coffee&health

from the institute for scientific information on coffee

The good things in life: Nutrition, coffee and age-related cognitive decline

Contents

Foreword

The demographic population of Europe is changing: there is a growing population of older adults. The United Nations' 'World Population Ageing' report highlights that there were 176.5 million people aged 60 years or over in 2015, and that this is projected to rise to 217.2 million by 2030[1]. Understanding and communicating diet and lifestyle factors that may limit age-related cognitive decline will help to improve the quality of life for this growing demographic.

The relationship between coffee consumption and ageing is of particular interest to healthcare professionals. Studies suggest that a regular, lifelong, moderate consumption of coffee/caffeine may slow down physiological, age-related cognitive decline and may reduce the risk of developing Alzheimer's Disease and Parkinson's Disease.

Delegates gathered at the European Union Geriatric Medicine Society (EUGMS) 2016 congress in Lisbon, Portugal, to discuss the congress theme: "Discovering new ways in the World of Geriatrics", in a search for knowledge that will improve older patients' care. The Institute for Scientific Information on Coffee (ISIC), a not-for-profit organization devoted to the study and disclosure of science related to coffee and health, hosted a symposium on the subject of 'Nutrition, Coffee and Age-related Cognitive Decline', where a group of eminent experts presented the latest research in this area.

Professor Lisette de Groot, Professor of Nutrition and Ageing, Division of Human Nutrition at Wageningen University (The Netherlands), led with an overview of research relating to the role of nutrition in cognitive function as we age. Professor Rodrigo A. Cunha, Professor at the Faculty of Medicine of the University of Coimbra and Principal Investigator at the Centre for Neuroscience and Cell Biology of the University of Coimbra (CNC) (Portugal), presented research in the area of coffee, caffeine and cognitive decline, including the current evidence and potential mechanisms. Finally, Dr Elisabet Rothenberg, Associate Professor of Nutrition at Kristianstad University (Sweden), discussed the evidence and implications for healthcare advice to patients.

The symposium provided a unique opportunity to highlight and consider recent research that suggests an association between moderate coffee consumption (3–5 cups per day) and a reduction in age-related cognitive decline. This report details the research discussed at the symposium and highlights the potential role of moderate coffee consumption in supporting healthy ageing.

Professor Athanase Benetos
Academic Director, EUGMS, France

Executive summary

Understanding the role of nutrition in cognitive function as we age is important. Europe is negotiating the needs of an ageing population to enhance quality of life amongst this demographic. Healthcare professionals have an important part to play in providing patients with accurate research-based information, to help them follow a healthy diet and lifestyle, and in turn, reduce their risk of age-related cognitive decline.

Research presented within this report suggests intakes of dietary components such as omega 3 fatty acids, B vitamins, and antioxidant nutrients have been associated with improvements in cognition in the elderly. The dietary pattern associated with a Mediterranean-style diet provides good sources of these nutrients, and overall is associated with aspects of healthy ageing such as improvements in cognitive and cardiovascular health.

A moderate intake of coffee (3–5 cups per day) may provide protection against age-related cognitive decline and other neurodegenerative diseases such as Alzheimer's and Parkinson's Disease. The association between coffee consumption and cognitive decline is illustrated by a 'U-shaped' pattern in recent meta-analyses, with the greatest protection seen at an intake of approximately 3–5 cups of coffee per day. In its Scientific Opinion on the safety of caffeine, the European Food Safety Authority (EFSA) concluded that intakes up to 400mg of caffeine (the equivalent of up to 5 cups of coffee per day), from all sources, do not raise any concerns for healthy adults. One cup of coffee provides approximately 75–100mg caffeine.

Although the precise mechanisms of action behind the suggested association between coffee and age-related cognitive decline are unknown, since the effect is observed with caffeinated but not decaffeinated coffee, caffeine is likely to be involved. There are many other compounds in coffee, such as antioxidants and anti-inflammatory agents that may play a role.

Coffee drinking also facilitates a social network in older adults, which is a key part of healthy ageing. Making coffee consumption a social occasion can help to maintain links with friends and neighbours.

Europe — an ageing nation

Europe's population is ageing, and as a result, more issues and diseases associated with ageing are being observed and treated by healthcare professionals. In Europe, 30.8% of the general population were aged between 50 and 79 in 2015, and this percentage is expected to increase to 35.6% by 2040[2]. Data suggest that the ratio of elderly people to those of current working age will double by 2050, not only increasing the burden on healthcare systems but also presenting a significant economic burden to support this ageing population[3].

