



# Center for Healthy Aging

Annual Report 2014

COPENHAGEN 2014

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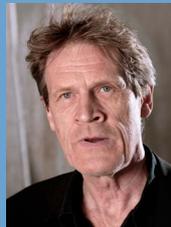
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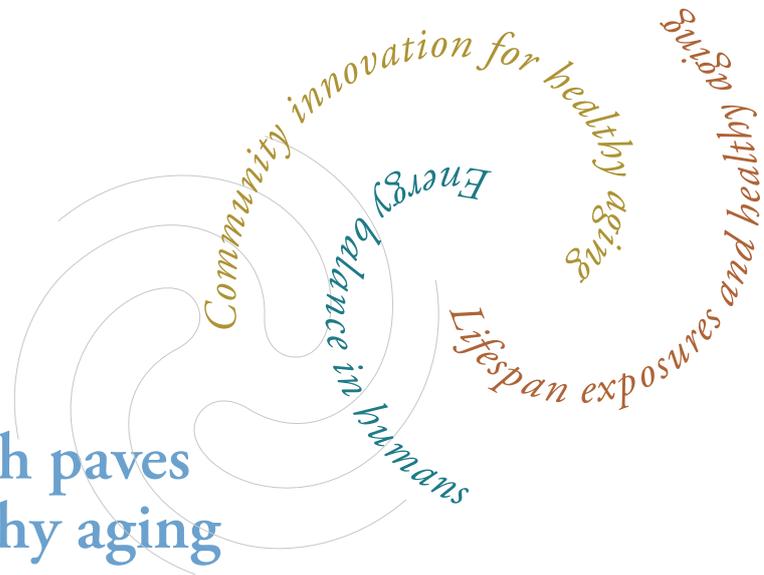
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# Involving research paves the way for healthy aging



The desire to live a long, healthy life is not just part of a speech at a christening party or a major birthday. For most people, it is one of the fundamental parameters for a happy life. We also now know that it is precisely the combination of 'long' and 'healthy' that is critical because healthy aging means that it will not necessarily be accompanied by a large increase in the number of infirmities even though more and more birthdays pass by.

Healthy aging may be significant for the quality of life for individuals but it is also a major factor at the community level because there are indisputable advantages from having a healthy population; the healthier the population, the less pressure there is on welfare services. Demographic trends with an increasing number of elderly in Denmark and internationally have put healthy aging at the top of national and international political agendas. Researching into how the population can achieve healthy aging is therefore not just a task but very much also a necessity.

In recent years, the Center for Healthy Aging (CEHA) has been a significant player, not just nationally but also in international research into healthy aging. In coming years, we shall continue to engage with the international community, also under the aegis of the EU, such as in the *EIT Health KIC* (see below for details) in which research into healthy aging is attracting great attention, and by way of the University of Copenhagen's member-

ship of IARU, an alliance of ten of the strongest research-intensive universities in the world. In this way, we ensure that our research is strongly anchored internationally.

## New interdisciplinary themes

The results of the research we have achieved and the experience we have harvested since establishing CEHA in 2009 have been invaluable, and especially usable. The interdisciplinary research model is the Center's hallmark and justification for its existence. This is why CEHA will be developing its research model in coming years. A new grant of a further 26 million USD from the Danish Nordea-fonden has ensured that we shall be able to continue researching into a whole range of important areas in coming years.

Hitherto, work at the Center was split into six research columns which worked together on various projects. At CEHA, we are now building further on the experience harvested using this model and have established three themes that all incorporate the projects that were successful in the Center's first period. At the same time, whilst we shall also be launching a series of new projects.

The three themes are:

1. *Community innovation for healthy aging* – CEHA researchers investigate the significance of the local community and opportunities for promoting the



Professor Lene Juel Rasmussen, Managing Director

health and energy of the elderly in the last stage of life. Much of this work is being done in collaboration with three different municipalities. Our researchers are also engaged in studying how historical and social changes have influenced relations between people and between generations.

2. *Life course aging processes: Lifespan exposures and healthy aging* – an area in which CEHA's researchers investigate the different factors that influence aging processes throughout life, how citizens could be motivated into active lifestyles and what happens to cells, muscles and the brain as we get older. Researchers are also carrying out a so-called intervention project focusing on physical activity to protect against age-related changes in musculature and the brain.
3. *Energy balance in humans: What are the mechanisms underlying reduced energy?* – a theme in which researchers focus on the body's inability to repair cellular damage and the mechanisms that cause the energy in our cells, and hence in our tissue and organs, to dwindle as we age.

At CEHA, we feel that these are three themes in which we can embrace research right from the cellular level via the individual to society and our culture, without doing less for one or the other. The critical factor is that we now have a range of issues that are well interconnected

and cover some important interdisciplinary problems to which we should like to find answers. At the same time, these interdisciplinary themes enable our highly specialized researchers to take entirely different methods of approach and thinking for the benefit of research. Interdisciplinarity means that we use electron microscopy and a cultural/historical helicopter approach in our research. We are not only interested in how aging occurs at the cellular level but also how psychological and social factors influence the possibilities for a good elderly life.

### External involvement

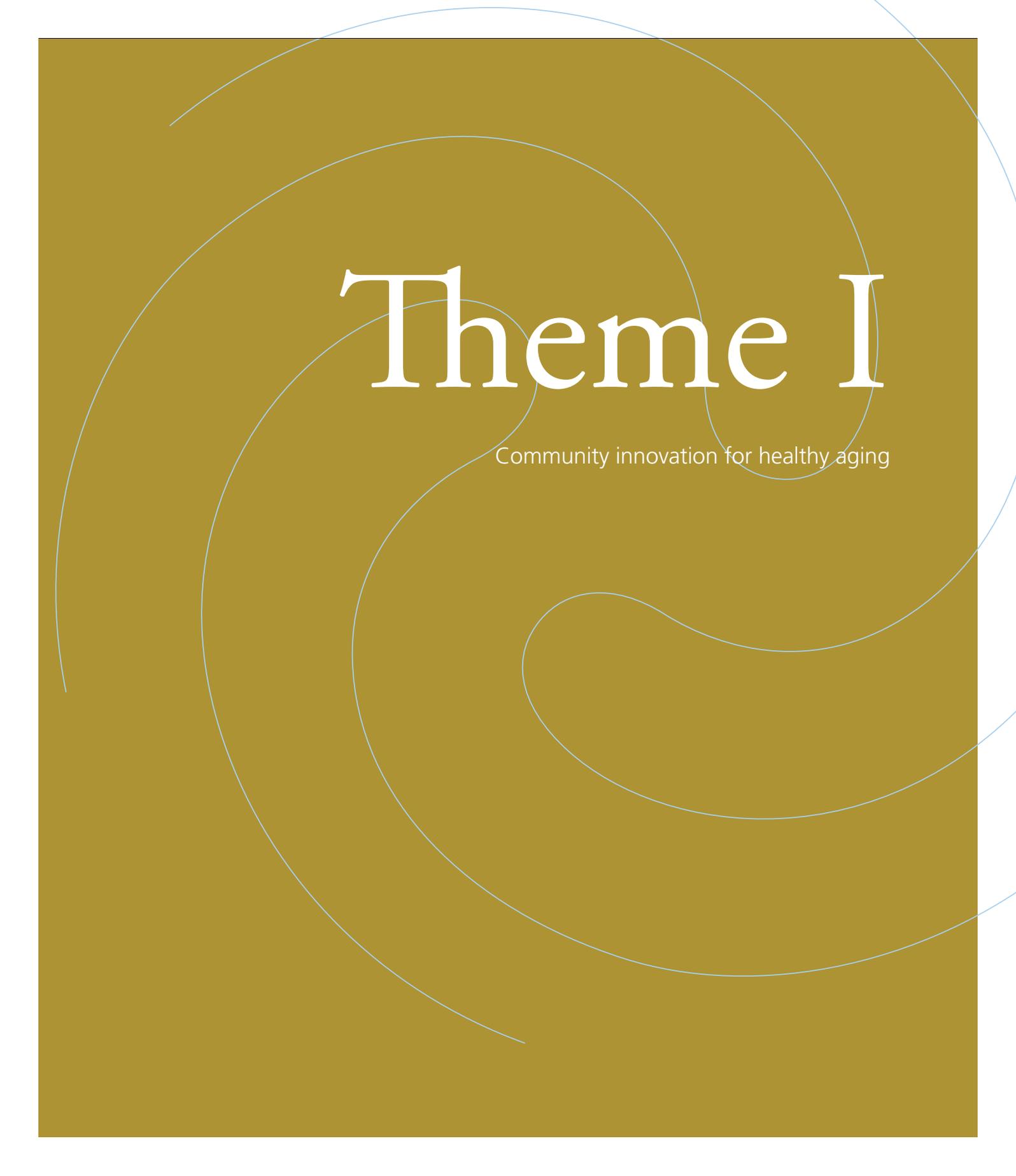
Our knowledge of a good elderly life is one of the many reasons why we at CEHA will be seeking in coming years to collaborate more with partners outside the University. It is actually crucial for our research to be not only interdisciplinary but also involving, meaning that it interacts directly with those around us. An outside world that we should very much like to get out into because, out of necessity, we find we spend too long at a time in our ivory tower. Much of CEHA's research is done in dialogue with the people who are directly affected, that is citizens as well as all the professionals who are working to create a good framework for citizens' healthy aging. Municipalities are one of the natural collaborative partners for our research since they have political responsibility for many of the areas that affect healthy aging. Over the next five years, CEHA will therefore be participating in a series of intervention projects in municipalities, especially under the aegis of the 'Health promotional innovations'. We shall also be doing our utmost to regularly communicate our results so that they can be quickly put into practice.

In this way, we shall be satisfying one of our most important goals: for CEHA's research to get to work directly together with those it is all about – our citizens who should hopefully live long, healthy lives.

A handwritten signature in blue ink that reads "Lene Juel Rasmussen". The signature is fluid and cursive, written in a professional style.

Professor Lene Juel Rasmussen, Managing Director





# Theme I

Community innovation for healthy aging



# Community innovation for healthy aging

## Group leaders

Astrid Jespersen, Associate Professor

Allan Krasnik, Professor

Bjarke Oxlund, Associate Professor

Susan Whyte, Professor

Theme I is focused on community participation and local practices as the foundation for healthy aging. We examine how differences in local settings and practices, as well as in socio-economic position affect processes and practices related to aging. Theme I researchers work in many disciplines, ranging from ethnology and anthropology to public health, and work closely together on a range of research topics. In other words, Theme I's aim is to understand how the heterogeneity of local communities influences the promotion of health and energy of aging citizens.

The research in Theme I is based on the close collaborations that we have established within four Danish municipalities: Ishøj, København, Vordingborg and Gentofte. These municipalities represent different organizational and institutional conditions as well as different population subgroups, as far as social class, ethnicity, age and health status is concerned. By focusing our research on these localities/municipalities, we create a common framework for projects and sub-projects, and facilitate insight into interactions between the bio-psycho-social, organizational and technological dynamics and social energies during daily life within these communities. The

goal is to achieve an understanding of *the reality of healthy aging* and to understand how healthy aging is promoted among aging citizens.

## Background and hypothesis

The research in Theme I is guided by four research questions:

1. What processes contribute to changing cultural ideas about health and energy over the life course within socially contrasting communities?
2. In what ways does historical change affect social relations between and within generations in a specific society?
3. How do different actors with diverse initiatives for healthy aging interact within a municipality?
4. With regard to healthy aging, how can relations between local stakeholders be reconfigured at the community level to promote energy for aging citizens nearing or in the late stages of the life course?

Theme I consists of cross-disciplinary and cross-faculty research groups, which utilize a unique combination of methods, including those from cultural history, cultural analysis, anthropology and public health.

## Program performance

In 2014, we focused on establishing good working relations and started fieldwork in all four municipalities. In addition, we recruited 1 senior researcher, 5 postdocs

and 3 Ph.D.-students. The following paragraphs describe currently active projects and sub-projects:

- The project on *local practices of active aging* investigates the following three themes through ethnographic fieldwork as well as policy analysis: Which life ideals are practiced through municipal active aging policies? How is active aging transformed in local, municipal practices? How is active aging packaged, formatted, commercialized and exported?
- A project on *intergenerational relations in age-related transitions* addresses the following questions through ethnographic fieldwork: How are transitions from work to retirement and age-influenced changes in living arrangements experienced? How do aging people navigate intergenerational relations, roles and engagement? What effect do intergenerational relations have on the older person's health practices, identity and experience of energy and resources?
- *Empowering community health* is the subject of a cultural analysis of aging citizens' practices of 'health' and 'quality of life' in a Danish municipality. This project asks the following questions: How do aging people in Gentofte Municipality practice 'health' and 'quality of life' in their everyday lives? How do aging people's subjective understandings of 'health' and 'quality of life' relate to their everyday lives? How do interactions between individuals constitute different forms of 'community'?
- The project on *healthy aging among ethnic minorities* is based on ethnographic fieldwork in Ishøj and sets out to investigate the ways in which 'healthy aging' and 'the good life' are created and enacted within the context of health promotion. This project targets ethnic minorities, and is expected to provide insight into the effects of public health policy.
- A project on *negotiating needs, negotiating old age* is focusing on the introduction of 'enabling care' in the context of Danish municipal eldercare. 'Enabling care' is a new way of practicing eldercare, and a new way of perceiving and attending to older people's needs. This project investigates how enabling care produces knowledge about what 'the good life' involves for older people, and what responsibility the welfare state has in ensuring it.
- *Transferring healthy aging* is the theme in a project based on the rise in public-private partnerships in health promotion, a trend where public health agendas meet political aspirations of achieving future welfare by exporting Danish-developed welfare technologies and innovations. The project analyses the grounds for and effects of packaging and folding Danish welfare into transferable objects able to travel to other destinations.
- The project on *third sector governance* aims to examine how local governments govern the 'third sector' (public private co-production of services) – specifically privately run associations that target elderly individuals. The project maps financial setups and economic incentives used to support the collaborative arrangement between three local governments and the community associations that provide services to elderly.
- A new project will evaluate whether *follow-up home visits* could be a useful tool to improve care, secure cross-sectoral coordination and to prevent re-admission. The project analyses the use of follow-up home visits by general practitioners for older patients after discharge, and to what extent follow-up home visits improve cross-sectoral care coordination. The project also asks which patients (age, gender, diagnosis and socioeconomic status) are receiving follow-up home visits and whether the health trajectories are better for patients who receive follow-up home visits than for those who do not.
- An anthropological postdoc project focuses on *elderly, socially-isolated men* on the eastern part of the island, Møn. Since the men may be difficult to contact, the postdoc has made it a key priority to develop the project in collaboration with the staff at the local health care center. Through intensive ethnographic fieldwork among the elderly on the island, the post-doc project aims at discovering what causes social isolation among elderly men and at finding ways to re-socialize and engage the elderly men within their communities.
- Another anthropological study on *aleness* takes its point of departure from past fieldwork (carried out in CEHA) among elderly Danish citizens receiving home nursing. The project examines the significance

of aloneness for health, wellbeing and social relations among the elderly.

In collaboration with colleagues from the Oxford Institute of Population Aging, we are also planning a new research proposal on problems and potentials related to *walkability* of neighborhoods for the elderly. This project is expected to yield significant insight into the relationship between physical and social activity and health in older people.

## Results

- Three political agendas are influential in how Danish municipalities work with promoting active aging in local communities: The development and use of new welfare technologies; strengthening of the collaboration with civil society organizations and lastly expansion of enabling care to encompass all older citizens in need of eldercare.
- A new form of rehabilitation referred to as enabling care has evolved during the last decade. Enabling care refers to a certain rehabilitative mode of eldercare, in which older people receive training and guidance in regaining the ability to carry out practical everyday tasks and/or personal care through time-limited home-based rehabilitation programmes.
- Multiple and to some extent conflicting political agendas in the governance of pharmaceuticals in Denmark leaves it up to individual clinicians to navigate between the conflicting agendas. This in turn prompts clinicians to develop their own ways of dealing with the friction between political objectives, which can lead to unintended consequences of governance attempts.
- Healthcare agreements with specific content and with regular follow-up and systematic mechanisms for organizing feedback between collaborative partners exemplify a useful tool for the coordination of health and social services, and document substantial improvements with the new health agreements in terms of formalizing a better coordination of the healthcare system.
- The practice of discontinuation of drugs should be standardized, considered, well-researched, sup-

ported with decision aids for GPs and patients, and recognized in systems of care just like practices of drug prescription. This is not the case yet, but by understanding the existing processes of discontinuing, greater equality between prescribing, continuing and discontinuing can be achieved.

- The anthropological fieldwork – among elderly Danish citizens receiving home nursing – and analysis rooted in citizenship studies focusing on rights, duties, and responsibility, indicated that elderly citizens try hard to maintain their health by physical activities, training, eating nutritionally-balanced meals, and take medication as prescribed.
- A workshop was held to discuss the expectations and goals of the collaboration between with municipal collaborators and Theme I. The workshop was attended by Theme I researchers, municipal collaborators and a representative from the foundation Nordea-fonden.

## Conclusion

Theme I research is carried out by a cross-disciplinary and cross-faculty research group. This group is unique in its ability to apply methods from cultural history, cultural analysis, anthropology and public health. Our aim is to identify how the heterogeneity of local communities influence the health and energy of aging citizens. During 2014, we began to collaborate with three Danish municipalities, each with very different population demographics and organizational character. Links with two additional municipalities are being developed, and several new researchers have been recruited. Results from completed projects have been published and a series of new projects have been initiated. It is expected that Theme I projects will elucidate how local actors contribute to healthy aging for all citizens, and will explore the impact of improved cooperation between municipal agencies, health professionals, businesses, associations, and the citizens themselves. New Theme I projects are also exploring how historical and social change affect the relationships between and within generations in a specific social context.

## Selected scientific publications

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Wadmann S. Physician-industry collaboration: conflicts of interest and the imputation of motive. *Social Studies of Science*. 44:531–554, 2014.

A complete list of publications is available at [healthyaging.ku.dk/publications](http://healthyaging.ku.dk/publications)

## PhD dissertations

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Lassen AJ. *Active ageing and the unmaking of old age: The knowledge productions, everyday practices and policies of the good late life*, CEHA Theme I, University of Copenhagen, September 2014.

Ludvigsen B. *Citizenship and Adaptation: Elderly people receiving home nursing: Perspectives on social relations, prevention, medicine and death*, CEHA Theme I, University of Copenhagen, May 2014.

