring together all stakeholders interested in improving the quality of life and independence of older people.

Advocacy of the challenges faced by older people and an ageing population and of the contribution of research to improving quality of life. SPARC is inclusive and warmly welcomes the involvement of everyone with a relevant interest.

Small Awards to newcomers to ageing research, across all areas of design, engineering and biology and at the interfaces relevant to an ageing population and older people. In 2005 and 2006 SPARC received 185 applications for support in response to two invitations for competitive proposals of which 34 were supported.

Executive Summaries

SPARC is supporting its award holders through funding, mentoring, a prestigious dissemination platform, professional editorial assistance, international activities and provision of contacts. Each of the projects has been small, yet the enthusiasm for discovery, and impatience to contribute to better quality of life for older people, has more than compensated for the very limited funding which was provided.

This executive summary is one of a series highlighting the main findings from a SPARC project. It is designed to stand-alone, although taken with summaries of other projects it contributes to a formidable combination of new knowledge and commitment by newcomers to ageing research, with a view to improve the lives of older people. This is a tangible contribution towards ensuring that older people receive full benefit from the best that research, science and technology can offer.