Cognitive functions remain more or less stable until about 60 years old, at which point they tend to decline, particularly between 60 and 80 years of age. Both the rate and extent of cognitive decline varies between individuals: however, some research suggests that brain function may start to deteriorate as early as 45 years old[4].

The incidence of neurological conditions, including Alzheimer's and Parkinson's Disease, is higher in older adults. Approximately 1 in 20 adults over the age of 65 suffer from Alzheimer's Disease, the most frequent cause of dementia[5–7]. Parkinson's Disease is also more prevalent in those aged over 60 years[8].

Improving the health and wellbeing of our older population to ensure a good quality of life in later years is a key task for healthcare providers across Europe. Focusing on strategies to reduce the risk of developing non-communicable diseases such as heart disease, stroke, diabetes, cognitive decline and neurodegenerative diseases is a key goal not only for improvements in health, but also to limit the economic burden of disease. To achieve these goals, an overarching view of both diet and lifestyle of older adults is required. Healthcare professionals are charged to deliver preventative advice to older patients that is effective, realistic and science based.

The role of nutrition in cognitive function as we age

Healthy ageing can help to maintain quality of life in later years and limit the economic burden of disease. Maintaining cognitive function is a key element of healthy ageing. Poor diet, excessive alcohol intake, lack of physical exercise, vascular diseases, genetic factors, oxidative stress and inflammation may all accelerate cognitive decline. Improving these factors through better diet and lifestyle changes may therefore help to reduce the risk of developing cognitive decline.

Research has suggested that a number of nutritional factors can impact cognitive function. Although not an exhaustive list, nutrients that are of particular interest currently include: omega 3 fatty acids, B vitamins, a Mediterranean-style diet, and coffee and caffeine.

Omega 3 fatty acids

Omega 3 fatty acids are understood to have a beneficial impact on healthy ageing by reducing inflammation and protecting cardiovascular and cerebrovascular function. Studies have also suggested that omega 3 fatty acids are associated with improvements in cognition[9]. A 2012 meta-analysis concluded that the effects of omega 3 supplementation were only observed in those with existing mild cognitive impairment, not in healthy adults or those with existing dementia[9]. A further review of observational studies showed preservation of brain morphology and an increase in executive function in those supplemented with omega 3 fatty acids[10]. Research suggests that at least one portion of oily fish per week can provide the benefits associated with omega 3 fatty acids.

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B vitamins

B vitamins have many important functions in the body, one of which is linked to homocysteine metabolism. B vitamins may help to beneficially limit circulating levels of homocysteine, high levels of which are associated with increased brain damage. Supplementation with B vitamins appears to benefit those with existing mild cognitive impairment rather than those who are apparently healthy. In those with cognitive impairment, B vitamins may have a positive effect on memory and reduce alterations of brain morphology[11,12,13].

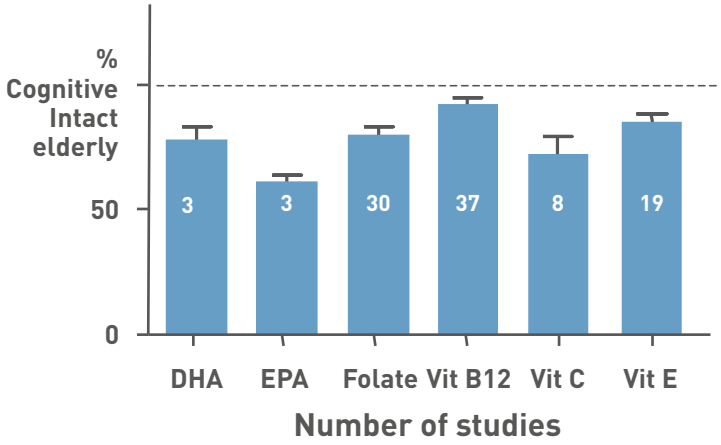


Figure 1: Comparison of plasma nutrient levels in cognitively intact individuals and patients with Alzheimer's Disease. [Lopes da Silva (2014)] A 2013 meta-analysis reviewed levels of certain nutrients in the blood in those with intact cognitive function compared to those with AD. Levels of nutrients including folate, vitamins B12, C, and E and compounds derived from omega 3 fatty acids were typically lower in those with cognitive impairment[14].