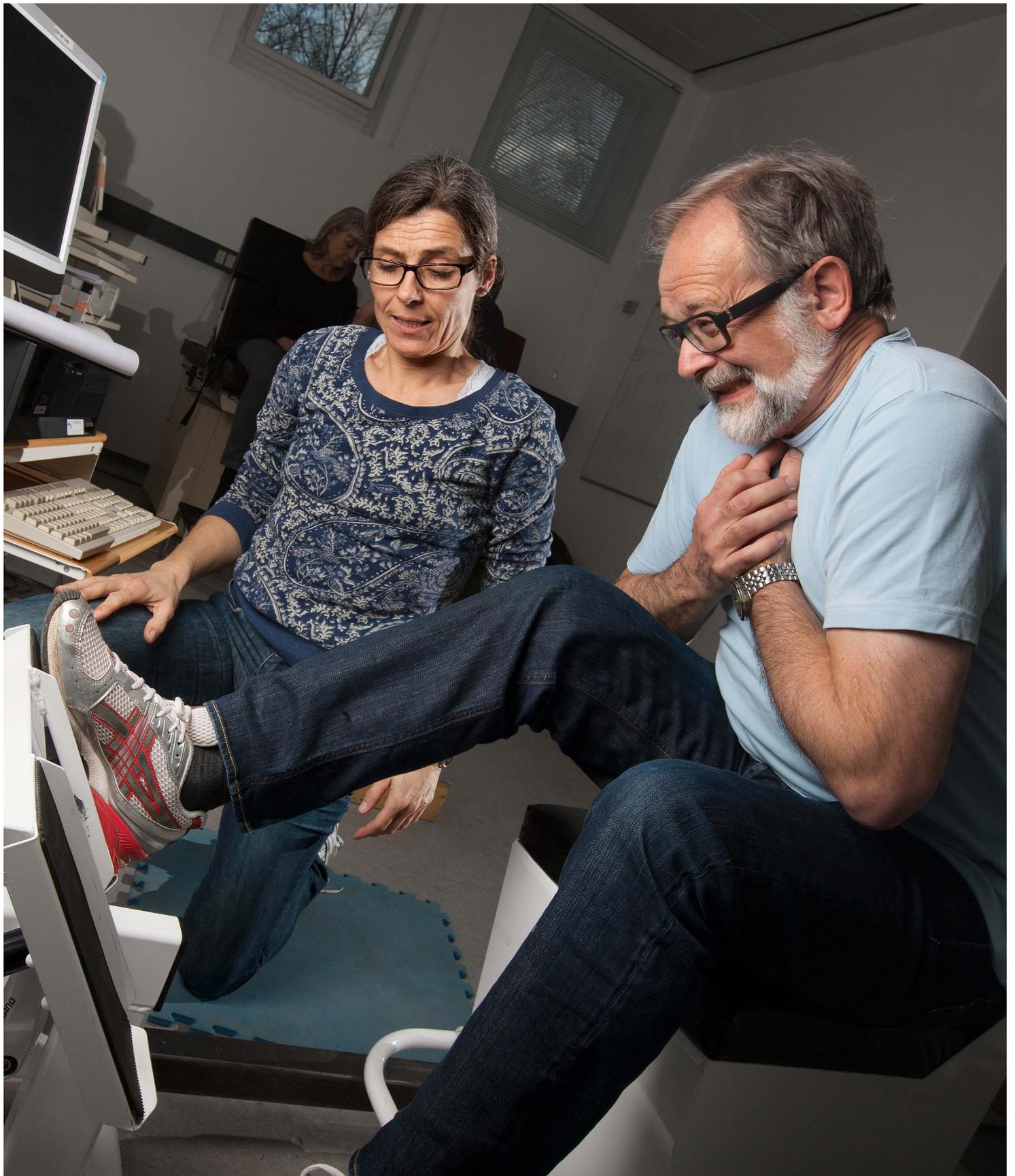
Nixon MS. *Organising medication discontinuation: An explorative study of GPs' decisions and practices when discontinuing statins*, CEHA Theme I, University of Copenhagen, October 2014.

Rudkjøbing A. *Towards coordinated care – Governance in a fragmented healthcare system*, CEHA Theme I, University of Copenhagen, September 2014.

Wadman S. *Preventive tensions – Governing clinical research and treatment practices in contemporary cardiovascular medicine in Denmark*, CEHA Theme I, University of Copenhagen, August 2014.

# Theme II

Life course aging processes:  
Lifespan exposures and healthy aging



# Life course aging processes: Lifespan exposures and healthy aging

## Group leaders

Erik Lykke Mortensen, Professor  
Rikke Lund, Associate Professor  
Martin Lauritzen, Professor  
Flemming Dela, Professor

## Introduction

The maintenance of energy in the cells and tissues of the human body is necessary for a continued active and healthy life. Life course exposures may influence aging processes and the extent to which older individuals maintain energy and an active lifestyle, or lose energy and show pronounced decline in functional ability, cognition and an increased level of overall fatigue. Theme II tries to stimulate an energetic and active lifestyle in aging individuals by:

- 1) Investigating cohorts of the middle-aged followed from their birth and coupling cognitive and physical function to exposures throughout their lifespan;
- 2) Investigating the metabolic profile of elderly individuals who receive preventive medication; and
- 3) Testing interventions in the elderly with different levels of physical fitness in order to study if interventions can promote higher energy levels and a long-term post-interventional adherence to a physically active and energetic lifestyle throughout old age.

In addition, several Theme II researchers analyze data on the Glostrup 1914 cohort, a group of individuals

followed from age 50 to age 100 for the oldest surviving cohort members. Theme II researchers have also been involved in establishing the Danish Conscription Database which includes draft board information on 728,160 men.

## Background and hypotheses

*Life course exposures:* Composite measurements of adversities and risk factors as well as measurements of positive environmental factors will predict individual differences in aging across major life periods: the earliest prenatal and early postnatal period, childhood, adolescence and young adulthood, midlife and late midlife.

*Age-related cognitive decline:* Signs of progressive cognitive decline can be confirmed in a follow-up examination of the 200 participants in the CEHA 2009-2013 cognitive neuroscience project and the results for this sample can be confirmed in a larger sample of 600 subjects.

*Physical activity intervention:* Program adherence and long-term beneficial effects will be greater for moderate training. We also hypothesize that the overall positive effects upon functional ability, cognitive functioning, health promotion and disease prevention will be greater in the long-run for those using moderate physical training than those using a high intensity training regimen.

*Cholesterol lowering drugs:* It will be necessary to conduct interdisciplinary research to describe the complex-

ity of a medical issue from biological, humanistic and anthropological points of view.

### Program performance

A major focus has been on life course social inequalities in early aging as reflected in low-grade inflammation (LGI) and physical functioning in midlife. Data from the Copenhagen Aging and Midlife Biobank (CAMB) form the basis for these projects as well as register linkage of the cohorts to the Danish Health and Social Registries including information from 1980 onwards.

Associations between growth (birth weight, early adult and midlife BMI) over the life course and midlife LGI, are also being investigated (CAMB). Based on data from Women's Health Initiative the associations between education, income and prestige of occupation and LGI are being investigated among older women.

Further studies of early physical growth and early behavioral milestones are based on the Copenhagen Perinatal Cohort. Studies have been conducted on early growth and behavioral milestones as predictors of adult personality and adult intelligence.

In addition to clinical studies of highly selected participants, ongoing projects are analyzing the issue of age-related changes in cognitive function in both middle-aged (CAMB) and older populations (the Glostrup 1914 cohort). One study is currently analyzing the association between young adult intelligence and physical performance in the middle-aged while another study is focusing on associations between young adult intelligence and risk of mental disorders. A first study based on the Danish Conscript Database is analyzing the association between intelligence at the conscript board examination and cause-specific mortality in all Danish males born in the period 1939-59. Studies based on the Glostrup 1914 cohort have a major focus on the association between cognitive function in midlife and several health outcomes in old age such as dental health, decline in cognitive function, decline in physical function, and all-cause mortality. Furthermore, a number of studies are analyzing the potential predictors of cognitive decline in old age; these studies include analyses of occupation, leisure time activities and social relations as predictors of cognitive decline. Finally, a large-scale study of associations between mental disorders, in particular alcohol

use disorders, and age-related cognitive decline is being planned and will be initiated in 2015.

An important area of aging research examines psychosocial risk factors for early aging measured as low grade inflammation (LGI), physical functioning and allostatic load. Specifically, there is an interest in analyzing the association between stressful social relations in private life and LGI as well as physical functioning. Furthermore, the association between major life events and allostatic load has been investigated. All analyses are based on data from the CAMB. Life course researchers are currently collaborating with several international researchers on projects based on CAMB data including, for example, Ivan Bautmanns from Vrije Universiteit in Brussels who is investigating the association between muscle endurance and self-perceived fatigue.

The Danish Intervention Study on Preventive Home Visits, including participants aged 75 or 80 years at baseline, is investigating if the negative effect of mobility-related fatigue on subsequent mobility can be alleviated by physical activity.

Another major life course theme is health expectancy for those aged 50 and 65 between 2004-2010 in Denmark. An additional aim is to evaluate whether health expectancy continues to increase more than life expectancy. Another project within this Theme is evaluating educational inequality in health expectancy before and after the financial crisis in Denmark amongst 50 years olds. Both projects are based on SHARE data ([www.share-project.org](http://www.share-project.org)).

Another major research focus in Theme II is cognitive function. An important collaborative effort is the Glostrup neurocognitive clinical project. From 2009-2013, about 200 men selected from the Metropolit cohort according to estimated change in cognitive function were enrolled. The plan is to expand this project to a sample of about 600 participants. During 2014, the continuation of the study was planned in detail and all necessary permissions obtained. The assessment will include both neuropsychological assessment and MRI brain scanning. The same assessments will also be included in a new study which will be based on the Copenhagen Perinatal Cohort and include both male and female participants.

## Results

- CAMB has been completed and described in several publications in the Journal of Aging and Health. A conscription database comprising data on 728,160 men has been completed and a paper describing the database has been published
- The physical training intervention project has successfully been initiated as a collaboration amongst several research groups within the Center for Healthy Aging.
- A cohort of statin users for primary and secondary prevention purposes and matched controls has been established.
- Patients with a diagnosis of Parkinson's disease showed significant differences in morbidities early on, following, and prior to, their diagnosis, compared with healthy controls.
- Bariatric patients with type 2 diabetes had better physical health related quality of life than non-diabetic patients.
- Findings suggest that inactivity and training alter mitochondrial biogenesis equally in young and elderly men.
- Both gender differences and social class gradients can be observed on physical performance tests in late midlife.
- Social gradients in allostatic load can be observed in late midlife.
- Early life adversity may potentiate the effects of later stress on cumulative physiological dysregulation.
- Aspects of adult personality may be related to early postnatal growth.
- Intelligence may mediate associations between early socioeconomic position and adult personality.
- The overall burden of cardiovascular risk factors may be more important than individual risk factors for cognitive decline.
- No evidence was found for long-term effects of occupational characteristics on cognitive change in old age.
- No evidence was found that a higher level or maintenance of leisure activity was protective against cognitive decline across a 10-year follow-up.
- Cognitive ability and personality are related to a broad range of socio-demographic variables in late midlife.
- Cognitive ability in young adulthood is related to mortality from both natural and unnatural causes.
- Social relations are associated with increased mortality risk among middle-aged men and women for a variety of different social roles. Those outside the labor force and men seem especially vulnerable to this exposure.
- Negative aspects of close social relations are associated with a higher risk of ischaemic heart disease hospitalization. Conflicts with partner are not associated with higher risk.
- Mobility-related fatigue is not a significantly stronger risk factor for subsequent mobility limitations among those with concomitant exposure to low socioeconomic status compared to those with a high socioeconomic status.
- Examination of the neurocognitive correlates of decline in intelligence showed a global pattern of impairment which was not indicative of accelerated cognitive aging effects, or of mild cognitive impairment (MCI).
- The trajectory of intelligence from youth to late midlife was related to education, vocational training and certain health variables, although they did not explain much of the variance in neurocognitive performance.
- The results indicate that intelligence may be more amenable to life experience than previously thought, and underscore the importance of identifying factors which may enhance or reduce the resilience to age-related cognitive decline and neuropathology.
- Patients with stroke often suffer from sleep apnea which has a major impact on prognosis.
- Sleep changes may be strongly indicative of the later development of neurodegenerative disorders.
- The neurobiological basis for subclinical cognitive decline in late midlife may include task-induced deactivation alterations similar to the pattern seen in patients with Alzheimer's disease while mild cognitive impairment and task-induced deactivation reduction may suggest an early marker for subtle cognitive decline.
- There is change in brain activation pattern in subjects with loss of IQ since youth, even when this loss is subclinical.
- The change in brain activation pattern is not associ-



ated with traditional risk factors for, or signs of, brain ischemia.

- The change in IQ from young adulthood to midlife is associated with educational attainment.
- Homocystein, which is a general risk factor for vascular disease, is also a determinant of brain perfusion in elderly subjects.
- Other determinants of brain perfusion were found to include hemoglobin, caffeine and blood CO<sup>2</sup> levels.

### Conclusions

Theme II researchers conduct observational epidemiological and clinical studies as well as intervention studies. 2014 was very successful with number of significant results based on ongoing research as well as the successful initiation and planning of a series of new studies. In addition to the physical training intervention study and

the establishment of the statin user cohort, the continuation of the Glostrup neurocognitive project has been planned and a further clinical study including MRI is being planned and will be initiated during 2015.

The basic assumption of the life course approach to aging is that individual differences in aging, to a large extent, can be explained by biological development and environmental exposures in childhood, adolescence and young adulthood. CEHA researchers have contributed evidence corroborating this general point of view, including a number of studies focusing on the identification of early aging biomarkers. These studies include several biological markers (e.g., low-grade inflammation, telomere length, mitochondrial function), physiological indicators (e.g., muscle strength, balance), cognitive decline, and self-reported indicators of aging (e.g., disability, fatigue). The physical activity training intervention study is not

only a substantial collaborative effort across the three CEHA Themes, but also an important example of CEHA researchers moving from observational and experimental laboratory studies to naturalistic interventions contributing to improving the health and quality of life of the present generations of older people.

### Selected scientific publications

Dich N, Hansen AM, Avlund K, Lund R, Mortensen EL, Bruunsgaard H, Rod NH. Early life adversity potentiates the effects of later life stress on cumulative physiological dysregulation. *Anxiety, Stress and Coping*. 30: In press, 2014.

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Wimmelmann CL, Smith E, Lund MT, Hansen M, Dela F, Mortensen EL. The psychological profile of bariatric patients with and without type-2 diabetes: Baseline results of the prospective GASMITO-PSYC study. *Surgery for Obesity and Related Diseases*. In press, 2014.

A complete list of publications is available at [healthyaging.ku.dk/publications](http://healthyaging.ku.dk/publications)

### PhD dissertations

Bay B. *Assisted reproduction and child neurodevelopment*, CEHA Theme II, University of Copenhagen, May 2014.

Christiansen LB. *Mitochondrial structure and function in feline hypertrophic cardiomyopathy: An animal model of spontaneous disease*, CEHA Theme II, University of Copenhagen, December 2014.

Emme C. *Quality of life in patients with chronic obstructive pulmonary disease*, CEHA Theme II, University of Copenhagen, February 2014.

Gram M. *Mitochondrial function in young and elderly men after immobilization and aerobic retraining*, CEHA Theme II, University of Copenhagen, December 2014

Hansen NL. *The dynamic brain Activity patterns in cognitive ageing and during cerebral blood flow modulation*, CEHA Theme II, University of Copenhagen, November 2014.

Larsen S. *Mitochondrial function in human skeletal muscle: Influence of age, physical fitness and insulin sensitivity*, CEHA Theme II, University of Copenhagen, February 2014.

Lund MT. *The influence of lifestyle interventions on glucose homeostasis*, CEHA Theme II, University of Copenhagen, September 2014.



# Theme III

Energy balance in humans:  
What are the mechanisms underlying reduced energy?



# Energy balance in humans: What are the mechanisms underlying reduced energy?

## Group leaders

Lene Juel Rasmussen, Professor  
Hocine Mankouri, Associate Professor/  
Ian Hickson, Professor  
Michael Kjær, Professor  
Jørn Helge, Professor  
Linda Bergersen, Professor  
Vilhelm Bohr, Professor  
Javier Pena-Diaz, Assistant Professor  
Andres Lopez-Contreras, Associate Professor

## Introduction

Aging is associated with a general decline in energy levels or 'vitality'. At the cellular, tissue, and organ levels, loss of vitality correlates with inability to adequately replace or repair 'worn-out' or damaged components. Theme III aims to better understand the molecular and physiological mechanisms that cause age-associated loss of vitality. This knowledge will ultimately lead to the development of novel strategies to diagnose and counteract age-associated functional decline, and allow us to have a higher quality of life as we age, which can also be described as 'longer healthspan'.

Illustration: Lehninger Preparations by Odra Noel ([odranoel.eu/](http://odranoel.eu/)). This piece is a homage to Lehninger, of the 'Principles of Biochemistry' fame. It is part of the series of Homage to pioneers, made for an exhibition at the Oroboros Museum of Scientific Art in Innsbruck.

## Background and Hypothesis

### I. Understanding the basic cellular mechanisms of aging

At the cellular level, we aim to understand how DNA damage contributes to aging. A number of DNA repair pathways counteract DNA damage and are implicated in suppressing premature aging and in maintaining genome stability in the nucleus and the mitochondria. The mitochondrion is known as the 'powerhouse' of the cell, because they generate ATP, which is the fuel for many intracellular processes. DNA repair pathways protect the nuclear and mitochondrial genomes from nearly continuous attack from intrinsic and external DNA damaging agents. Although cells can efficiently repair DNA damage, if the rate of damage exceeds the rate of repair, mutations and other changes in genome structure will eventually accumulate, leading to altered gene expression, and cellular dysfunction. Indeed, increased DNA damage and mitochondrial dysfunction are two well-characterized phenotypes of aging. Furthermore, mitochondrial dysfunction leads to age-associated pathologies, such as cognitive and/or neurological decline, muscle weakness and fatigue. We believe that this perpetual cycle of DNA damage and repair has important implications for understanding aging-associated changes in the physiology of cells and tissues. Theme III researchers study energy homeostasis/balance with a powerful set of tools, including molecular genetics, biochemistry, molecular and cell biology, in the context of cell culture and animal models, including mouse models. We are

also investigating the effects of mitochondrial dysfunction on organ/tissue level processes during aging, by analyzing the relationships between mitochondrial dysfunction, premature cognitive decline and age-associated muscle dysfunction.

## **II. Understanding the relationships between cellular aging & tissue/organ aging**

Theme III researchers are investigating the connection between DNA damage and brain deterioration. Mitochondrial dysfunction leads to increased production of reactive oxygen species (ROS) as well as reduced production of ATP. The brain is especially susceptible to oxidative DNA damage from ROS, and this may directly contribute to age-associated cognitive decline and neurodegenerative diseases such as Alzheimer's disease. We therefore aim to better understand how cells repair and respond to oxidative damage to the nuclear and mitochondrial genomes.

### **Theme III**

Theme III researchers are also investigating aging-associated decline in muscle function, a well-established but poorly understood phenomenon. A contributing factor is physical inactivity, but other factors are decreasing capacity for muscle growth and relative increase in muscle catabolism (i.e., muscle breakdown) with age. In some individuals, the net effect is rapid muscle deterioration, also known as sarcopenia, whilst others are relatively resistant to muscle loss during periods of reduced physical activity. We are investigating the biological and physiological mechanisms that lead to, or could prevent muscle loss and/or sarcopenia in the elderly. Better understanding of these mechanisms could potentially help us develop novel treatments or interventions that promote retention of muscle mass in individuals susceptible to muscle loss during inactivity. In particular, we are examining how physical training induces physiological change in muscle, and how this knowledge could be exploited to improve 'healthspan' and vitality in older individuals, as well as in individuals whose capacity for physical training is limited and/or restricted for other reasons.

