

Addressing degenerative ageing with long-term and comprehensive dietary studies

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Researchers from the NU-AGE project have published 15 papers in a special issue of the journal *Mechanisms of Ageing and Development*, which summarises new methods to tackle one of the key factors of ageing - inflammation. This process plays a key role in most conditions that elderly people suffer from, such as frailty, loss of muscle mass and other disabilities that lead to further disease and eventual death. Growing research suggests this process can be halted and even reversed through changes in lifestyle and diet.

The NU-AGE project, which receives funding from the European Commission, is combating the process of chronic and inflammatory deterioration of health - [aptly named 'inflammaging'](#). The project is targeting nutrition with the hypothesis that a whole-diet approach will have a greater and beneficial impact on healthy ageing, than single nutrient interventions, reducing inflammaging's effect and the risks of suffering from heart disease, diabetes and brain disorders.

The following is a summary of the special issue. The first two papers (Aurelia Santoro et al. & Agnes Berendsen et al.) describe the conceptual framework, design and rationale behind the project's randomised study of introducing a Mediterranean diet to 1,250 volunteers from 65 to 80 years of age for one year. Participants are a mixture of pre-frail and non-frail individuals and split into a diet group or a control group, with equal numbers of men and women. The study is measuring a selection of nutritional, physical and cognitive parameters in participants before and after a one year diet, ending in October 2014.

According to NU-AGE researchers, this is the largest dietary intervention study of its type. The idea is that a holistic approach, that considers a variety of data and looks at tissues, organs and biological systems as one network, instead of assessing a single tissue and organ separately will enable higher-quality insights.

The NU-AGE study is also researching how dehydration in the elderly can lead to disability (Lee Hooper et al.), e.g. fractures and disease (such as urinary tract infections and strokes). Currently, there is no evidence of a causal relationship. It is crucial to test whether increasing fluid intake in older people improves health outcomes.

One paper (Susan J. Fairweather-Tait et al.) assesses the status of measuring iron levels in elderly people and strategies for preventing iron deficiency or overload. Existing inflammatory conditions, such as obesity and age-related chronic and degenerative diseases, exacerbate the problem of accurately measuring iron status - [improved 'biomarkers'](#) of iron status are needed. Also, there is growing evidence that iron metabolism is affected by ageing and iron deficiencies could be corrected through diet or iron therapy. Researchers hope to characterise chronic diseases more accurately and identify any causality or links between iron status and dementia.

A personalised nutrition approach

Micronutrients such as zinc, copper and selenium play a pivotal role in a range of physiological functions and maintain immune and antioxidant systems (Eugenio Mocchegiani et al.). The complex interactions between micronutrients and genes could help in understanding how best to use nutrients as supplements in clinical practice. Further genetic and nutritional studies are required to clearly define the impact of these micronutrients.

Targeting the human gut microbiome (Sebastiano Collino et al.) is an emerging field of personalised nutrition. This approach could help to identify key molecular mechanisms affected by diet and inflammaging, and lead to basic profiles of health and diagnostic tools to address conditions such as inflammatory bowel disease.

Three papers cover the interaction between diet and the gut microbiota (Candela et al.), the effect of an elderly tailored diet on cognitive decline and brain and gut connections, including the liver and pancreas (Caracciolo et al.). Nutritional interventions such as low calorie intake with nutrient supplementation can impact an individual's cell epigenetic profile e.g. DNA methylation, microRNA and organs (Bacalini et al.). Better knowledge of gene interactions with nutrients and the environment may lead to earlier interventions of malnutrition in people (Yves Boirie et al.). And more genomic information may identify impacts of general health recommendation policies in at-risk, elderly sub-populations.

The effect of diet on immunosenescence, which is the functional decline of the immune system (Maijó et al.), and changes that happen in ageing fat tissue (Zamboni et al.) are both assumed to be major sources of inflammation. Nutritional interventions have shown some promising results in targeting some impairments of an ageing immune system; combining interventions with a whole diet approach could be more beneficial.

It is commonly known that physical exercise can benefit health and age-related decline. In one study (van de Rest et al.), resistance-type exercises, using a number of body techniques and workout machines, with and without protein supplementation, was undertaken to see the effect on cognitive functions in frail and pre-frail elderly people. After 24 weeks of training a beneficial improvement was noted in participants' information processing speed, attention and working memory.

However, identifying the best diet for healthy ageing is difficult and could be helped by a database containing all relevant biological and clinical patient data. A mathematical modelling approach (Calçada et al.) of this information may help to devise appropriate nutritional interventions.

Finally beyond Europe, in Japan the traditional Okinawan diet represents a combination of foods that is among the healthiest in the world and comparable to the traditional Mediterranean diet (Willcox et al.) Okinawan elderly people who consume this diet have lower rates of cardiovascular disease, some cancers and diabetes. The NU-AGE researchers highlight that we all share a common mission to educate the public about health, family and societal benefits of traditional diets.



For further information please see:

[Santoro A, Brigidi P, S. Gonos E, et al. \(2014\). Mediterranean Diet and Inflammaging in the elderly: the EU project NU-AGE. Mechanisms of Ageing and Development. 136-137:1-162. Published online ahead of print 25 January 2014. DOI: 10.1016/j.mad.2014.01.006](#)