Mediterranean Diet

Overall, dietary advice is moving to a more holistic approach, encouraging healthier diets in general rather than focussing on specific nutrients. One example of this is the 'Mediterranean Diet', which focuses on higher intakes of fruit, vegetables, wholegrains, and unsaturated fats, with a moderate alcohol intake. In many parts of the Mediterranean (Greece, Italy, Spain and Turkey for example) and even other European countries such as Portugal, coffee drinking is a ritual and a significant part of everyday life.

Research suggests that a Mediterranean-style diet may be associated with better cognitive performance. Research from the PREDIMED study suggested that the protective effect of the Mediterranean diet improved cognitive performance as opposed to a reduction in cognitive decline[15]. Further work has suggested that a combination of a Mediterranean-style diet and elements of the DASH diet (an eating plan designed to control blood pressure that is rich in fruits and vegetables, low-fat and non-fat dairy, nuts, beans, and seeds) was particularly associated with a reduced risk of Alzheimer's by up to 35–53%[16].

Coffee, caffeine and cognitive decline — current evidence and potential mechanisms

Research suggests that coffee drinkers have a reduced incidence of age-related cognitive decline. The HALE Study (Healthy Ageing: a Longitudinal study in Europe) concluded that moderate coffee drinking was associated with a reduction in cognitive decline, particularly in elderly men, suggesting a 'U-shaped' association with optimum protection seen at 3–5 cups of coffee per day[18].

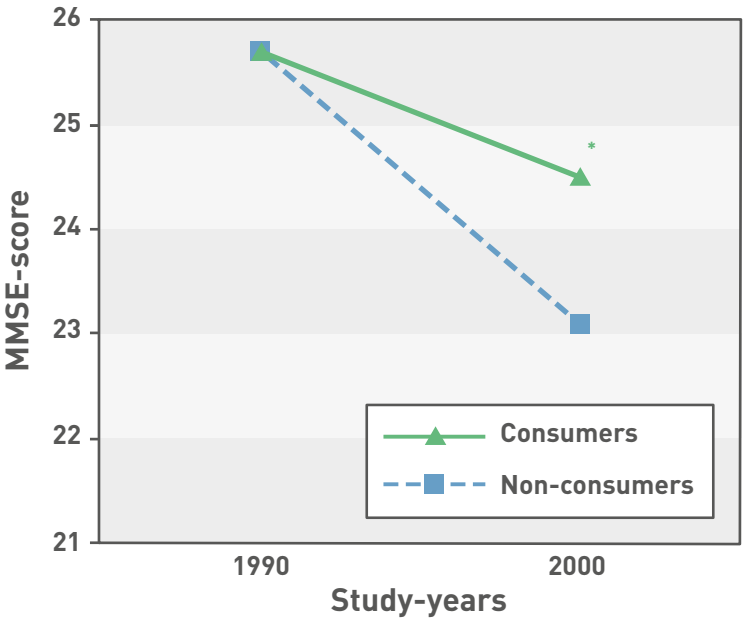


Figure 2: Relationships between coffee consumption and mental state score [Van Gelder, 2007] This chart shows cognitive function in coffee drinkers compared to non-consumers, with a higher cognitive score in coffee drinkers.

Research from
Prof Lisette de Groot

Coffee consumption patterns in the older population

Healthcare professionals should bear in mind cultural differences in coffee intake when imparting data from the SENECA study on healthy ageing (Survey in Europe on Nutrition and the Elderly; a Concerted Action) concluded that coffee intakes in adults aged 70–75 years from various European countries vary by country[17]. Intakes were reported as approximately 3 cups per day in Denmark and the Netherlands, 1–2 cups a day in France, Italy and Switzerland, and less than 1 cup per day in Poland and Northern Ireland.