## **Program performance**

### **I. Characterizing the cellular defects that contribute to aging**

Balanced levels of dNTPs are important for maintaining genomic stability. We demonstrated previously that depletion of mtDNA in cultured human cells can lead to imbalanced cytosolic dNTP pools, and a corresponding increase in chromosomal instability. The mtDNA carries genes that encode protein components of the electron transport chain (ETC) and proteins that facilitate ATP production by oxidative phosphorylation. Mitochondrial proteins also perform *de novo* synthesis of pyrimidines through dihydroorotate dehydrogenase (DHODHase), which localizes to the inner mitochondrial membrane. We demonstrated that inhibition of ATP synthase or DHODHase decreases cytosolic dNTPs, leading to increased DNA damage. These findings suggest that mitochondrial dysfunction could directly (or indirectly) promote DNA damage and genome instability during aging.

We are also examining how inherently 'fragile' or unstable regions of the human genome contribute to genome instability during aging. The RecQ family of DNA helicases appear to be critical in preventing age-associated genome instability. We are further characterizing how the roles and mechanisms of these important enzymes using a range of biochemical and cell biological techniques.

### **II. Characterization of novel biomarkers of vitality**

To identify novel biomarkers of vitality, we examined spontaneous DNA damage, cardiovascular risk and physical performance in 2487 participants of the Metropolitan cohort (a birth cohort of 11, 532 men born in 1953 in the Copenhagen Metropolitan area). We observed that vitality correlates inversely with the abundance of spontaneous DNA breaks, and correlates positively with several parameters of physical performance. The results of this study reveal possible 'early warning' biomarkers of incipient frailty or loss of vitality. Additional study of these associations may ultimately provide novel insights into the physiological mechanisms that impact upon energy levels during aging.

### III. Characterizing the effects of physical exercise on sarcopenia

We investigated the properties of connective tissue in old and young athletes and non-athletes. The results suggest that non-reversible advanced glycation end-products are present at a lower level in individuals who perform endurance sports throughout their lives, even into old age. Although tendons tend to become 'loose' after periods of inactivity, they can return to/ re-acquire normal function and characteristics when activity is resumed (i.e., during re-mobilization). Inactivity-related change in mechanical properties of connective tissue can be reversed by exogenous growth hormone, which stimulate release of insulin-like growth factor I, especially in younger individuals.

We also demonstrated that muscle mass correlates inversely with the level of inflammatory markers in the blood. Interestingly, the level of inflammatory markers was similar in untrained but healthy young individuals ( $\approx 20$  yrs old) and highly-trained elderly endurance master athletes (70 yrs old). In normal older individuals who maintained a moderate level of activity, circulating inflammatory factors were higher, muscle mass was lower, and inactivity-induced muscle loss could be counteracted markedly through use of anti-inflammatory medication.

#### Results

- Non-reversible advanced glycation end-products are present at a lower level in connective tissues of individuals who perform life-long endurance sports.
- The inactivity-induced changes in the mechanical properties of muscles are counteracted by administration of growth hormone in young individuals.
- Skeletal muscle mass is inversely correlated with the levels of inflammatory circulating markers, which are lower in endurance trained individuals, as compared to untrained counterparts. During periods of inactivity, the loss of skeletal muscle in elderly individuals is markedly reduced in participants receiving anti-inflammatory medication.
- The age-related decline in number of muscle stem cells ('satellite cells') occurs independently of the level of physical activity undertaken.

- Inhibition of ATP synthase or DHODHase results in a subsequent decrease in cytosolic levels of dNTPs, and increased sensitivity to DNA damage.
- Mitochondrial dysfunction and increased levels of DNA damage are potential predictors of cognitive decline.
- Overexpression of DNA ligase III in mitochondria enhances cell survival following oxidative stress.
- Subjective vitality is inversely correlated with spontaneous DNA breaks, suggesting this could serve as 'early warning' biomarker that is indicative of future loss of vitality.
- Persistent activation of the DNA damage response protein, PARP1 causes the neurodegeneration seen in the premature aging syndromes Cockayne syndrome (CS), ataxia telangiectasia (A-T), and xeroderma pigmentosum A (XPA) diseases.
- High fat diet and supplementation with nicotinamide adenine dinucleotide (NAD<sup>+</sup>) can alleviate some CS phenotypes.
- The RecQ helicase, BLM, has a number of critical roles in preserving genome integrity. Newly described roles for BLM (and its orthologues in other organisms) have been identified in promoting the resolution of i) various secondary structures in replicating DNA, ii) homologous recombination repair intermediates, and iii) ultra-fine DNA bridges in anaphase.

#### Conclusions

At the cellular level, mitochondrial dysfunction and inherent chromosomal 'fragility' in the human genome can contribute to age-associated increases in DNA damage and genome instability. Indeed, our recent observations reveal that increased levels of certain types of DNA damage may serve as a useful prognostic marker for loss of vitality during aging.

Physical activity leads to an array of physiological changes, resulting in better muscle performance and increased vitality. Muscle mass and function deteriorates during periods of inactivity, and this can be counteracted in some circumstances by exogenous growth hormone and/or anti-inflammatory medication.

## Selected scientific publications

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A complete list of publications is available at [healthyaging.ku.dk/publications](http://healthyaging.ku.dk/publications)

## Doctoral dissertation

Larsen S. *Mitochondrial function in human skeletal muscle: Influence of age, physical fitness and insulin sensitivity*, CEHA Theme III, University of Copenhagen, February 2014.

## PhD dissertations

Bielert T. *Training of patients with hip arthrosis – the effect of strength training and aerobic training*, CEHA Theme III, University of Copenhagen, May 2014.

Boesen A. *Tendon and skeletal muscle responses to immobilization and rehabilitation in humans: Influence of aging and growth hormone administration*, CEHA Theme III, University of Copenhagen, April 2014.

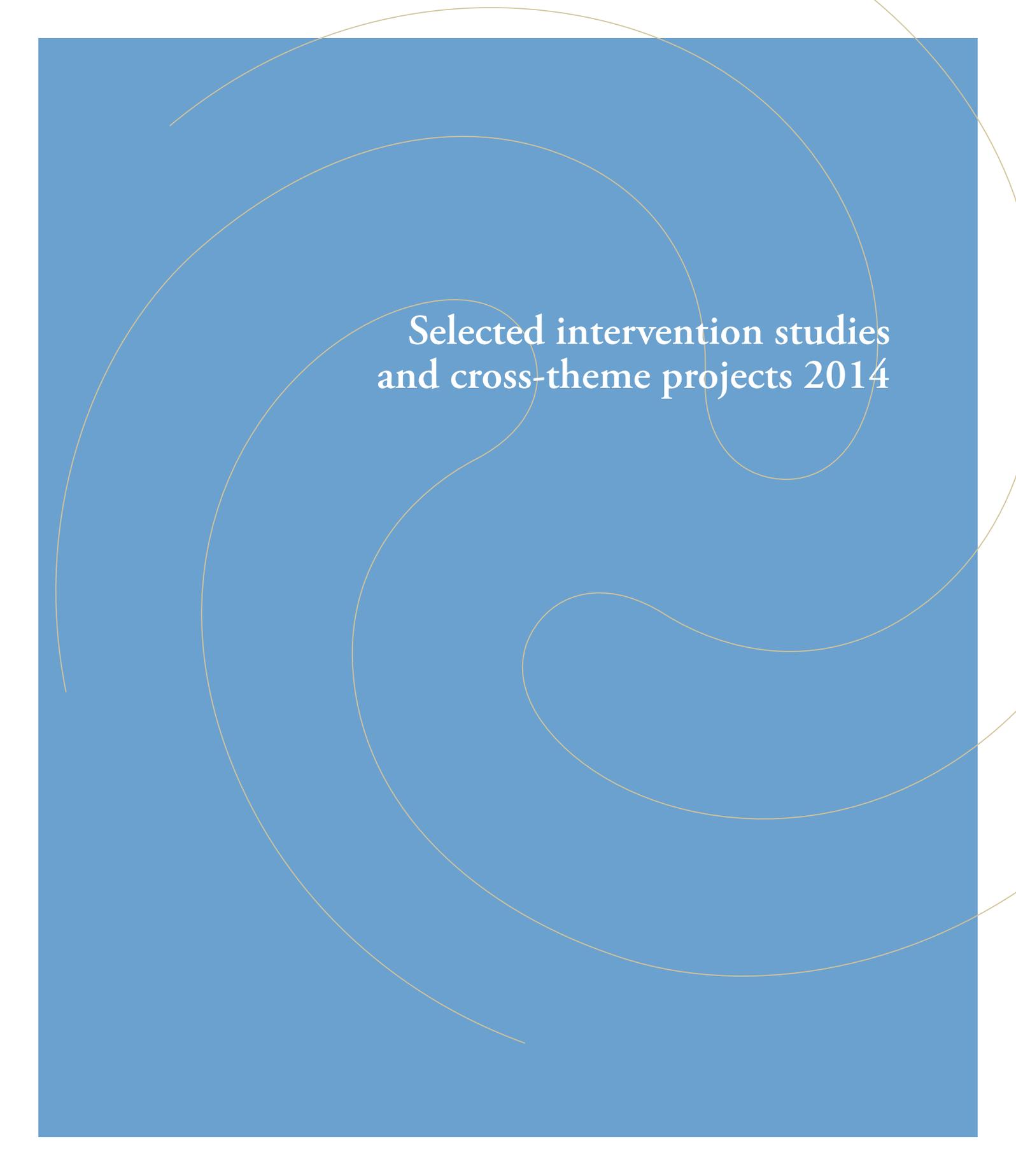
Bursomanno S. *Post-translational modification of proteins by SUMOylation in response to DNA replication stress*, CEHA Theme III, University of Copenhagen, October 2014.

Christiansen LB. *Mitochondrial structure and function in feline hypertrophic cardiomyopathy: An animal model of spontaneous disease*, CEHA Theme III, University of Copenhagen, December 2014.

Gram M. *Mitochondrial function in young and elderly men after immobilization and aerobic retraining*, CEHA Theme III, University of Copenhagen, December 2014.

Larsen NB. *Analysis of site-specific DNA replication perturbation in eukaryotes*, CEHA Theme III, University of Copenhagen. December 2014.

Lund MT. *The influence of lifestyle interventions on glucose homeostasis*, CEHA Theme III, University of Copenhagen. September 2014.

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**Selected intervention studies  
and cross-theme projects 2014**

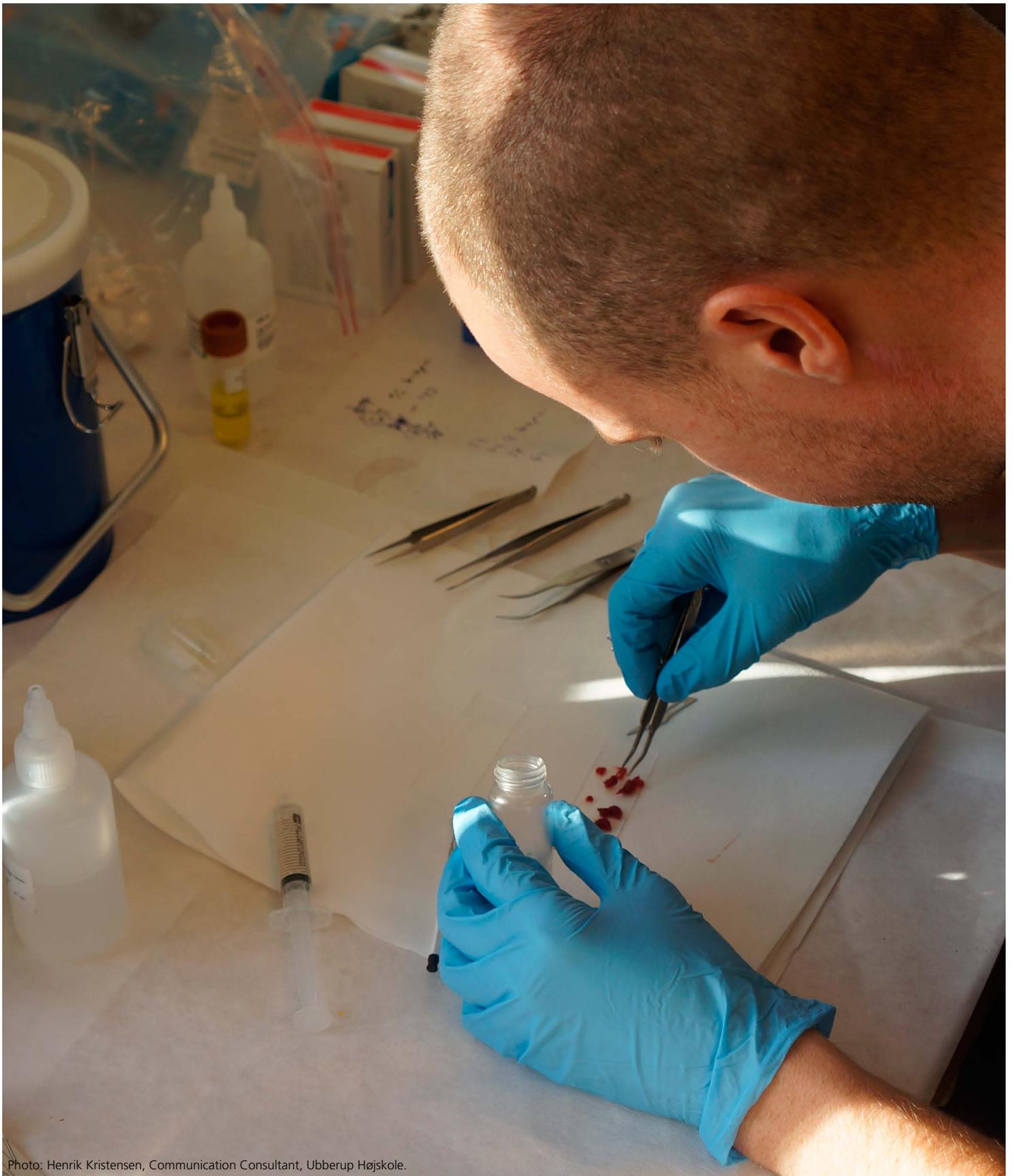


Photo: Henrik Kristensen, Communication Consultant, Udderup Højskole.

# Selected intervention studies and cross-theme projects 2014

## **LIFESTAT (Lead-PI Flemming Dela)**

This is an interdisciplinary project that leverages approaches and knowledge from medicine, the humanities and the social sciences to analyze the impact of statin use on health, life-style and well-being in a cohort of Danish citizens. The impetus for the present project is the fact that more than 600,000 Danes are currently taking statins as a preventive treatment for cardiovascular disease (CVD). Statins are widely prescribed throughout the developed world to lower blood cholesterol and reduce CVD events and are generally well tolerated. However, through incompletely understood mechanisms, statins are reported to cause muscle pain (myalgia) in 20-30% of users, and predominantly (up to 75%) in people who are physically active. This is counterproductive for health, because it reduces patient compliance in achieving target levels of daily physical activity. The acceptable level of blood cholesterol and acceptable CVD risk are somewhat arbitrary, and the typical patient receives knowledge on these and other health issues from a variety of sources. Although the pathways by which information flows to the patient and the patient's perception of risk vary from individual to individual, patterns may exist. The LIFESTAT project will investigate the biological consequences of statin treatment of high blood cholesterol, patient per-

ception of disease risk and the way risk of CVD is managed in the context of a patient's daily life. In essence, LIFESTAT investigates the complex interplay between medical knowledge, healthy behavior, life-style choices and moral/medical imperative.

Targeted aims of LIFESTAT include:

- Determine the biochemical and physiological phenotypes of statin users with and without myalgia.
- Identify and characterize potential biochemical, physiological, lipidomic and metabolomic markers of statin-induced myalgia.
- Analyze the relationships between economic, social, cultural and biological processes influencing perception of disease risk and compliance to CVD prevention.
- Identify and characterize patterns of perceived CVD risk in statin users.
- Identify a typology of different beliefs about statins and behavioral practices.

In order to achieve this, a gathering of different research disciplines is required. This project is also funded by the University of Copenhagen Excellence Programme for Interdisciplinary Research. (UCHP2016).



Photo: Henrik Kristensen, Communication Consultant, Uubberup Højskole.

### Intervention project on physical activity (Lead-PI Michael Kjær)

The training intervention project is a collaboration among several research groups within the center. Recruitment, training and testing are carried out at clinical facilities at Bispebjerg Hospital (Kjaer group), and MRI scans are conducted at Hvidovre Hospital (Siebner and Garde group). Finally questionnaires and a cognitive test are administered by Lykke Mortensen and colleagues at the Department of Public Health (UCPH). The project has been initiated and subjects (62-70 yrs old) are being recruited and randomized to 3 study subgroups, stratified by intensity and type of training, as follows:

- Heavy resistance training 3x/week in a training center;
- Unsupervised moderate resistance training at home (2x/week) and supervised 1x/week training at a hospital;
- Non-strenuous exercise activities (control group). Current enrollment is 80 individuals. To date, compliance with exercise regimens has been good, and relatively few adverse effects of the exercise programs have been reported. Subject testing is proceeding on schedule.

### The UBBERUP project (Lead-PI Jørn Helge)

The world-wide increasing prevalence of obesity is a combined effect of low compliance with daily goals for physical activity and high daily caloric intake, such that average daily calories consumed exceeds average daily calories burned. Weight loss can be achieved by a change of life style, which includes daily participation in physical activity: this kind of life-style change often requires participation in an intense, prolonged course in life-style modification, under supervision. Many who enroll in such a course see immediate positive impact, including weight loss; however, the majority of participants fail to remain committed over the long term to a change in life style, rapidly regaining lost weight after the supervised intervention ends.

This project will characterize the physiological factors that determine/influence an individual's capacity to maintain weight loss and to change lifestyle after the end of a prolonged lifestyle intervention. The study has a cross-sectional (n=80) component and a longitudinal (n=80) component, and will be conducted at CEHA

and Ueberup College (Danish: højskole). Endpoints monitored during the study include body composition, aerobic fitness, capacity for fat oxidation, mitochondrial function, inflammation, glucose metabolism etc. The societal impact of obesity is huge and reaching unprecedented levels. We strive to identify factors that lead to successful weight loss and lifestyle modification. Better understanding of these factors will facilitate successful development of tailored interventions to promote long-term maintenance of healthy weight goals.

### The IFAST project (Lead-PI Jørn Helge)

This study will investigate the effects of short-term intermittent fasting on insulin resistance (IFAST). During intermittent fasting, periods of fasting are alternated with periods of eating. Recent findings suggest that it has beneficial effects on glucose homeostasis even in the absence of net weight loss. Here, a clinical study will explore the effects of intermittent fasting on glucose metabolism in patients with type 2 diabetes. Possible mechanisms will be explored. Preliminary data shows a high compliance to the intervention, a decrease in central obesity after the intervention and change in mitochondrial ADP sensitivity in skeletal muscle. The impact of the intervention on glucose homeostasis is not yet known.