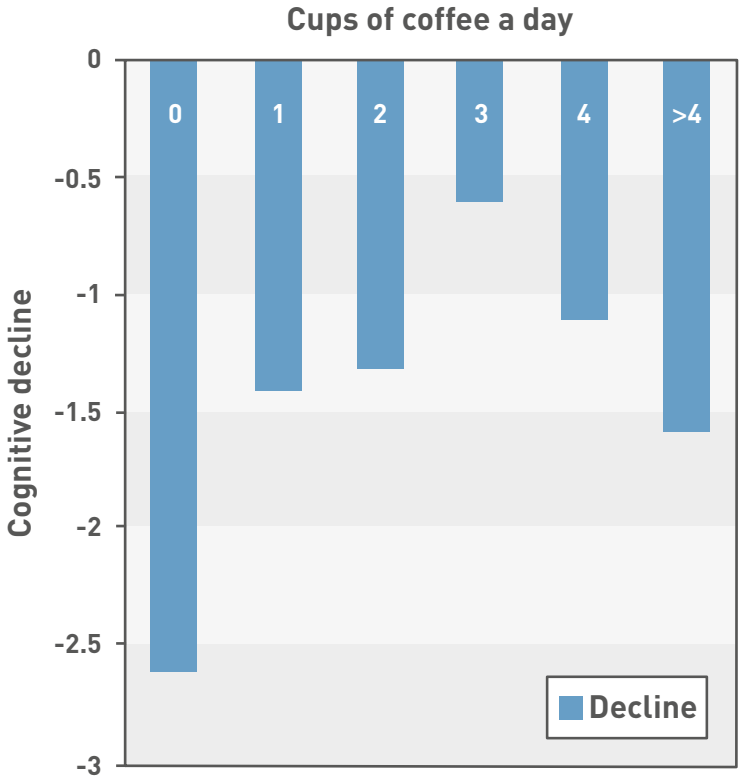


Figure 3: Cognitive decline in an elderly population in relation to coffee intake [Van Gelder, 2007]
This chart shows cognitive decline in relation to differing intakes of coffee, with a consumption level of 3 cups per day associated with the lowest level of cognitive decline.

It has been suggested that habitual coffee intakes beneficially affect cognition, probably by attenuating regular cognitive decline. Since this effect is not seen with decaffeinated coffee it is likely that caffeine is key to the association. Whilst most studies agree that regular, lifelong coffee intake is key, rather than occasional coffee drinking, the differences between the effect on men and women are less clear.

Coffee appears to reduce the risk of developing Alzheimer's Disease. Lower than average levels of caffeine in the body are associated with a greater chance of developing the disease. Research published in 2016 suggests that moderate coffee consumption can reduce the risk of developing Alzheimer's by up to 27%[19]. Research has suggested that it is regular, long-term coffee drinking that is key to helping to reduce the risk of Alzheimer's Disease[20]. A 2015 meta-analysis concluded that in the short-term, coffee/caffeine consumption may have a protective effect against Alzheimer's, likely due to its stimulation of the central nervous system; the systematic review also showed a long-term favourable influence in decreasing new incidence Alzheimer's Disease risk[21].

Potential mechanisms

Although the precise mechanisms for the observed effects of coffee on age-related cognitive decline and other neurodegenerative conditions are still being studied, it is clear that caffeine plays a key role. Evidence suggests that in older adults, caffeine normalises rather than boosts cognitive performance, particularly in relation to memory deterioration[22]. Normally, adenosine binds to adenosine receptors in the brain, acting as a central nervous system depressant, promoting feelings of tiredness and suppressing arousal[23]. Since caffeine and adenosine have similar structures, caffeine can also bind to the adenosine receptor, acting as an imposter. Caffeine can therefore block the actions of adenosine, leading to feelings of alertness and arousal.

Other coffee compounds such as antioxidants or anti-inflammatory agents may also be involved in reducing age-related cognitive decline and Alzheimer's Disease. Phenolic acids, such as caffeic acid, are polyphenols (antioxidants) found in coffee, and research suggests that these may be associated with improved cognitive function and protection against aluminium chloride-induced dementia[24]. Further studies to identify the exact coffee compounds that play an active role in reducing cognitive decline, and their mechanisms of action, are required.

Caffeine and adenosine receptors

Prof Rodrigo A. Cunha

The actions of caffeine in the body may vary depending on the specific type of adenosine receptor (A1, A2A, A3 and A2B) involved. Long-term caffeine intake has been shown to be key in reducing the risk of age-related cognitive decline. Research suggests that the A2A receptor may be of particular importance. Targeting adenosine receptors with caffeine is considered to be a key step in improving cognitive function[25,26].

Evidence for an optimal intake of coffee?

Although an optimal amount of coffee to consume remains undefined, evidence suggests that a lifelong moderate coffee consumption of 3–5 cups of coffee per day is associated with improvements in age-related cognitive decline, and reductions in the risk of developing Alzheimer's and Parkinson's Diseases[18,27,28,29].

It is difficult to draw firm conclusions about an optimal intake of coffee from the research as there are many factors to consider. Of note are genetic differences in the way individuals metabolise and react to caffeine, which may in part explain individual responses to the effects of coffee drinking. Some research suggests that older adults may be more sensitive to the effects of caffeine[30]. This is likely because elderly people often lose weight as they age. As body mass can affect the rate at which caffeine is absorbed, a lower body weight may reduce tolerance. Furthermore, the targets for caffeine (the adenosine receptors) change with aging as an adaptive strategy to maintain brain function[31].

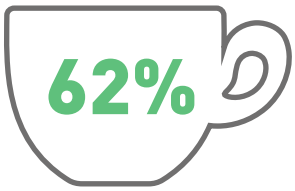
Practical advice for healthcare professionals

Research on diet and the risk of non-communicable disease enables us to understand which dietary aspects should be focused on to improve patients' health. Communicating this information to the population is vital to encourage healthier lifestyles. Even today, socioeconomic health inequalities are readily observed: for example, those with a better standard of education tend to be more active, have a better diet and, overall, live longer.

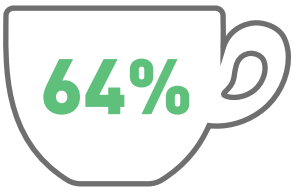
Official bodies including the World Health Organization, World Cancer Research Fund and country specific health bodies are consistent in their recommendations. The overall dietary pattern is key, rather than a focus on individual nutrients. The Mediterranean-style diet is one that is much studied, with published research suggesting that a greater adherence to this style of diet is associated with slower cognitive decline and lower risk of developing Alzheimer's Disease[21,32,33].

Consumer attitudes towards coffee drinking

In 2015, a survey conducted by the Institute for Scientific Information on Coffee among over 4,000 adults across 10 European countries considered consumer understanding, beliefs, behaviours, and knowledge regarding a healthy diet[34]. Despite the scientific evidence, ISIC's survey suggests that the role of coffee as part of a healthy diet and lifestyle is not fully understood across Europe. Although it is well recognised that moderate coffee consumption can increase concentration and alertness, many are unaware of coffee's other suggested benefits.



of respondents aged 55+ believed coffee was 'neither good nor bad for your health'



of respondents aged 55+ thought that drinking coffee does not help to reduce mental decline in older people, e.g. Alzheimer's Disease and Parkinson's

Figure 4: Findings from a survey by ISIC, conducted through an independent research company in November 2015[34]. 4119 respondents across 10 European countries were surveyed.

Overall, the results from ISIC's survey suggest that consumers are confused about the potential health effects of coffee, in part, because the information they receive is not in line with the latest science[34]. This presents challenges for healthcare professionals across

Europe, as they must therefore address common misconceptions and help patients to understand the role of key nutrients in the diet. Findings suggest the contribution coffee makes to hydration, as well as the role coffee can play in cognitive health, are particularly misunderstood.

Practical advice on coffee drinking

Research has suggested that a moderate intake of coffee (3–5 cups of coffee per day) can help to reduce age-related cognitive decline and risk of other neurodegenerative disorders. In its Scientific Opinion on the Safety of Caffeine, the European Food Safety Association confirmed that intakes of up to 400mg of caffeine per day (the equivalent of up to 5 cups of coffee) do not raise any concerns for healthy adults[35].

One of the most common health issues seen in older adults is dehydration. Even mild dehydration is known to affect alertness and cognition. A regular fluid intake is important for all populations, with beverages such as water, tea, coffee, milk and juices all contributing to hydration status. Although caffeine can have a mild diuretic effect and increase frequency of urination in non-habitual coffee drinkers, moderate amounts do not increase the overall amount of urine passed. Caffeine tolerance develops after habitual consumption and the fluid provided by a cup of coffee outweighs any effect of the caffeine present, contributing towards fluid balance[36,37].

Coffee beverages can also contribute to intakes of key nutrients. For instance, milky coffee provides protein and calcium (from milk): both of which are of particular importance in diets for older people for muscle and bone health. Those concerned about overall energy intakes may need to limit additional calories by reducing or restricting the addition of sugars, sweet syrups or full fat milk or cream to their coffee.