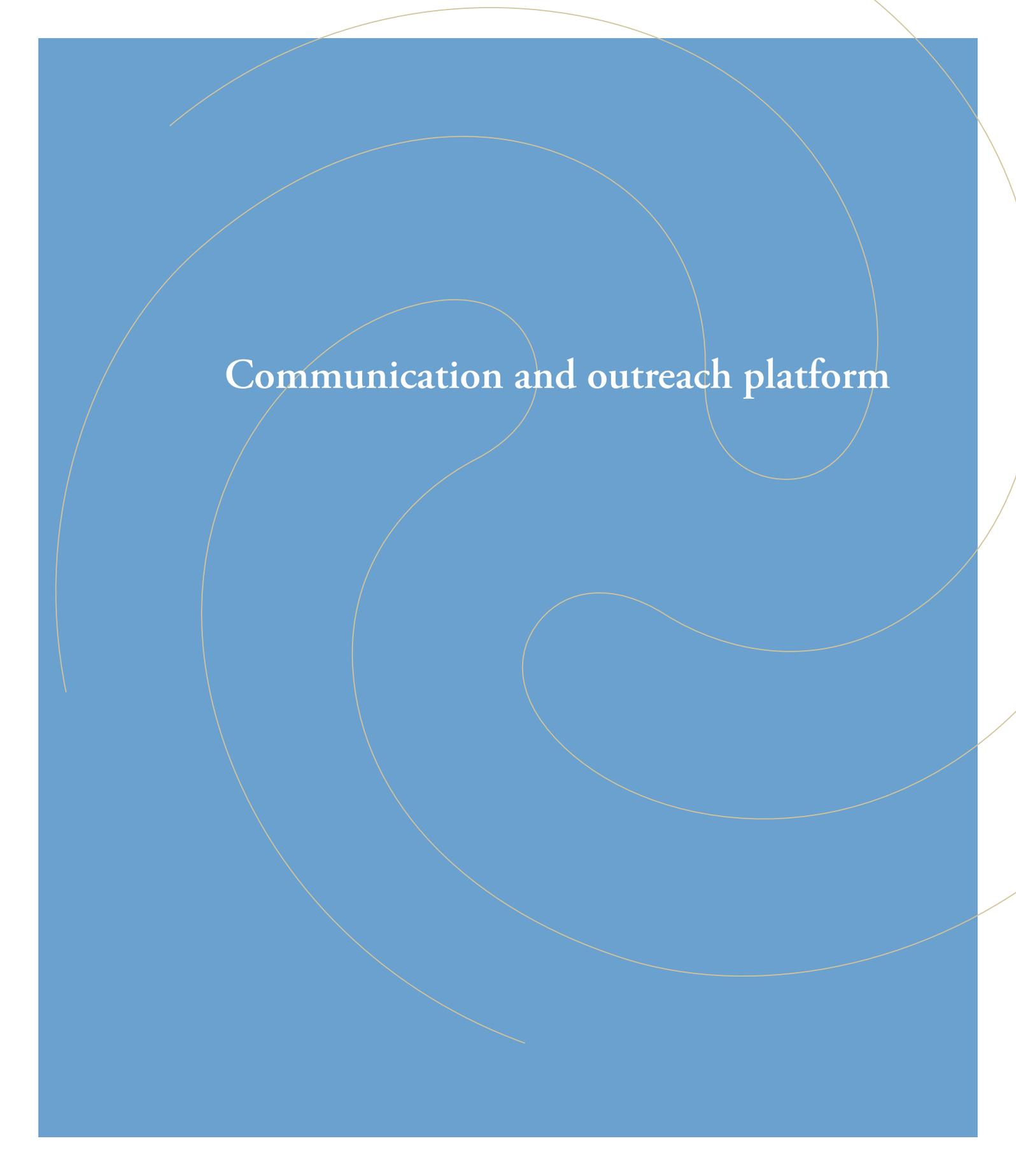


### Book: The good senior life – a joint communication project (Lead-PIs Astrid Jespersen, Rikke Lund, Lars Holm)

CEHA researchers Associate Professors Astrid Jespersen (Theme I), Rikke Lund (Theme II) and Lars Holm, (Theme III), published a book entitled *The good senior life – Find the motivation and strengthen your muscles with exercise and protein consumption*, through agreement with Strandberg Publishing and assisted by CEHA Communication and Press Officer Gitte Inselmann Frandsen. The book was published on 17 November, and by the end of 2014, approximately 700 copies had been sold. The book is inspired by both CEHA research and the UCPH Excellence Programme for Interdisciplinary Research called CALM. It is about how older people can remain active both physically and socially. Throughout the book we follow four case persons between 61 and 75 years.

CEHA researchers involved in the project wrote and edited the book, which is also richly illustrated. Strandberg Publishing launched the book at the year book fair BogForum at Bella Center, Copenhagen, where one of the authors, Lars Holm (Theme III), was interviewed by the journalist Bente Dalsbæk in front of an audience, mostly +60 years old. The press work was managed in collaboration with Strandberg Publishing. By December, the book had been cited in more than 20 articles, including several long articles in national newspapers, and featured in two interviews on local television TV2. The highly acclaimed Danish webportal on Science [Videnskab.dk](http://Videnskab.dk) printed an excerpt of the book, focusing on social relations. Some of this information was also posted on Facebook and Twitter.





# Communication and outreach platform

# Communication and outreach platform

## Group leader

Thomas Söderqvist

## Aim and focus in 2014

CEHA is engaged in outreach activities designed to foster interactions between the CEHA research community and Danish society at large. We want citizens, public authorities and health professionals to engage with healthy aging research and to learn more about the Center's activities. We also want the public's perspectives and experiences to inform CEHA's vision for the future. The aim is to make CEHA the most valued and important source for news, discussion and opinion about healthy aging in Denmark.

CEHA's outreach program has four major aims:

### 1) Disseminate

To disseminate CEHA research results via printed and electronic mass media and on the internet via the CEHA website. These activities are managed by Gitte Inselmann Frandsen, PhD, communication and press officer since February 2014 (CEHA, Communication Office, Faculty of Health and Medical Science). Frandsen manages the following tasks:

- *Mass media dissemination for non-scientists:* Press releases and journalism in the print and electronic mass media, targeting broad segments of the Danish population.
- *Dissemination for health professionals:* Specialized

articles and highlights targeting health professionals, social workers, nursing home employees and other health professionals.

- *Website:* The CEHA website, currently being re-developed to feature reports on CEHA research, integrated with social media postings by CEHA researchers.
- *Newsletter:* We are replacing the former newsletter with a continuous news flow as well as social media presence on Facebook, targeting health professionals, political decision-makers and the general public.

### 2) Dialogue-based communication

To build a dialogue-based communication platform using events and social media to promote dialogue between citizens, professionals, politicians and researchers. These activities are managed by Hanne Boll Overgaard, MA, and Annika Holme, MA, management officer (Medical Museion) and social media officer (Medical Museion), respectively, since May 2014, whose management goals include:

- *Events:* A series of innovative events initiated in the last quarter of 2014 involving CEHA researchers and community stakeholders. These events target the non-professional general public.
- *Social media:* We encourage CEHA researchers to cultivate a social media presence, thereby promoting broad public engagement in issues related to healthy aging. To this end, the social media officer supports CEHA researchers and staff in the use of social media.

Professor  
Thomas Söderqvist



### 3) Interdisciplinary communication

To enhance the effectiveness and internal cohesiveness (identity) of the Center by strengthening interdisciplinary communication and dialogue among researchers in the Center through seminars and workshops. This task is the responsibility of the Center management team.

### 4) Awareness

To increase awareness of CEHA and its brand within Denmark and internationally; to improve networking at national and international levels among aging researchers.

Thomas Söderqvist, director of the Medical Museion and a specialist in the public engagement with science, is the architect and head of CEHA's communication platform. He supervises the practical aspects of CEHA's communication activities, and has an active research program on the history and philosophy of healthy aging. Thomas Söderqvist oversees a course in cross-disciplinary science communication in the Masters Program in Public Health Science, taught by postdoc Morten Hillgaard Bülow.

### Results

In 2014, the communication program participated in and/or promoted the following main activities:

- Events: 'Drawing Science' and 'Live Forever'
- Events: 'Welfare Innovation Day' and 'Science Slam'
- Social Media: Increased activity on Facebook, Twitter and Instagram

- Publications: 'The good senior life'
- Internet: Internet-based media presence nationally and internationally

For more detail on activities, see pp. 77.

### Conclusion

CEHA is unique among health research centers to have a strong communications and outreach program that supplements traditional mass media dissemination with a strong focus on events and social media activities.

So far we have fulfilled the milestones. The mass media dissemination activities are already up and running. We need to gather more experiences before we make any adjustments in the protocol and milestones.

We have spent the last half years planning the event program and performing a number of very successful events. It is too early to suggest any changes in the protocol and milestones. Likewise the social media program is also in the planning phase.

### Scientific publication

Bülow MH, Söderqvist T. Successful ageing: A historical overview and critical analysis of a successful concept. *J Aging Stud* 31: 139-49, 2014.

### PhD dissertation

Bülow MH, *Unsettling successful ageing: A history and queering of the concept of successful ageing in ageing research*. University of Copenhagen, April 2014.



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# International recruitment in 2014

## International recruitment in 2014

### Professor Linda Hildegard Bergersen

Professor Linda Hildegard Bergersen was a guest professor in CEHA until December 2013, at which time she was hired as a part-time professor.

Professor Bergersen's research is focused on regulation, function and transport of lactate and other monocarboxylates in the brain in young and old animals and humans. Professor Bergersen recently discovered that a G-protein coupled lactate receptor, GPR81, is present and active in brain (Lauritzen KH et al., 2014 *Cereb Cortex*). In 2014, Professor Bergersen recruited PhD student, Elisabeth Holm Diget, who will be sponsored by a three-year PhD student fellowship from the Danish Lundbeck Foundation and who will participate in an optogenetic study in collaboration with Karl Deisseroth (Stanford University, USA). Her doctoral project, entitled *Can optogenetic stimulation of G-protein-coupled receptor 81 rescue cognitive decline?* will use optogenetics to investigate the physiological effects and molecular mechanisms of GPR81.

Bergersen, Shelton Mariga, Miriam Kolko and Albert Gjedde co-authored a perspective article entitled *Lactate transport and receptor actions in cerebral malaria* (*Frontier of Neuroscience*, May 2014). This article discusses infection with plasmodium falciparum, a causative agent in cerebral malaria, and new opportunities to develop treatment or interventions to prevent this prevalent neurological disorder in tropical countries. The project is

part of a partnership to fight poverty-related diseases in Africa.

During 2014, Professor Bergersen and one of her PhD students, Mahdi Hasan Olive collaborated with Professor Vilhelm Bohr and Morten Scheibye-Knudsen in a project that explores use of a ketogenic diet to prevent or mitigate symptoms of Cockayne syndrome.

Professor Bergersen is also engaged in an ongoing collaboration with CEHA Managing Director Professor Lene Juel Rasmussen and Professor Martin Lauritzen. This project is characterizing morphological and chemical change at neural synapses in DNA repair-deficient transgenic mice. In another collaboration, Bergersen's postdoctoral fellow, Knut Husø Lauritzen is working with Professor Rasmussen to analyze the role of mitochondrial dysfunction in heart disease.

Professor Bergersen works closely with Professors Lene Juel Rasmussen (Theme III), Martin Lauritzen (Theme II) and CEHA associates Vilhelm Bohr and Albert Gjedde.

### Publications

**Bergersen LH.** Lactate transport and signaling in the brain: potential therapeutic targets and roles in body-brain interaction. *J Cereb Blood Flow Metab.* [Epub ahead of print], 2014

**Bergersen LH, Eid T.** Monocarboxylate transport matters. *N Engl J Med.* 371:1931-1932, 2014



Professor Linda  
Hildegard Bergersen



Assistant Professor  
Javier Peña Diaz

Mariga ST, Kolko M, Gjedde A, **Bergersen LH**. Lactate transport and receptor actions in cerebral malaria. *Front Neurosci*. 19: 8:125

Lauritzen F, Eid T, **Bergersen LH**. Monocarboxylate transporters in temporal lobe epilepsy: roles of lactate and ketogenic diet. *Brain Struct Funct*. [Epub ahead of print] 2014

Rinholm JE, **Bergersen LH**. White matter lactate--does it matter? *Neuroscience*. 2014 Sep 27;276:109-116, 2014

Lauritzen KH, Morland C, Puchades M, Holm-Hansen S, Hagelin EM, Lauritzen F, Attramadal H, Storm-Mathisen J, Gjedde A, **Bergersen LH**. Lactate receptor sites link neurotransmission, neurovascular coupling, and brain energy metabolism. *Cereb Cortex*. 24:2784-2795, 2014

### Assistant Professor Javier Peña Diaz

In May 2013, Javier Peña Diaz (Assistant Professor) was recruited by CEHA to establish a research group in molecular aging and neurobiology with focus on the role of DNA repair in aging-related disease.

Peña Diaz obtained his PhD in molecular parasitology at the University of Granada working under the supervision of Dr. Dolores Gozalez-Pacanowska. Later he moved to the University of Trondheim, Norway under the supervision of professor Hans E. Krokan, and afterwards to the University of Zurich, Switzerland under the supervision of Dr. Pavel Janscak and Professor Josef Jiricny, where he initiated his work on mechanisms of DNA repair in human disease.

Peña Diaz's current research is focused on the roles of

DNA repair in maintaining genome integrity, and DNA replication fidelity and in preventing human disease. Peña Diaz is also interested in instances when DNA repair enzymes introduce errors instead of removing them, also known as 'error-prone' DNA repair. In some circumstances, error-prone repair may ultimately have beneficial effects (for example, it may increase diversify within a pool of antibodies), while in other circumstances, DNA repair enzymes inadvertently promote disease-causing mutations (for example, DNA repeat expansion leading to progressive neurodegenerative disease).

Peña Diaz is interested in the relationships between aberrant DNA repair, aging and brain disease, a good fit in CEHA's molecular neuroscience group.

Peña Diaz's group includes two PhDs students, Sara Thornby Bak and Despoina Sakellariou. He is funded by CEHA, Department of Neuroscience and Pharmacology, the Danish Cancer Society and the Danish Council of Independent Research.

### Publication

Bak ST, Sakellariou D, Pena-Diaz J. The dual nature of mismatch repair as antimutator and mutator: for better or for worse. *Frontier in Genetics*. 5: 287, 2014.

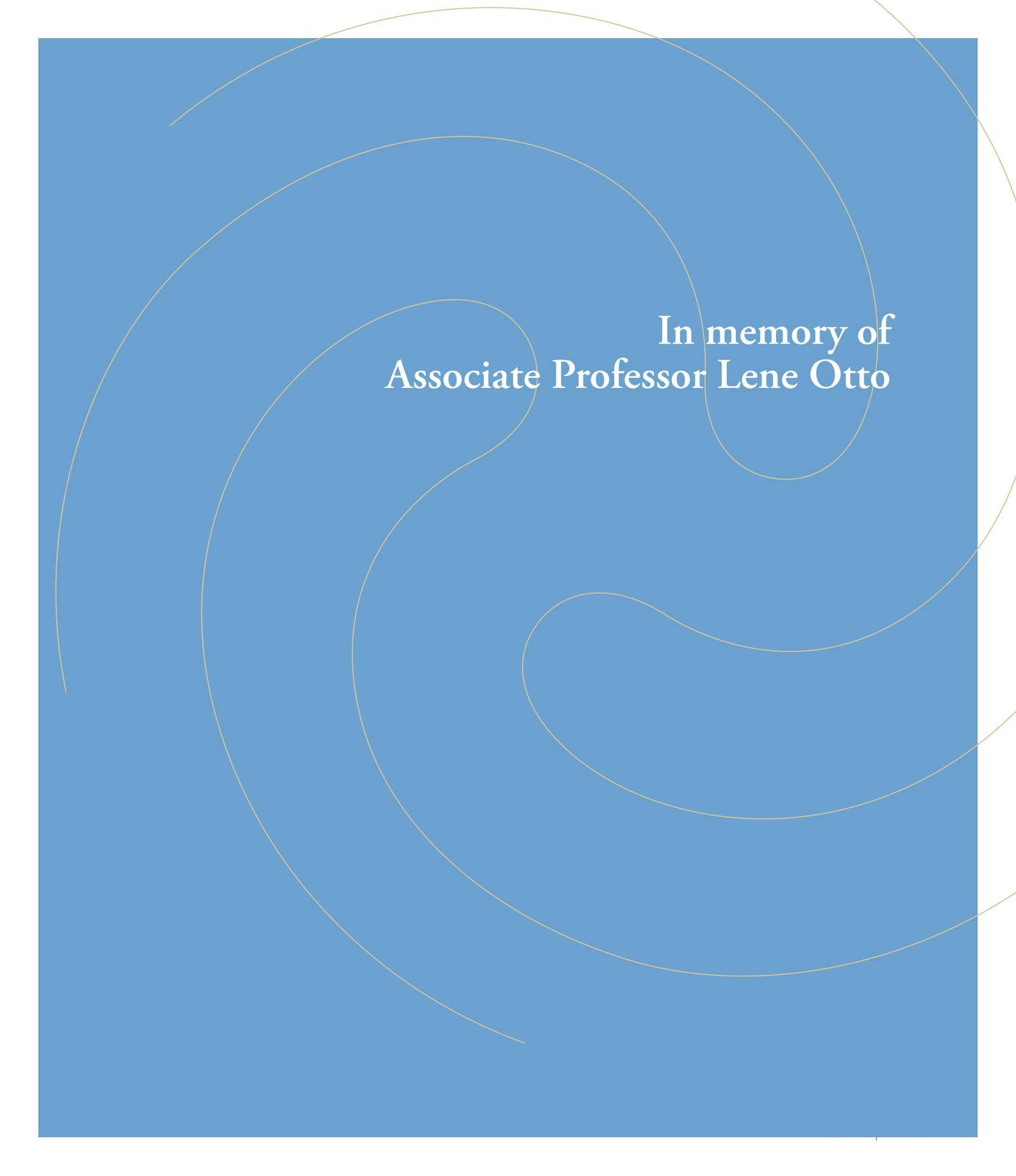


Associate Professor  
Andrés J López-Contreras

### Associate Professor Andrés J López-Contreras

In September 2014, Andrés J López-Contreras established a new research group at the ICMM and joined CEHA. This group will study the impact of genomic instability on aging using transgenic mouse models. López-Contreras obtained his PhD in Biochemistry and Molecular Biology at the University of Murcia (Spain). Then, he moved to the Spanish National Center for Cancer Research (CNIO, Madrid), where he performed postdoctoral research under the supervision of Prof Fernandez-Capetillo. At the CNIO, López-Contreras generated several mouse models with alterations in genomic instability and characterized their susceptibility to cancer. López-Contreras' current research goal is to understand the role of replication stress (RS) in normal aging exploiting transgenic mice with increased or decreased levels of RS. Proposed studies will evaluate long-term survival and will include proteomic analyses *in vivo*. His results could ultimately help identify novel biomarkers and/or clinically-relevant therapeutic targets.

López-Contreras' group includes 1 technician (Alexandra Avram), 1 PhD student (Eliene Albers) and 1 Postdoctoral fellow (Mauro Sbroggiò), and is currently funded by the Danish National Research Program and the Danish Cancer Society.



In memory of  
Associate Professor Lene Otto



## In memory of Associate Professor Lene Otto

Lene Otto was an associate professor of ethnology from 2003 to 2013. From the beginning of her academic career, Lene Otto worked to strengthen the connection between ethnology and health research. Her thesis on inter-disciplinary conferencing, published subsequently as a book entitled *Rask eller lykkelig* (Healthy or Fortunate), is widely read and used in academic courses on professional healthcare; the book is considered a significant commentary on healthcare and welfare policy in Denmark.

Given this background, it was natural for Lene Otto to take a leadership role in shaping CEHAs early research in the area of humanistic aging, which was from the outset anchored in the Faculty of Humanities at the Saxo Institute. Between 2009 and 2013, Lene Otto carried out ethnological and cultural/analytical research on aging, was the lead investigator in CEHA Program 5/Health in Everyday Life, and was a member of the CEHA steering group.

Lene Otto was energetic, industrious, serious and targeted in her approach to research. Even after she fell ill, she put health on the ethnological agenda and ethnology on the health and disease prevention agenda. Her other core interests were museology, material culture re-

search, cultural inheritance, and the correlation between body, age and material culture. Lene Otto communicated the outcomes of her work through scholarly publication and in the context of museum exhibitions.

Over the years, Lene Otto served on many national and international honorary boards and committees, editorial teams, and assessment committees. Her many professional activities reflected her serious commitment to the worlds of the academic science and museum curation. Lene Otto remained very active to the end of her life. Her work was and continues to be disseminated through radio programmes, reports and articles.

In her private life, even during her final illness, Lene Otto demonstrated unusual strength of will, a characteristic that also drove her commitment to excellence in research. In older, lay illustrations of the process of human ageing, the life course has often been represented as a rising staircase ending at a high landing, followed by a descending staircase. Lene Otto, who passed at the young age of 50, traversed up the staircase to the pinnacle of her life, never to descend from that pinnacle. We all feel great loss, in that Lene Otto's life was too short. We all miss her as a colleague and friend, now and always.





Staff list

# Staff list

Complete staff list

- Paid by CEHA<sup>1</sup>
- ◐ Partly paid by CEHA<sup>2</sup>
- Not paid by CEHA

## Total

Paid or partly paid by CEHA: 71 persons

Not paid by CEHA: 144 persons

Definitions:

- 1 ● represents 1 person paid 1 full work year (37/hours per week in 12 months).
- 2 ◐ represents 1 person paid part time in 1-12 months or full time in less than 12 month.

## Senior Researchers

- Theme I
- Allan Krasnik, Professor
  - Karsten Vrangbæk, Professor
  - Susan Reynolds Whyte, Professor
  - Astrid Pernille Jespersen, Associate Professor
  - ◐ Annegrete Juul Nielsen, Associate Professor
  - ◐ Bjarke Oxlund, Associate Professor
- Theme II
- ◐ Flemming Dela, Professor
  - Åse Marie Hansen, Professor
  - Poul Jennum, Professor
  - Martin Lauritzen, Professor
  - Erik Lykke Mortensen, Professor

- Merete Osler, Professor
  - Hartwig Siebner, Professor
  - Ulla Christensen, Associate Professor
  - Trine Flensburg-Madsen, Associate Professor
  - Carsten Hendriksen, Associate Professor
  - Rikke Lund, Associate Professor
  - Charlotte Juul Nilsson, Associate Professor
  - Anders Petersen, Associate Professor
  - Signe Vangkilde, Associate Professor
  - Helle Wallach Kildemoes, Assistant Professor
  - Helle Bruunsgaard, Senior Researcher
  - Ellen Garde, Senior Researcher
  - Egill Rostrup, Chief Physician
  - Krisztina Benedek, Consultant
  - Birgitte Fagerlund, Consultant
  - Niklas Rye Jørgensen, Consultant
- Theme III
- Linda Hildegard Bergersen, Professor
  - Vilhelm A. Bohr, Professor
  - ◐ Ian Hickson, Professor
  - Michael Kjaer, Professor
  - Peter Magnusson, Professor
  - Lene Juel Rasmussen, Professor
  - Nina Beyer, Associate Professor
  - ◐ Javier Pena Diaz, Associate Professor
  - Katja Heinemeier, Associate Professor
  - Lars Holm, Associate Professor

- Ying Liu, Associate Professor
- Andrés López-Contreras, Associate Professor
- Abigail Mackey-Sennels, Associate Professor
- Hocine Mankouri, Associate Professor
- Mansour Akbari, Assistant Professor
- Claus Desler, Assistant Professor
- Sasha Liberti, Assistant Professor
- Jesper Løvind Andersen, Senior Researcher
- Peter Schjerling, Senior Researcher

#### Across Theme II and III

- Jørn Wulff Helge, Professor
- Clara Prats, Associate Professor

#### Guest Researchers

Theme I  Tiago Moreira, Senior Researcher

- Theme II
- Ivan Bautman, Professor
  - Carlos de Mendes de Leon, Professor
  - Alan Gow, Associate Professor
  - Robert Fieo, Post Doc
  - Minna Mänty, Post Doc

Theme III  Jeffrey Holmes, Professor

#### Post docs

- Theme I
- Christian Scheele Elling
  - Kamilla Pernille Nørtoft Johansen
  - Margit Kriegbaum
  - Bodil Ludvigsen
  - Henrik Hvenegaard Mikkelsen
  - Andreas Rudkjøbing

- Theme II
- Sanne Barsballe Jessen
  - Margit Kriegsbaum
  - Jolene Lee Masters Pedersen
  - Lene Rask
  - Iris Wiegand

- Theme III
- Monika Bayer
  - Anna Bizard
  - Christian Coupe

- Pernilla Eliasson
- Diana Huttner
- Maciej Kliszczak
- Sheroy Minocherhomji
- Anders Fabricius Nedergaard
- Søren Reitelseder
- Kata Sarlos
- Jesper Strickertsson
- Rene B. Svensson
- Yao Qi

#### Across Theme II and III

- Therese Bieler
- Steen Larsen
- Michael Taulo Lund

#### PhD Students

- Theme I
- Michael Christian Andersen
  - Marlene Bødker
  - Amy Clotworthy
  - Nanna Hilm
  - Aske Juul Lassen
  - Michael Simon Nixon
  - Sarah Wadmann

- Theme II
- Stine Harrsen Bachkati
  - Gunhild Tidemann Christensen
  - Naja Liv Hansen
  - Otto Henriksen
  - Anna Horwitz
  - Rikke Hodal Meincke
  - Gitte Lindeved Petersen
  - Laura Graves Ponsaing
  - Laura Gertrud Sørensen
  - Linda Waller
  - Marielle Zoetmulder

- Theme III
- Jakob Agergaard
  - Aiste Aleliunaite
  - Maria Angleys
  - Sara Thornby Bak
  - Rasmus Bechshøft
  - Victoria Bjerregaard
  - Sara Bursomanno
  - Kasper Dideriksen

- Jon Durhuus
- Nima Fakouri
- Jane Frederiksen
- Thomas Lau Hansen
- Mette Flindt Heisterberg
- Andreas Herchenhan
- Signe W. Jørgensen
- Nicolai Larsen
- Cecilie Jæger Leidesdorff
- Dekang Liu
- Marya Morevati
- Christian Nielsen
- Rie Harboe Nielsen
- Annesofie Thorup Olesen
- Özgun Ozer
- Despoina Sakellariou
- Wei Wu

#### Across Theme II and III

- Liselotte Bruun Christiansen
- Tine Lovsø Dohlmann
- Christian Eriksen
- Martin Gram
- Andreas Vigelsø Hansen
- Merethe Hansen
- Sune Dandanell Jørgensen
- Marianne Kristensen
- Anja Birk Kuhlman
- Malene Kristensen Maag
- Thomas Morville
- Stinna Skaaby
- Ditte Søgaard
- Andreas Ziegler

#### Research Assistants

- Theme I
- Malene Bødker
  - Aske Juul Lassen
- Theme II
- Kjeld Andersen
  - Emilie Just-Østergaard
  - Kristian Klinkby
  - Marie Grønkjær Pedersen

#### Across Theme II and III

- Anne Theil Gylling

#### Bachelor/Master students

- Theme III
- Ragna Djurhuus
  - Mark Lorenzen
  - Emilie Thomsen

#### Across Theme II and III

- Carina Vestergård Abildskov
- Anne-Sofie Andersen
- Magnus Asping
- Julie Hagstrøm Danielsen
- Sofie Greve Dideriksen
- Rie Dybbøe
- Julie Mucha Økjær Jørgensen
- Ronni Sahl
- Camilla Skovborg
- Stine Dam Søndergaard
- Caroline Wiuff

#### Pregraduate Research Students

- Theme III
- Kristine Bramsen Andersen
  - Maren Høgberget
  - Jonas Frimer Kristiansen
  - Mads Rohde Loeb
  - Nikolaj M. Malmgaard-Clausen
  - Mathias Bech Møller
  - Frederik Scheel

#### Across Theme II and III

- Monika Calov
- Kirstine Kjær Christensen
- Marie Dehlbæk
- Arthur Ingersen
- Sofie Drevsholt Jørgensen
- Anne Line Jørgensen
- Kasper Bøgh Kristensen
- Malene Glerup Nielsen
- Charlotte Boslev Præst
- Cathrine Scheuer
- Mimmi Torp

### Lab Technicians

Theme II  Micael Lønstrup

- Theme III  Alexandra Avram  
 Anne Marie Bundgaard  
 Malgorzeta Clausen  
 Kenneth Jakobsen  
 Anja Sisko Jokipii-Utzon  
 Ann-Christine Ronnie Reimann  
 Ann-Marie Sedstrøm  
 Camilla Brink Sørensen  
 Theresa Wass

Across Theme II and III

- Jeppe Bach  
 Thomas Beck  
 Regitze Kraunsøe  
 Katrine Qvist

### Secretaries

- Theme I  Mads Christoffersen  
 Emil Bjarne Johansen  
 Jonas Møller Pedersen

Theme II  Eva Jepsen

- Theme III  Elin Erichsen  
 Birgitte Kjær  
 Else Pedersen

Across Theme II and III

- Jacqueline van Hall

### Other

Theme I  Janne Sørensen, Research Coordinator

- Theme II  Lykke Kempfner, PhD  
 Drude Molbo, Database Manager

Across Theme II and III

- Christina Neigaard Hansen, Molecular Biologist  
 Søren Lindemose, Molecular Biologist

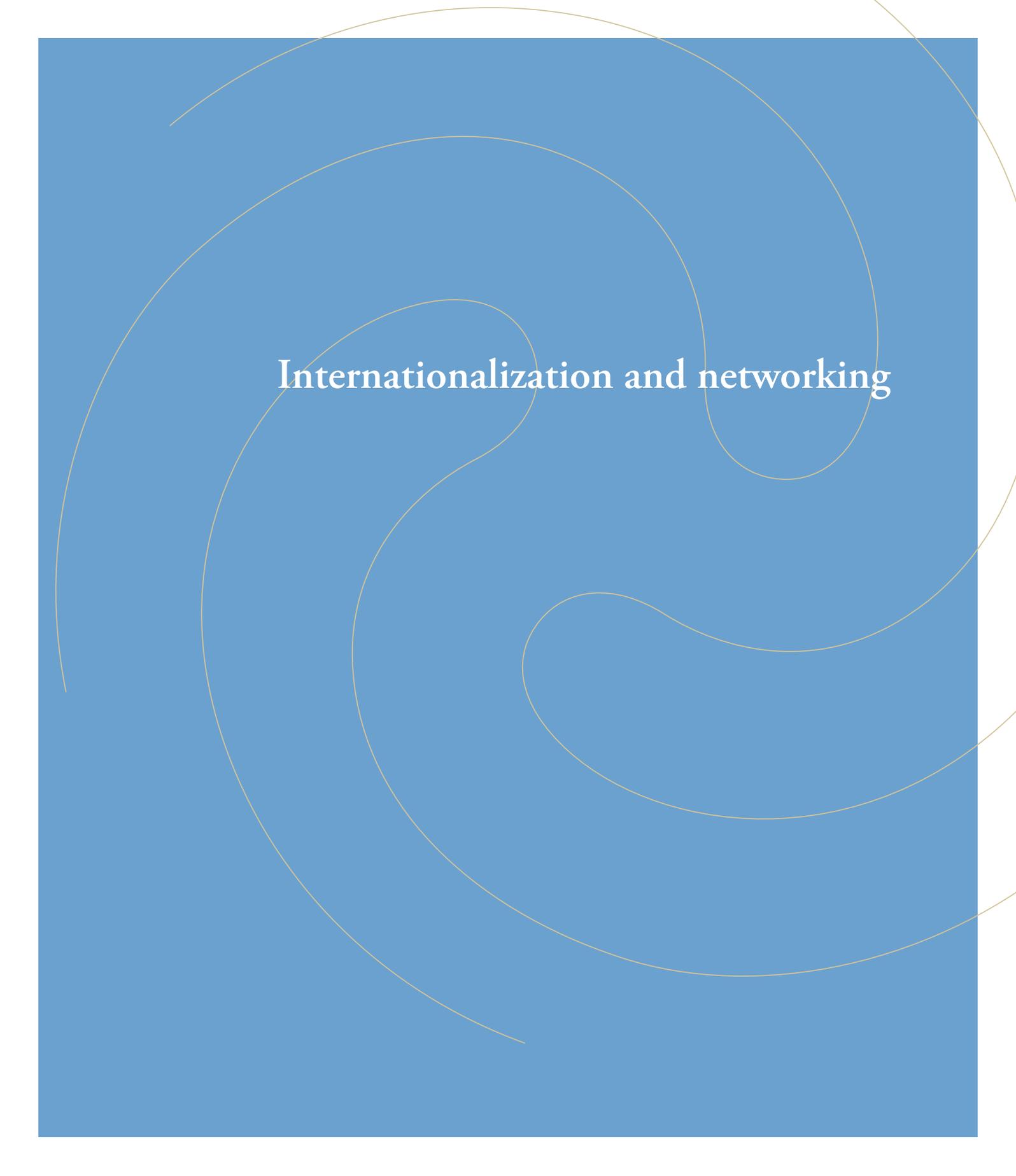
### Communication and outreach platform

- Morten Hillgaard Bülow, Post doc  
 Gitte Inselmann Frandsen, Communication and Press Officer  
 Annika Holme, Social Media Curator  
 Hanne Boll Overgaard, Event Curator  
 Bente Vinge Pedersen, Head of Section  
 Thomas Söderqvist, Professor

### CEHA administration

- Tina Gottlieb, Head of Administration  
 Line Damberg, Academic Officer  
 Ditte Marie Hansen, Student Assistant  
 Julie Roll, Student Assistant  
 Thomas Tjærandsen, Student Assistant





# Internationalization and networking



Summer school student speaks intently with a resident of Søndervang. Photo: Lizette Kabré.



INTERNATIONAL ALLIANCE OF  
RESEARCH UNIVERSITIES

## Internationalization and networking

### IARU – International research cooperation

From the outset, CEHA has been closely associated with the International Alliance of Research Universities (IARU), a prestigious alliance that includes the University of Copenhagen. The other IARU members are Yale University, University of California at Berkeley, Swiss Federal Institute of Technology in Zurich (ETH), University of Cambridge, University of Oxford, National University of Singapore, Australian National University, Peking University and the University of Tokyo. IARU is a valuable networking opportunity for members of CEHA, who arrange meetings and workshops and utilize IARU as a mechanism for enhancing collaboration and future research activities, mainly through the IARU *Aging, Longevity and Health* (ALH) initiative.

The close association between CEHA and IARU is a cornerstone in the efforts to internationalize CEHA. In 2014, CEHA empowered IARU network further by forming the ALH Steering Committee, whose *raison d'être* is to increase engagement across IARU campuses and to promote joint activities and funding opportunities for IARU ALH participants.

The first meeting of the IARU ALH Steering Committee was held on 20 June 2014. At this meeting, the Committee agreed on Terms of Reference and discussed new opportunities of mutual interest, such as a reciprocal exchange PhD program/fellowship, collaborative research projects, and a biennial IARU ALH Graduate Student Conference. It was agreed among ALH Steering

Committee members that the next IARU ALH Graduate Student Conference would take place in 2016 in Tokyo, Japan.

The ALH Steering Committee members are:

- Prof. Barry Halliwell, National University of Singapore
- Prof. Kaarin Anstey, Australian National University
- Prof. Xiaoying Zheng, Peking University
- Prof. Junichiro Okata, University of Tokyo
- Prof. William Satariano, University of California, Berkeley
- Dr Louise Lafortune, University of Cambridge
- Prof. Sarah Harper, University of Oxford
- Prof. Michael Ristow, ETH
- Prof. Lene Juel Rasmussen, University of Copenhagen

Detailed information on IARU ALH can be found at [www.iaruni.org/research-initiatives/aging](http://www.iaruni.org/research-initiatives/aging).

### IARU – International congresses on Aging in Copenhagen

In June 2014 in the Copenhagen area, two IARU ALH conferences were sponsored by University of Copenhagen and CEHA. The 2<sup>nd</sup> IARU ALH Graduate Student Conference on aging also took place, so that ALH graduate students could benefit most from the overlapping conferences.

As noted at these conferences, the ongoing rapid



GDN5 participants (June, 2014, Marienlyst, DK)



CHA participants (June, 2014, Copenhagen, DK)

increase in the mean age of human populations and the mechanism(s) of human aging are 'hot topics' of the day, being investigated in many diverse studies in research institutions worldwide. University of Copenhagen and CEHA are heavily engaged in aging research, some of which involves collaborations with its IARU partner universities.

Leading-edge aging research must leverage expertise from many distinct disciplines and seeks to fulfill the following goals: 1) to address the implications of population aging within social, cultural, psychological, economic, political and public health contexts; 2) to define and understand the molecular biological and physiological bases of human aging; and 3) to identify factors that protect or promote aging-related disease and dysfunction.

These issues were discussed, and nearly 70 lectures and 10 posters were presented, at two IARU conferences in Copenhagen:

- *Cultures of Health and Aging* (CHA), 20-21 June, 2014
- *Genome Dynamics in Neuroscience and Aging 5* (GDN5), 17-20 June, 2014

CHA focused on population aging and the challenges it presents to human society. It included a session entitled *Aging in a National and International Perspective*, where researchers from seven IARU universities provided country-specific perspective on aging issues (Oxford

University, Peking University, National University of Singapore, Australian National University, University of California, Berkeley, University of Tokyo and University of Copenhagen).

GDN5 focused on the genetic and biomolecular mechanisms of genome instability and neurodegenerative disease in the context of human aging.

The conferences were attended by expert researchers from IARU and non-IARU universities and were both organized by CEHA, University of Copenhagen. GDN5 was co-organized by CEHA and the GDN organizing committee.