Coffee as part of a social occasion

Coffee is a beverage enjoyed by millions for its flavour and aroma. Anecdotal evidence suggests that sensing the aroma of coffee may have an impact on feelings of alertness, although further research is required to confirm this[38]. Research does suggest, however, that aroma can trigger emotions and evoke memories[39]. Coffee may also form the focus of a social occasion, a key aspect of life as we age understood to help reduce the incidence of isolation and depression.

The coffee occasion

Coffee is very much part of daily routine for many Europeans, marking a specific time of day or forming part of an enjoyable social occasion. Although moderate coffee consumption (3–5 cups per day) has been associated with a range of desired physiological effects, 49% of those responding to ISIC's 2015 survey on coffee and a healthy diet believed 'drinking coffee may cause health problems'. The perceived health effects of a coffee break may be influenced by the choice of accompaniment, for some it might be a fruit-based option, for others a sweet treat such as a pastry, cake or biscuit, whilst others may associate it with a cigarette break.

Conclusion

Regular lifelong coffee consumption is associated with a reduced risk of age-related cognitive decline and other conditions associated with ageing, such as Alzheimer's Disease, Parkinson's Disease, and cerebrovascular disease. A moderate intake of coffee (around 3–5 cups per day) has been shown to be protective against these conditions. The caffeine in coffee is key to the favourable association with age-related cognitive decline, but other compounds found in coffee, such as antioxidants or anti-inflammatory agents, may also play a role.

Intakes of other dietary components such as omega 3 fatty acids, B vitamins, and antioxidant nutrients are also associated with improvements in cognition in the elderly. The dietary pattern associated with a Mediterranean-style diet provides good sources of these nutrients, and overall is associated with aspects of healthy ageing such as improvements in cognitive and cardiovascular health.

Coffee drinking also facilitates a social network in older adults, which is a key part of healthy ageing. Making coffee consumption a social occasion can help to maintain links with friends and neighbours, which in turn can be important for monitoring health and reducing the risk of loneliness and depression.

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About ISIC

The Institute for Scientific Information on Coffee (ISIC) is a not-for-profit organization, established in 1990 and devoted to the study and disclosure of science related to "coffee and health." Since 2003 ISIC has also supported a pan-European education programme, working in partnership with national coffee associations in nine countries to convey current scientific knowledge on "coffee and health" to health care professionals.

ISIC respects scientific research ethics in all its activities. ISIC's communications are based on sound science and rely on evidence and scientific studies derived from peer-reviewed scientific journals and other publications.

ISIC members are six of the major European coffee companies: illycaffè, Jacobs Douwe Egberts, Lavazza, Nestlé, Paulig, and Tchibo.

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The European Union Geriatric Medicine Society Congress

The annual European Union Geriatric Medicine Society Congress is a forum that brings together a range of delegates including; academics and researchers, healthcare professionals, policy makers and civil servants, and industry representatives.

At the 12th International Congress of European Union Geriatric Medicine Society on 6th October 2016, ISIC hosted a symposium on Nutrition, Coffee and Age-Related Cognitive Decline, with an expert panel from across Europe:

Professor Lisette de Groot

Professor of Nutrition and Ageing, Division of Human Nutrition at Wageningen University (The Netherlands)

Lisette CPGM de Groot is Professor of Nutrition and Ageing at the Division of Human Nutrition at Wageningen University, the Netherlands. She has gained twenty-five years of research experience in the field of nutrition and health of elderly people, both in nutritional epidemiology and in intervention studies in old age. Her research interests centre around the role of nutrition in the maintenance of health in old age, and nutritional ways to slow down ageing related functional decline.

Professor Rodrigo A. Cunha

Professor at the Faculty of Medicine of the University of Coimbra and Principal Investigator at the Centre for Neuroscience and Cell Biology of the University of Coimbra (CNC) (Portugal)

Rodrigo A. Cunha is a Professor at the Faculty of Medicine and Principal Investigator at the Centre for Neuroscience and Cell Biology of the University of Coimbra, Portugal. He is part of the Steering Committee of the European Neuroscience Campus and the National representative of the Network of European Neuroscience Institutes.

Dr Elisabet Rothenberg

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Elisabet Rothenberg in an assistant professor at the department of Food and Meal Science at Kristianstad University, and is an associate professor at the Sahlgrenska Academy at Gothenburg University. Her special interest is dietary intake and body composition in ageing, and she has worked clinically with disease related malnutrition in nursing homes.