A commentary article on CHA will be published in the March 2015 issue of *Age and Aging* available online: [ageing.oxfordjournals.org/content/early/2014/12/01/ageing.afu189.full.pdf](http://ageing.oxfordjournals.org/content/early/2014/12/01/ageing.afu189.full.pdf)

A summary of key points and emerging issues from CHA and GDN5 and both conference programs can be accessed online at [healthyaging.ku.dk/activities/iaru-congress-2014](http://healthyaging.ku.dk/activities/iaru-congress-2014).

### IARU – Graduate Student Conference

The 2<sup>nd</sup> IARU ALH Graduate Student Conference, organized by CEHA Network for Young Scholars, was held in Copenhagen, immediately following the CHA conference:

- *Aging Research and Scientific Careers*, 21-22 June, 2014



Participants: IARU Graduate Student  
Conference Aging Research and Scientific  
Careers (June, 2014, Copenhagen, DK)

Twenty-one students from IARU partner universities participated and networked during the conference discussing diverse topics, such as: *Theories of aging – How do we understand aging?*, *Studies of aging and behavior*, *Health care services among the general population and The physiology of health and aging – from cell to society*. Conference participants also spent a full day at the Euroscience Open Forum 2014 – Science Building Bridges, during which students participated in career related activities, such as Career Track for Young scientist ([esof2014.org](http://esof2014.org)). (Also see p. 77).

### IARU – CEHA Summer School

CEHA hosted the 4<sup>th</sup> interdisciplinary Summer School on *Interdisciplinary Aspects of Healthy Aging*, 2-21 July, 2014 at UCPH, Copenhagen.

The Summer School gives students the opportunity to learn and use research methods from other disciplines, and to develop new projects with guidance from Summer School teachers. CEHA Associate Professor Ying Liu has developed and implemented the Scientific Programmes, which also included international lecturers. Prof. George Leeson, University of Oxford, a visiting scientist at CEHA, gave lectures to students at the 2014 Summer School.

Summer School students were from Yale, Peking University, University of Oxford, University of Tokyo, Australian National University, National University of Singapore, University of Copenhagen, Universidad de Federal de São Carlos, Brazil, and the University of Tohoku, Japan.

As a new initiative, students visited the home care facility *Søndervang* in Copenhagen, in order to gain

insight into the lives of older people in Denmark. During the visit, the students interacted one-on-one with the residents of *Søndervang*. Both students and residents reported that this interaction was valuable and mutually beneficial.

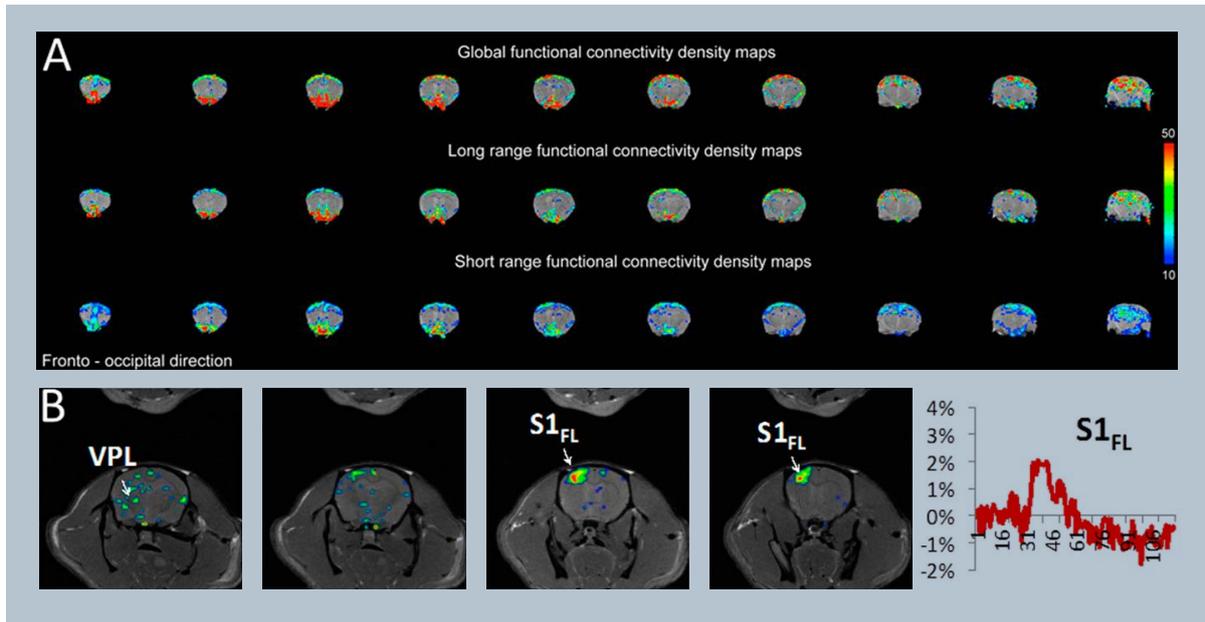
### iHAN – International Healthy Aging Network

The International Healthy Aging Network (iHAN) is part of IARU. The researchers in iHan collaborate to study molecular and cognitive biomarkers of healthy aging and age-related diseases, including type 2 diabetes and Alzheimer's disease. iHAN members include researchers from University of Melbourne, Australian National University, Queensland University, Yale, Johns Hopkins University, University of California, Berkeley, McGill, University of Oslo, University of Aarhus, and University of Copenhagen.

### Seminars, meetings, symposia

In February 2014, iHAN hosted a seminar entitled *Beyond the Amyloid Cascade* arranged by Professor Albert Gjedde at John Hopkins University. The network also hosted a mini-symposium in July 2014 entitled *Alzheimer's disease: mechanisms, diagnosis and prognosis*, at the BRAINlab of the University of Copenhagen.

Professors Albert Gjedde, Ron Kupers and Maurice Ptito (University of Copenhagen), met with Professor Robin Alexander, Dr. Charles Rupprecht, and Professor Arve Lee Willingham at Ross University School of Veterinary Medicine, on the island of St. Kitts, in May 2014. The goal of this meeting was to establish a collaborative project using positron emission tomography (PET) tech-



**Figure 1**

A: Example of resting-state and task-evoked fMRI.

B: Forepaw stimulated fMRI analysis. Forepaw stimulation (2 mA, 9 Hz, 0.3 ms) for 30 s revealed BOLD signal increases in S1FL (somatosensory forelimb) and VPL (ventral posterior lateral part of the thalamus) across several slices. BOLD time course of S1FL. BOLD scale % change. Source: BGract22 Exp #22. Acquired during visit of iHAN member Fahmeed Hyder to BRAINlab at Panum Institute in October 2014.

nology. This project will support future research on aging in non-human primates using PET technology.

Drs. Anders Rodell and Michael Gejl represented iHAN at the Symposium of the Australian Society for Molecular Imaging at the Center for Advanced Imaging in Brisbane, Australia, in July 2014.

#### Knowledge exchange between iHAN universities

In February 2014, Professors Maurice Ptito and Ron Kupers of the University of Copenhagen visited the laboratory of Professor Fahmeed Hyder at Yale University, to strengthen their collaboration and to explore their mutual interest in specific magnetic resonance technology. The goal is to facilitate transfer of expertise in this technology from QNMR Core Center at Yale to the Panum NMR Center at the University of Copenhagen. Fahmeed Hyder (Yale University) also visited the BRAINlab and CEHA (UCPH) in July and October 2014. A wide range of MRI and Magnetic Resonance Spectroscopy (MRS) methods were used successfully during these

visits, and the feasibility of performing in vivo (rat brain) and ex vivo (Guinea pig brain, primate brain) studies with this technology was demonstrated. See Figure 1 for representative images collected during these collaborative visits.

In 2014, Professor William Jagust hosted Adjmal Nahimi (MD) at the University of California, Berkeley, and Drs Anders Rodell and Michael Gejl were hosted by Professor David Reutens at the Center of Advanced Imaging at the University of Queensland, Brisbane.

#### Publications of the Danish arm of iHAN in 2014

Andalib S, Vafaee MS, Gjedde A. Parkinson's disease and mitochondrial gene variations: A review. *J Neurol Sci.* 2014 Aug 7. pii: S0022-510X(14)00513-9. doi: 10.1016/j.jns.2014.07.067. [Epub ahead of print] Review. PubMed PMID: 25151610.

Darusman HS, Kalliokoski O, Sajuthi D, Schapiro SJ, Gjedde A, Hau J. The success rate in a complicated spatial memory test is determined by age, sex, life history and search strategies in cynomolgus monkeys. *In Vivo.* 2014 Sep-Oct;28(5):741-50. PubMed PMID: 25189885.

Darusman HS, Pandelaki J, Mulyadi R, Sajuthi D, Putri IA, Kalliokoski OH, Call J, Abelson KS, Schapiro SJ, Gjedde A, Hau J. Poor memory performance in aged cynomolgus monkeys with hippocampal atrophy, depletion of amyloid beta 1-42 and accumulation of tau proteins in cerebrospinal fluid. *In Vivo*. 2014 Mar-Apr;28(2):173-84. PubMed PMID: 24632970.

Gjedde A. Positron emission tomography of brain glucose metabolism with [18F]fluoro-deoxyglucose in humans. In 'Brain Energy Metabolism', *Neuromethods*, 2014. Vol. 90, chapter 14. p341-364. Springer Protocols.

Lauritzen KH, Morland C, Puchades M, Holm-Hansen S, Hagelin EM, Lauritzen F, Attramadal H, Storm-Mathisen J, Gjedde A, Bergersen LH. Lactate receptor sites link neurotransmission, neurovascular coupling, and brain energy metabolism. *Cereb Cortex*. 2014 Oct;24(10):2784-95. doi: 10.1093/cercor/bht136. Epub 2013 May 21. PubMed PMID: 23696276.

Rinholm JE, Bergersen LH. White matter lactate – does it matter? *Neuroscience*. 2014 Sep 12;276:109-16. doi: 10.1016/j.neurosci.2013.10.002. Epub 2013 Oct 12. PMID: 24125892 PubMed – in process.

Stender J, Gosseries O, Bruno MA, Charland-Verville V, Vanhauzenhuyse A, Demertzi A, Chatelle C, Thonnard M, Thibaut A, Heine L, Soddu A, Boly M, Schnakers C, Gjedde A, Laureys S. Diagnostic precision of PET imaging and functional MRI in disorders of consciousness: a clinical validation study. *Lancet*. 2014 Aug 9;384(9942):514-22. doi: 10.1016/S0140-6736(14)60042-8. Epub 2014 Apr 15. PubMed PMID: 24746174.

Stender J, Kupers R, Ptito M, Gjedde A. Unresponsive, but Aware: The Non-Behavioral Minimally Conscious State. *Brain Disord Ther*. 2014, 3:5.

Stender J, Kupers R, Rodell A, Thibaut A, Chatelle C, Bruno MA, Gejl M, Bernard C, Hustinx R, Laureys S, Gjedde A. Quantitative rates of brain glucose metabolism distinguish minimally conscious from vegetative state patients. *J Cereb Blood Flow Metab*. 2014 Oct 8. doi: 10.1038/jcbfm.2014.169. [Epub ahead of print] PubMed PMID: 25294128.

## Other international networking and events

### KIC – and the Center for Healthy Aging

In early 2014, the European Institute of Innovation and Technology (EIT), based in Budapest, Hungary, launched a call for Knowledge and Innovation Communities (KICs), as part of the larger European Union (EU) initiative, Horizon 2020. The goal of the KIC initiative is to provide innovative solutions to societal problems through highly integrated, creative and excellence-driven partnerships among stakeholders in education, technology, research, business and entrepreneurship. KICs tackle the grand-challenges facing the EU, to ensure economic growth along with sustainable solutions into the 21<sup>st</sup> century.



Key persons from the InnoLife consortium after the presentation of the InnoLife project for the EIT Governing Board, Brussels on 9 December, 2014. From left to right: Koenraad Debackere (Professor, KU Leuven, Belgium), Lucyna Wozniac (Prorector for Research, Medical University of Lodz, Polen), Ursula Redeker (Spokesperson for the Board, Roche, Germany), Ulla Wewer (Dean, Faculty of Health and Medical Sciences at University of Copenhagen, Denmark) and Elio Riboli (Director, School of Public Health at Imperial College London).

More than 50 core partners (and their 90 associate organizations), including leading businesses, public partners, research centers and universities from nine EU countries, responded to the 2014 call for KICs, submitting a proposal for the project *InnoLife – Healthy living and active aging*. Early in December 2014, InnoLife was designated the winning KIC, to be called *EIT Health*, and was awarded approximately a business value of 395 million euros over 7-10 years. Partners in *EIT Health* include University of Copenhagen, University of Oxford, Karolinska Institutet, Novo Nordisk, Abbott Laboratories (Spain), National Institute of Health and Medical Research (Inserm, France), Philips Healthcare and Roche Diagnostics GmbH (so-called core partners). The goal of the *EIT Health* is to promote entrepreneurship and develop innovations in healthy living and active aging, providing the EU with new opportunities and resources. This will be achieved by delivering products, services and concepts designed to improve quality of life and contribute to the sustainability of healthcare across the EU. The partners represent the top tier in excellence in healthcare and research, and the outreach activities of *EIT Health* are expected to spread throughout the EU.

At the University of Copenhagen, the Center for Healthy Aging (CEHA) will be the central player in the *EIT Health*. Currently, Dean Ulla Wewer is interim director of the education part of the project.

The relationship between the University of Copenhagen and IARU is an acknowledged component of the

KIC, opening opportunities for new and strengthened collaboration between CEHA, the University of Copenhagen, IARU universities and beyond.

More information on the *EIT Health* KIC is available at: <http://eit.europa.eu/sites/default/files/EIT Health - Factsheet 2014.pdf>

### **CEREHA**

In 2013, CEHA also became a partner in the Israeli Centre of Excellence for Research on Environment, Health and Aging (CEREHA). CEREHA is the most important aging research initiative in the Galilee region of Northern Israel.

### **MARRIAGE**

Since 2012, CEHA has been member of the EU funded Initial Training Network MARRIAGE. The overall objective is to provide state-of-the-art training in study of the biology of aging. The network includes European Aging Centers and the Training Network will create a pan-European Network focused on aging research.

### **ABRAHAM**

CEHA is also active in the establishment of the network ABRAHAM, which include researchers, companies, governmental institutions and patients/citizen. The network started in 2010. ABRAHAM aims to create a transatlantic network with partners from the EU, the USA and Canada. This network will build on several existing projects, some of which involve transatlantic partnerships that focus on aging-related issues, such as genome stability and metabolism and systems biology. The founding partners of ABRAHAM are the University Medical Center Groningen (The Netherlands, EU), University of Copenhagen (Denmark, EU), University of Newcastle upon Tyne (United Kingdom, EU), Mayo Clinic (Minnesota, USA) and McGill University (Montreal, Canada) and all have extensive collaborations with industries in the food, pharmaceutical and medical technology sectors. ABRAHAM aims to enhance integration in the field of biobanking and basic aging research in order to contribute to the goal set by the European Commission, namely adding two extra healthy years to life in 2020.

### **Tohoku University**

In 2012 CEHA established an agreement with the Institute of Development, Aging and Cancer (IDAC), Tohoku University, Japan. The objective is to promote and improve academic exchange between the two institutions. Initially, the cooperation is to be focused on following fields of training and research:

- 1) Molecular mechanisms of aging,
- 2) Genome instability and aging and,
- 3) Multidisciplinary aging-related human science and technology.

### **MouseAge**

CEHA is part of a European network, MouseAge, which is being developed for preclinical testing of interventions in mouse models of age and age-related diseases.

The number of people over 65 is predicted to double in the next 50 years. Age is the most important risk factor for stroke, heart attacks, cancers, diabetes, and many other chronic diseases. Tackling the effects of the aging population in Europe has stimulated funding of research initiatives at both national and European levels. A key requisite to develop new interventions for age-related conditions and promote healthier aging is the availability and use of preclinical murine models. There is currently a clear lack of such models and appropriate standardized methodologies to test interventions. Therefore, to improve the quality of European aging research a coordinated interdisciplinary action is needed to standardize methodologies and animal welfare, and to define endpoints, as well as centralizing information, models and technologies for the assessment of interventions. This Action proposes to set-up a highly interactive and flexible European network, which will create a critical mass of cross-disciplinary scientists, clinicians and industrial partners to reach consensus on ways to test preclinical interventions in aging mice. It will consolidate current best practice across leading European institutions and researchers, maximize resource efficiency, and provide a platform to help train the next generation of scientists.

[www.cost.eu/COST\\_Actions/bmbs/Actions/BM1402](http://www.cost.eu/COST_Actions/bmbs/Actions/BM1402)



# Selected educational activities



# Educational activities

An important goal for CEHA is to educate the next generation of aging researchers. To this end, CEHA scientists make a concerted effort to provide high quality educational resources to CEHA students/trainees, and to recruit junior and senior scientists with appropriate research interests and/or expertise to the CEHA faculty. CEHA's educational programs include undergraduate and graduate level courses on aging-related topics and specialties as well as opportunities for postdoctoral studies under the mentorship of CEHA faculty. Educational activities increase year to year. Selected examples are described below.

## Selected PhD dissertations

Below, examples of dissertations from the Themes and the Communication Platform are described. Complete lists of dissertations are available above (pp. 12, 19, 26, 35).

### **Active ageing and the unmaking of old age: The knowledge productions, everyday practices and policies of the good late life.**

Lassen AJ. CEHA Theme I, University of Copenhagen, September 2014.

Since the end of the 1990s, the European Union and the World Health Organization have proposed active ageing as the best possible solution to the problem of ageing populations. This dissertation discusses how active ageing policies are constructed. Aske Juul Lassen has

explored this via ethnographic fieldwork at two activity centres in the Copenhagen area, and via document studies of policy papers and gerontological literature about the concept of activity. Active ageing policies can be seen as operationalisations of knowledge forms and everyday life problems. Together, they are crafted into one common statement: activity can unmake old age. These policies constitute solid formats with specific ideals of the good late life. But when these ideals about the good late life become entangled with the everyday practices of the elderly, they are transformed in various ways. While active ageing may constitute an unmaking of old age, this is a generative unmaking that creates new forms of the good late life.

### **The influence of lifestyle interventions on glucose homeostasis**

Lund MT. , CEHA Theme II, University of Copenhagen, April 2014.

The aim of the thesis was to investigate the effects of years of endurance training on glucose homeostasis and to investigate alterations in glucose homeostasis with a diet and subsequently a gastric bypass operation induced weight loss. Two studies showed lower plasma glucose and insulin concentrations in endurance trained healthy young men compared with untrained men after intake of liquid mixed meal, in an oral glucose tolerance test and an intravenous glucose infusion test. After gastric

bypass operation, improved glucose metabolism leads to remission of type 2 diabetes, but the beta cells were still failing, and therefore regain of weight is likely to be associated with redevelopment of the disease. The studies are relevant for understanding the increase in type 2 diabetes in aging populations and for evaluating physical training as a preventive measure.

### **Tendon and skeletal muscle responses to immobilization and rehabilitation in humans: Influence of aging and growth hormone administration**

Boesen A. CEHA Theme III, University of Copenhagen, April 2014.

The aim of the study was to determine age-related differences in the influence of immobilization and subsequent re-training on the connective tissue, structural and mechanical properties in human skeletal muscle and tendon. Administration of GH counteracted the loss of tendon stiffness in young but not in old individuals, but had no influence upon muscle loss independent of age. The findings indicate that GH/IGF-I stimulates matrix proteins in both skeletal muscle and tendon and abolishes the inactivity related loss in tendon stiffness, and thus show that GH may have a matrix stabilizing effect during periods with muscle inactivity in young but not in old individuals.

### **Unsettling successful ageing:**

#### **A history and queering of the concept of successful ageing in ageing research**

Bülow MH. CEHA Communication Platform, University of Copenhagen, April 2014.

This dissertation aims to, on the one hand, map out the central themes and issues emerging in the recent historical discussions and practices related to the concept of 'successful ageing' within aging research, and, on the other hand, to critically engage with the norms and understandings of 'aging' and what might be called 'good aging' that this conceptual frame relates to.

### **PhD courses**

CEHA researchers also taught or contributed at several PhD courses, for example:

- *Organizing linking magnetic resonance imaging (MRI) to the neuroanatomy of the human brain ('MRI*

*neuroanatomy course')*, Senior Researcher Ellen Garde (Theme II)

- *Principles and confocal microscopy I and II*, Associate Professor Clara Prats (Theme II).
- *Aging skeletal muscle: size, signalling and satellite cell*, Assistant Professor Abigail Mackey (Theme III)
- *Matrix biology – cell-matrix interplay, physiology and function of extracellular matrix*, Associate Professor Katja Heinemeier and Professor Michael Kjaer (Theme III).

### **Post graduate level**

Selected examples:

- *Introduction to the Danish welfare model and health care system*, at the study program Erasmus Mundus Master in Public Health, Associate Professor Annegrete Juul Nielsen (Theme I).
- *The physical limits for you and your patient*, Society of Physician Education (LUF, Professor Flemming Dela (Theme II).
- *Symposium on CAMB*, Nordic Gerontological Congress, Associate Professor Rikke Lund (Theme II).
- *Physical training*, post graduate course, *The aging patient* for young resident doctors, Nina Beyer (Theme III).
- *Biological mechanisms of aging – changes in the DNA with aging*, Summer School on Healthy Aging, Professor Lene Juel Rasmussen (Theme III)
- *Overuse injuries in the lower extremity in young and elderly*, Idrattsmedicinsk Diplomkursus (Steg II) i Svensk Idrattsmedicinsk Selskab, Professor Michael Kjær (Theme III).

### **Master level**

Selected examples:

- *User-driven innovation of welfare technologies for older citizens*, Guest lecture at the master program IT & Health, Aske Juul Lassen (Theme I)
- *Ethnology project* – supervision of MA student as part of photo/sound elicitation project on retirement, Kamilla Nørtoft (Theme I).
- *Health promotion in a community setting*, Professor Susan Reynolds Whyte (Theme I).
- *Social relations and health*, Lund Rikke (Theme II).
- *Psychometrics*, Erik Lykke Mortensen (Theme II).



- *Gerontology – about the complex issues in dealing with older patients*, Charlotte Juul Nilsson (Theme II)
- *Science communication and interdisciplinarity*, Thomas Söderqvist, (CEHA Communication Platform).

### Pre graduate level

Selected examples:

- *Medical physiology and pathophysiology*, Flemming Dela (Theme II).
- *Psychology and health communication*, Erik Lykke Mortensen (Theme II)
- *Social epidemiology and public health*, Charlotte Juul Nilsson (Theme II)
- *The effect of immobilization and aging on tendon and muscle*, Peter Magnusson (Theme III).
- *Physical activity and biochemical-physiological changes*, Michael Kjaer (Theme III)

- *Physical activity as prophylaxis and Fitness training with chronic disease*, Michael Kjaer (Theme III)
- *Mitochondria in disease and aging*, Claus Desler (Theme III).

CEHA senior researchers also supervise students in bachelor and master level programs, some of whom are affiliated with different departments at the University of Copenhagen.

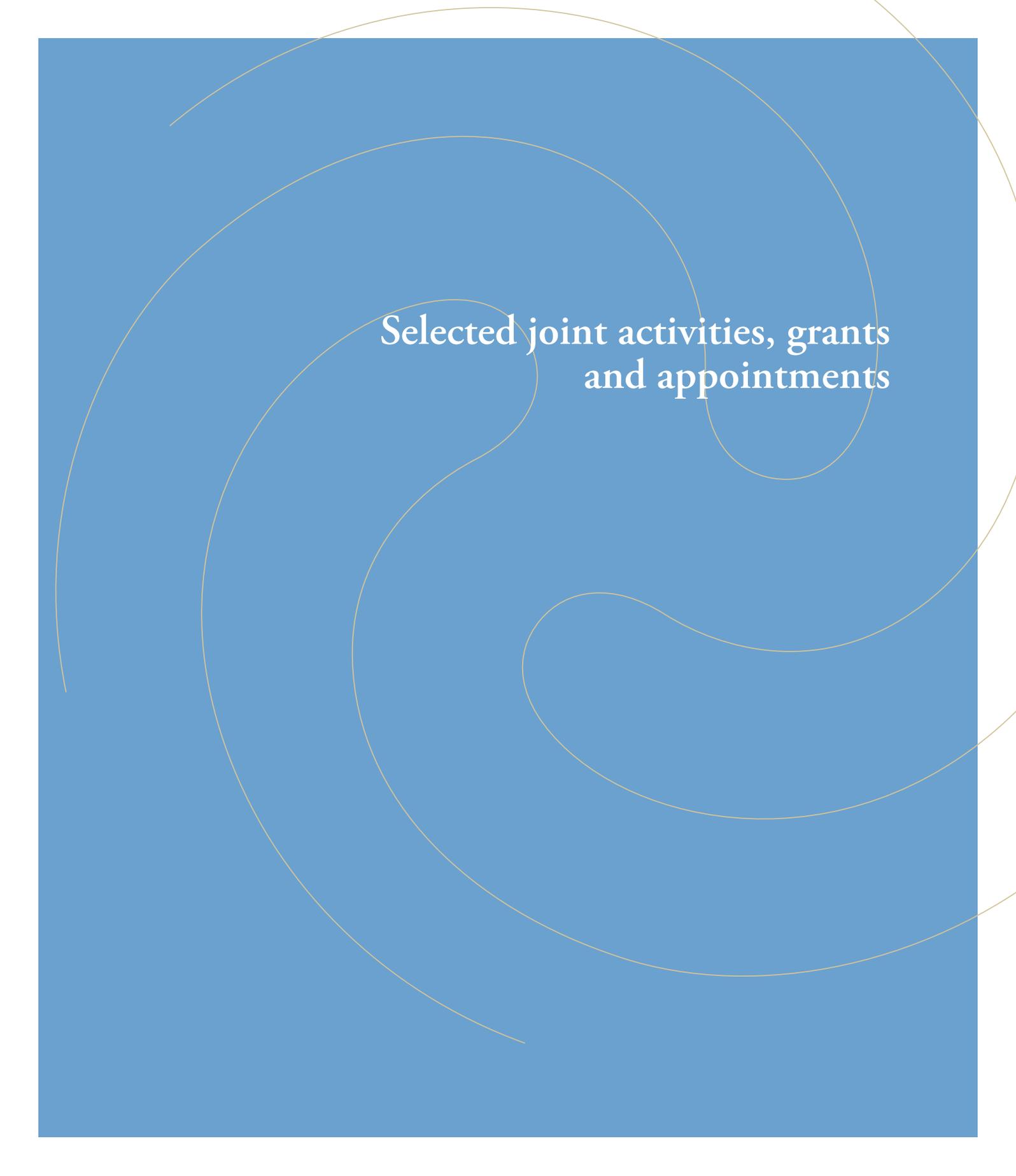
### Other dissemination activities

Selected activities outside the university, such as lectures and presentations at public and private hospitals, societies, associations, organizations, general public, etc. are:

- *Healthy Aging in a Community Context*, presentation at the Vordingborg Municipality Health Center Seminar in Stege, 23 April, Bjarke Oxlund (Theme I).



- *Formal and informal caregiver support in Denmark*, working paper for Briefing Book for The Commonwealth Fund's 17th International Symposium on Health Policy: "Caring for High Need/High Cost Patients: The Test of a High Performing Health Care System", 19-21 November, Washington D.C., Karsten Vrangbæk (Theme I).
- *Getting into the aging brain: does scars and shrink matter?*, Ældre Sagen (DaneAge), Rødovre (January); Folkeuniversitetet (Open University Denmark), Århus (March); Forskningens Døgn (Festival of Research), Hvidovre Hospital (April); Lions Club – Søllerød (June); Inspirational Seminar for Teachers AOF, Amager (September); Opening of Senior-Academy, Skanderborg (September); Activity Center Bakkehuset, Rudersdal Municipality (November). Ellen Garde (Theme II).
- *Can one run from the metabolic syndrome?*, Symposium arranged by Astra-Zeneca for diabetologists and diabetes nurses, Tivoli Congress Center, October, Flemming Dela (Theme II).
- *Lifestyle intervention and muscle adaptation*, three lectures at the Ubberup Folk High School, 3 March, 30 April and 19 November, Jørn Wulff Helge (Theme III).
- *Ubberup project*, TV-interviews and film programs on the National Channel TV2 News, 25 March and "Geek of the Week" on TV Lorry 10 September, Jørn Wulff Helge (Theme III).
- *Protein intake and muscle size – for men*, lectures for dairy and meat industry authorities, Copenhagen, 19 September and on the annual meeting for Danish Dairy Association, Randers, 22 May, Lars Holm (Theme III)



**Selected joint activities, grants  
and appointments**

# Selected joint activities, grants and appointments

## Joint activities

### CEHA retreat

CEHA holds an annual retreat, at which CEHA scientists share data, accomplishments and concerns and discuss potential areas of shared interest and opportunities for collaboration.

In May 2014, CEHA held a retreat to identify and promote new interdisciplinary projects. During a morning session, presenters reviewed ongoing research, described possible new projects, and discussed the CEHA communication strategy/platform, and the role played by management in facilitating dialogue across research themes and interdisciplinary research. Retreat discussions were facilitated by Dr. Laura Meagher, Innogen & ISSTI, University of Edinburgh.

### Workshop on interdisciplinary research

In March 2014, Associate Professor Astrid Jespersen (Theme I) organized a workshop on interdisciplinary research in collaboration with Dr. Laura Meagher and Dr. Catherine Lyall, University of Edinburgh, at the Faculty of Humanities, University of Copenhagen. Workshop participants included 45 scientists from CEHA and many individuals from other interdisciplinary research initiatives, including Governing Obesity, UNIK Food fitness and Pharma, and Counteracting Age-Related Loss of Skeletal Muscle Mass (CALM).

### CEHA-BRIC seminars

Throughout 2014, CEHA and the Biotech Research & Innovation Centre (BRIC) conducted weekly research seminars on important topics in biological sciences. This seminar series features international speakers, who are at the forefront of their respective fields, and who agree to present seminars on research and/or technologies that are having a major impact on biological and biomedical sciences.

The 2014 CEHA-BRIC seminars included:

- *The interplay between non-coding RNA, Rapamycin and telomeres in cellular senescence and aging.* Speaker: Brian Luke, Zentrum für Molekulare Biologie der Universität Heidelberg (ZMBH), Germany. Host: Hocine Mankouri, CEHA. February 6, 2014
- *Systemic DNA damage responses: organismal adjustments to genome instability.* Speaker: Björn Schumacher. Cologne Excellence Cluster for Cellular Stress Responses in Aging-Associated Diseases (CECAD), Cologne, Germany. Host: Lene Juel Rasmussen, CEHA. February 27, 2014.
- *Sequencing of DNA template strands in single cells.* Speaker: Peter M. Lansdorp, European Research Institute for the Biology of Ageing (ERIBA), Groningen, Holland. Host: Ian Hickson, CEHA. March 6, 2014.
- *Aging of hematopoietic stem cells.* Speaker: Gerald de Haan. European Research Institute for the Biology

of Ageing, University Medical Center Groningen, the Netherlands. Host: Lene Juel Rasmussen. October 9, 2014.

- *Telomere functions during the cell cycle*. Speaker: Jan Karlseder, Molecular and Cell Biology Laboratory, the Salk Institute for Biological Studies, US. Host: Ian Hickson. December 4, 2014.
- *Lifespan regulation via MAPK activation in C. elegans DNA repair mutants*. Speaker: Hilde Nilsen. Department of Clinical Molecular Biology, University of Oslo and Akershus University Hospital, Norway. Host: Mansour Akbari. December 11, 2014.

More information: [www.bric.ku.dk/seminars\\_events/seminars](http://www.bric.ku.dk/seminars_events/seminars)

### Network for Young Scholars

Network for Young Scholars (NYS) was established in 2010 by CEHA undergraduate and postdoctoral fellows to promote interdisciplinary research training, educational activities, and improve social interactions among young CEHA researchers. Network activities are scheduled and coordinated by the NYS Steering Group, made up of CEHA PhD and postdoctoral trainees.

In 2014, the NYS Steering Group members were:

- Amy Clotworthy, Postdoc (Theme I)
- Michael Simon Nixon, PhD student (Theme I)
- Sanne Jessen, Postdoc (Theme II)
- Andreas Vigelsø Hansen, PhD student (Theme II)
- Claus Desler, Assistant Professor (Theme III)
- Jon Ambæk Duurhus, PhD student (Theme III)
- Thomas Lau Hansen, PhD student (Theme III)
- Morten Hillgaard Bülow, Postdoc (Communication and Outreach Platform)
- Line Damberg, Academic Officer, CEHA Administration

### Activities in 2014

The NYS Steering Group organized the IARU Graduate Student Conference (GSC), held June 21-22, 2014. This event is described in greater detail on p. 54.

The NYS Steering Group initiated work to prepare a catalogue covering relevant PhD courses.

NYS also organized a special event called *Academic*

*Friday*. How CEHA can help communicate your research to the public. CEHA Communication and Press Officer Gitte Inselmann Frandsen gave a presentation at this event.

## Major grants

### Center for Chromosome Stability

Members of the Center for Healthy Aging were recently awarded a major national research grant of 65 Mio DKK to establish the Center for Chromosome Stability. The award from the Danish National Research Foundation (DNRF) was made as part of their *Centers of Excellence* program, and will permit recruitment of two new research groups from overseas. The Center for Chromosome Stability will be directed by Professor Ian Hickson from Theme III, and will also include Associate Professors Andres Lopez-Contreras, Ying Liu and Hocine Mankouri as Principal Investigators (also Theme III). The mission of the new Center will be to define how structural alterations in chromosomes affect the aging process in humans; in particular, how they cause age-associated diseases such as cancer and infertility. For example, one of the proposed new recruits, Professor Eva Hoffmann, will be investigating how genome instability affects fertility and birth defects in older mothers.

### Research Initiative on

#### Brain Barriers and Drug Delivery

The Research Initiative on Brain Barriers and Drug Delivery (RIBBDD) is a network of five independent research units in four Danish universities. RIBBDD was formed in March 2014 and received 40 Mio DKK funding over three years from the Lundbeck Foundation, with the possibility of two years additional funding at the end of the initial term. The goal is to understand mechanisms that promote and/or regulate transport of small molecule drugs across the BBB, and cellular communication in the brain. Professor Martin Lauritzen, the PI of CEHA's Theme II (neuroscience), is heading the project and Agnieszka Hac-Heimburg is administrating its activities. For more: [www.ribbdd.dk](http://www.ribbdd.dk)



## Appointment

### **Søren Bregenholt appointed as Honorary Industrial Ambassador**

In September 2014, the Faculty of Health and Medical Sciences appointed its first Honorary Industrial Ambassador: Corporate Vice President and Head of R&D External Relations Søren Bregenholt from Novo Nordisk A/S. Søren Bregenholt is the first to hold this title, which is awarded to individuals with special relevance for faculty research and teaching, a high professional level and significant work experience. The Honorary Industrial Ambassador is expected to generate innovative new ideas and to work with students and researchers to create concrete solutions and products. Søren Bregenholt has been with Novo Nordisk A/S since 2010. Previously, he was director of the bio-tech firm Symphogen. He has more than 10 years experience in external relations, strategic partnerships and alliance management involving universities, biotech and pharmaceutical industries. Novo Nordisk A/S is Danish partner in the KIC (see p. 57).



Søren Bregenholt  
Photo: Novo Nordisk A/S

*“Thinking about it, most modern breakthrough innovations are based on a formula including world class insights and inventions, committed, talented individuals well as organizations translating inventions into products for the benefit of customers. This is also true for Novo Nordisk – all the way from our formation in 1923 to our latest modern medicines.*

*It is clear that changing European demographics impose an increasing need for new ways of allowing the population to live longer healthy, independent and productive lives. To successfully bring such innovations forward – be they IT solutions, medical devices, new medicines or whole new ways of integrating healthcare – we must commit ourselves to the winning formula noted above.*

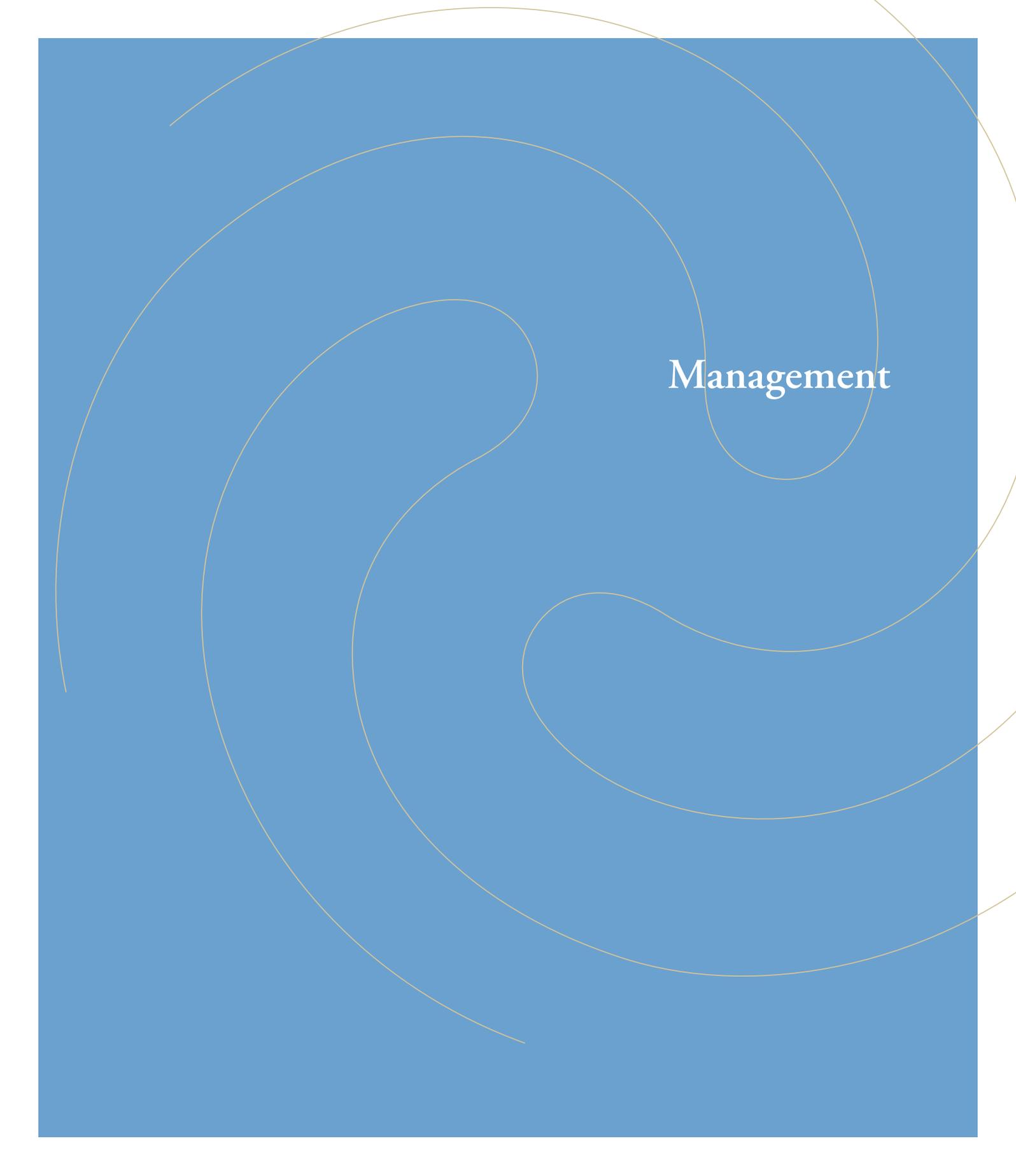
*Increased industry-academia collaboration is the fastest way to success. Industry not only needs access to inventions from academia – successful translations in innovation depend on access to models, technologies and*

*deep insights that often only exist in leading academic laboratories. On the other side, collaborating with industry allows academia access to translation tools, resources and direction, often providing a clear competitive edge to academic scientists.*

*More likely than not, such collaborations hinge on young, talented postdocs or junior faculty staff not only being the epicentre of knowledge and drive, but also building bridges between the industry and the academic objectives and mindsets crucial for mutual success.*

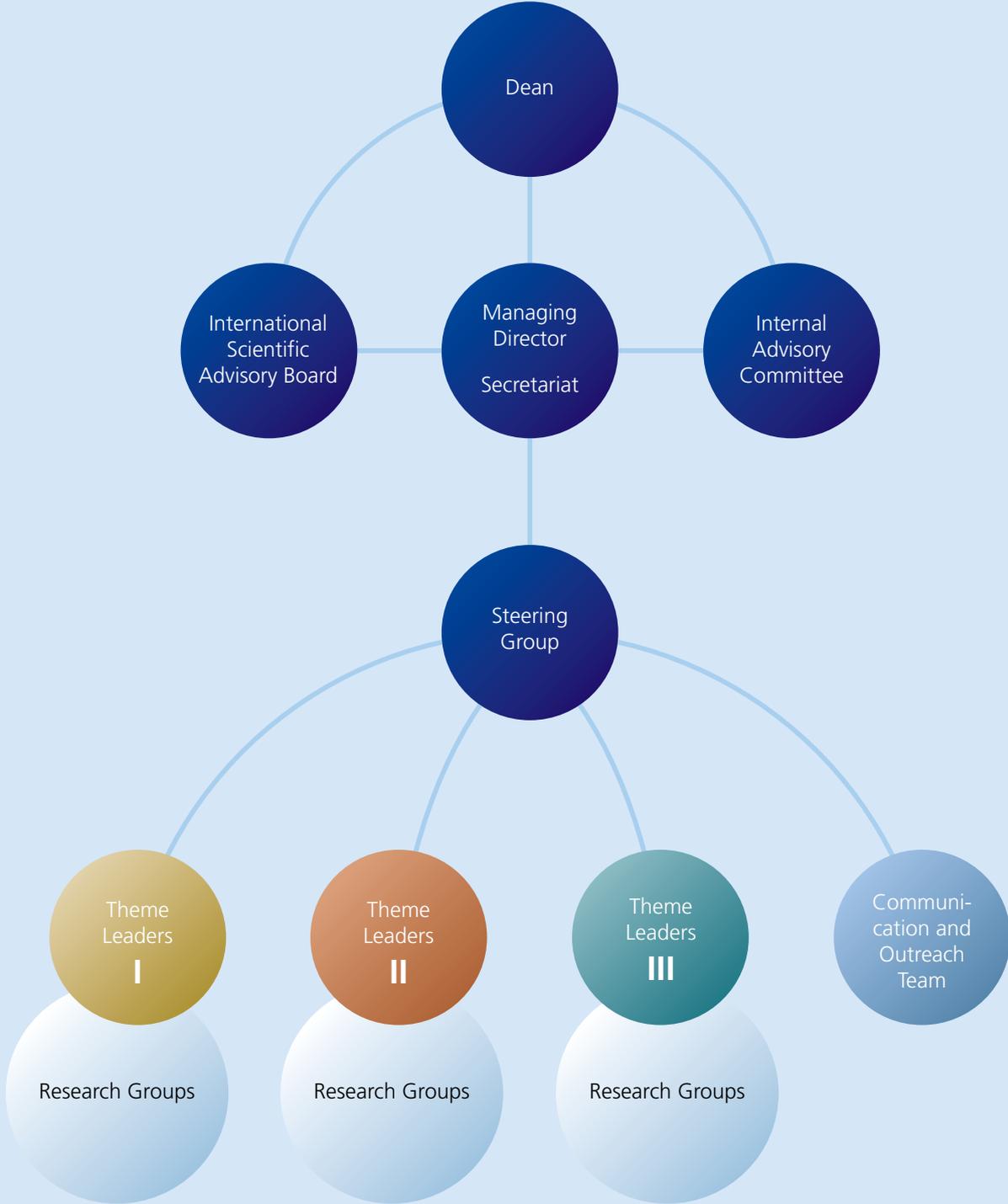
*As Industrial Ambassador, I am part of the formula. I facilitate collaborations to ensure a two-way exchange of knowledge and value, while focusing on providing opportunities for the most talented students to experience what industrial science is about, as they will be the ones to ensure future discoveries and inventions – and their translation into innovations that benefit the European population.”*





Management

# Organization Chart



# Management

The management of the Center for Healthy Aging is anchored at the Faculty of Health and Medical Sciences, Dept. of Cellular and Molecular Medicine. CEHA administrative duties are carried out by Managing Director, a Steering Committee, an International Scientific Advisory Board and Administrative staff, with the Managing Director reporting to the Dean of the Faculty of Health and Medical Sciences, Dr. Ulla Wewer. Dr. Wewer is ultimately responsible for all CEHA activities.

## CEHA Steering Committee

The CEHA Steering Committee provides oversight for research activities, financial issues, recruitment, strategic planning and outreach. The Chair of the Steering Committee is the Managing Director, Professor Lene Juel Rasmussen (Theme III), and the Committee members are leaders of the three research themes, as well as the leader of the communication and outreach platform. The Committee meets approx. eight times a year.

CEHA Steering Committee members:

- Managing Director – Professor Lene Juel Rasmussen (Chair)
- Assoc. Professor Astrid Pernille Jespersen (Theme I)
- Professor Allan Krasnik (Theme I)
- Professor Erik Lykke Mortensen (Theme II)
- Professor Martin Lauritzen (Theme II)
- Professor Michael Kjær (Theme III)

- Professor Ian Hickson/Hocine Mankouri (Theme III)
- Professor Thomas Söderqvist (Communication and outreach)

Meetings in 2014: 7 January, 4 March, 1 April, 10 June, 11 September, 7 October, 4 November and 19 December. The CEHA Steering Committee also organized the joint meeting with CEHA senior researchers on 6<sup>th</sup> May 2014 to acknowledge the beginning of a new funding cycle (2014-2018), but also to share ongoing research themes and to discuss potential future joint collaborations (see p. 29-31).

## International Scientific Advisory Board

During 2014, the International Scientific Advisory Board (SAB) was appointed for the period of 2014-2018. It includes eight distinguished scientists, representing broad scientific expertise relevant to CEHA research.

The role of the SAB is to provide advice about strategic planning, recruitment, feasibility, progress and development of the Scientific Program. The Board proposes criteria for evaluating scientific progress and success, assists in establishing suitable external domestic and international collaborations, and advises on scientific goals. Finally, SAB helps CEHA leadership ensure that its research programs meet the highest international standards and achieve optimal scientific impact. The Board meets once a year in Copenhagen.

The first meeting will take place after the summer of 2015 in connection with the annual CEHA meeting. The program will include meetings with the Theme Leaders, discussions of scientific progress, and consultation with CEHA management. The SAB reports to Dean Ulla Wewer.

The SAB members are:

- Professor Sarah Lamb, Brandeis University, US
- Professor Dr Ulrika Winblad, Uppsala University, Sweden
- Professor Erik Boddeke, University of Groningen, Netherlands
- Professor George Brooks, University of California, Berkeley
- Professor Boo Johansson, Göteborg University, Sweden
- Professor Tone Tønjum, Oslo University, Norway
- Professor Jan Vijg, Albert Einstein College of Medicine, US
- Dr Erinma Ochu, University of Manchester, UK

### Internal Advisory Committee

The members are:

- Dean of the Faculty of Health and Medical Sciences, Prof. Ulla Wewer MD DMSci (Chair)
- Managing Director, Prof. Lene Juel Rasmussen, PhD (Vice Chair)

- Prof. Vilhelm Bohr, MD DMSci, Lab Molecular Gerontology NIA/NIH, USA (International PI, Biomedicine)
- Prof. Carlos Mendes de Leon, PhD, University of Michigan School of Public Health, USA, (International PI, Epidemiology)

Departmental Chairs from:

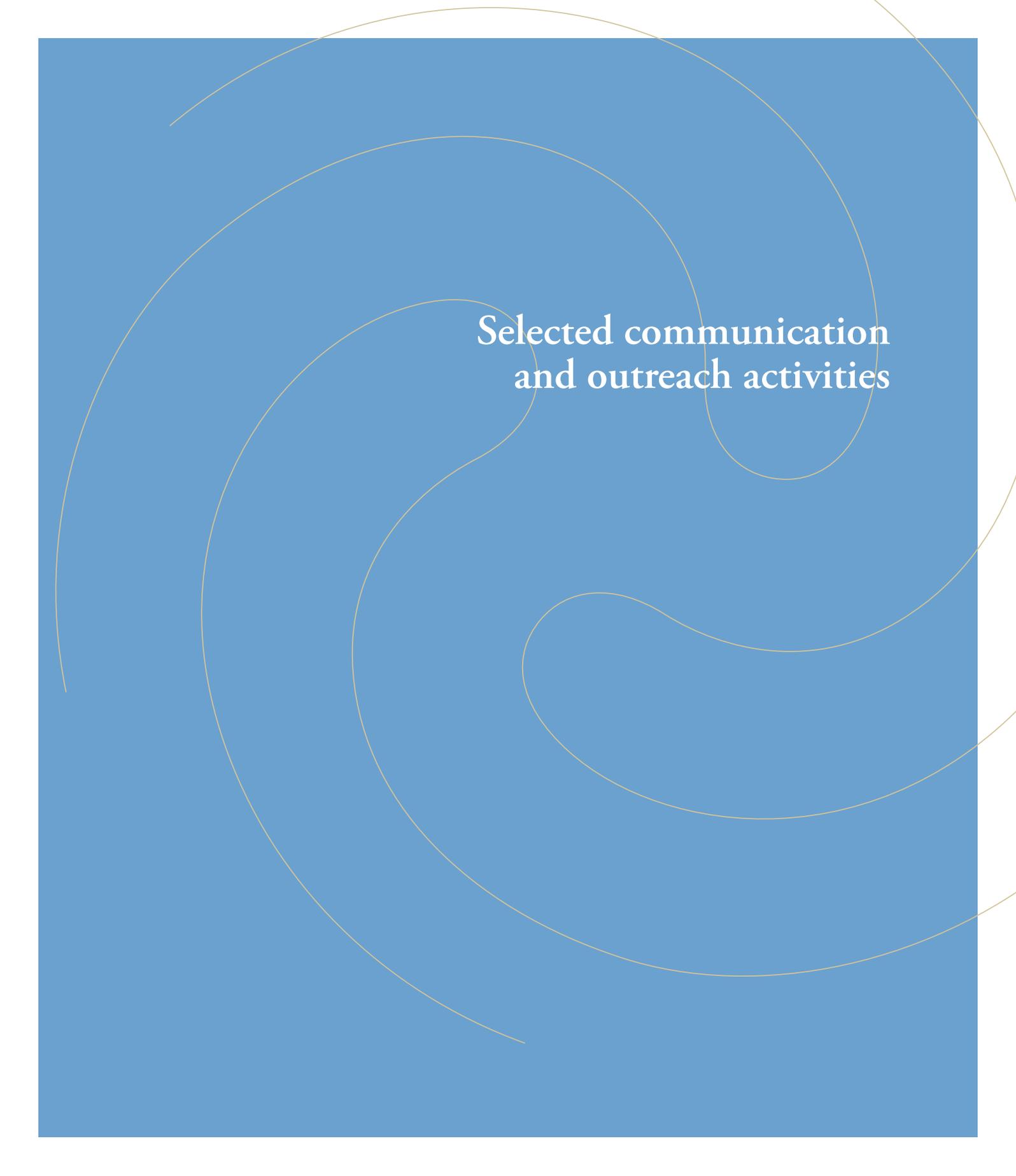
- Dept. of Neuroscience and Pharmacology
- Dept. of Cellular and Molecular Medicine
- Dept. of Public Health
- Dept. of Biomedical Sciences

Deans from:

- Faculty of Humanities, Prof. Ulf Hedetoft
- Faculty of Social Sciences, Assoc. Prof. Troels Østergaard Sørensen

### CEHA Administration

CEHAs administrative staff manages logistics and helps coordinate research activities and programs. The secretariat is centrally located in the Panum Building, Faculty of Health and Medical Sciences. In 2014, it includes three full-time employees: Tina Gottlieb, Head of Administration; Line Damberg, Academic Officer; Gitte Inselmann Frandsen, Communication and Press Officer located at the CEHA secretariat.

The background is a solid blue square. Overlaid on this are several thin, white, curved lines that sweep across the page in a fluid, organic pattern, resembling stylized waves or calligraphic strokes. These lines vary in length and curvature, creating a sense of movement and depth.

## Selected communication and outreach activities



# Selected communication and outreach activities

## Events

### Drawing healthy aging

In November, CEHA hosted the public event *Drawing science* at the Medical Museion, Faculty of Health and Medical Sciences, University of Copenhagen. In a collaboration between CEHA, the Danish Comics Committee and the Medical Museion, the idea was to combine popular science talks with real-time cartoon drawing. Four young CEHA researchers – Kamilla Nørtoft (Theme I), Rikke Hodal Meincke (Theme II) Jakob Agergaard (Theme II) and Claus Desler (Theme III) – presented aspects of their research projects while cartoonists Erik Petri and Katrine Clante continuously annotated and illustrated their presentations on a large paper roll which was projected onto a large screen in the background. The discussions continued over a glass wine in the museum's reception room. The event attracted approximately 100 people, primarily elderly people and students.

### Live forever

Also in November, CEHA organized an event in collaboration with the Copenhagen International Documentary Film Festival (CPH:DOX) in the Koncertkirken event venue, Copenhagen. In the first part of event, we showed the documentary drama film *The immortalists* (2014). The film is about two eccentric aging researchers, Aubrey de Grey and Bill Andrews, who strive to achieve eternal youth in a world they call 'blind to the

tragedy of old age'. Others are more skeptical: How about the ethical and existential consequences, not to mention overpopulation and food crises? And is science actually able to bring man eternal life? In the following debate, postdoc Morten Hillgaard Bülow from the CEHA communication team raised the themes of 'successful aging' and 'research and the pursuit of living forever' with independent aging researcher Henning Kirk, philosopher Søren Riis, and ordained priest Ane Mia Lykner. Approximately 150 people, mostly in their 30s, participated in the event.

### ESOF 2014 and Science in the City

The largest European science conference, *ESOF*, and the open science festival, *Science in the City*, were held in Copenhagen 21-26 June. CEHA researchers participated in both events. *ESOF* featured 120 sessions related to society, policy, business, and careers in science. CEHA Managing Director Lene Juel Rasmussen hosted one of the scientific sessions: *Young scientists fighting age-related disease*.

The *Science in the City* festival was open to the public. More than 80 sessions in Danish and other languages provided the audience with a unique opportunity to experience scientific research first-hand. CEHA participated in the event *Into the body: A journey with leading scientists*, arranged by the Faculty of Health and Medical Sciences, University of Copenhagen. CEHA researchers Bjarke Oxlund (Theme I), Ellen Garde (Theme II), Rikke



Lund (Theme II), and Vilhelm Bohr (Theme III) participated in three Science Slam sessions, where they presented their research in a short and precise four minute format. A video from one the Science Slam sessions is available at [video.ku.dk/video/10096541/science-slam-aktiv-aldring](http://video.ku.dk/video/10096541/science-slam-aktiv-aldring)

#### **Science Slam at Copenhagen Culture Night**

The Copenhagen Culture Night (Kulturnatten), a major cultural event in the Greater Copenhagen region in mid-October each year, is a unique opportunity for the University to get into dialogue with citizens. In 2014, the Faculty of Health and Medical Sciences arranged a number of Science Slams during *Kulturnatten*, one of which focused on aging and featured CEHA researchers Ellen Garde (Theme II), Rikke Lund (Theme II) and PhD student Rasmus Bechshøft (Theme III).

#### **Welfare Innovation Day**

CEHA hosted a session entitled *Active Aging – from research to practice* at the Welfare Innovation Day in January 2014 in Copenhagen. The aim was to engage in dialogue with stakeholders, especially with municipalities. 1,300 persons participated in Welfare Innovation Day. At CEHA's session, Aske Juul Lassen (Theme I) gave a presentation on active aging, followed by a panel discussion where Allan Krasnik (Theme I), PhD student Maja Schøler (Theme I) and Lars Holm (Theme III) gave input and examples related to the active aging theme. The Health Director of the the Ishøj Municipality, Per Tostenæs, was interviewed about how the municipality uses its collaboration with CEHA to evaluate services for senior citizens. CEHA researchers and staff also met with and distributed information to event participants, before and after the session.

## CEHA on social media

CEHA is active on Facebook, Twitter and Instagram, and uses these platforms to engage in dialogue with Danish citizens and other stakeholders in healthy aging.

### Facebook

CEHA's Facebook page went online in April 2013. By the end of 2014, it had 10,361 likes. The page has good dialogue with its followers; the estimated engagement rate (percentage of views that were shared, liked or commented) is approximately 8% (an engagement rate of 1-2% is considered high). The CEHA communication and press officer Gitte Inselmann Frandsen is responsible for the Facebook page and seven young CEHA researchers are part of the editorial board ([www.facebook.com/sundaldring/app\\_208195102528120](http://www.facebook.com/sundaldring/app_208195102528120)):

- Nanna Hilm, PhD student (Theme I)
- Henrik Hvenegaard, Postdoc (Theme I)
- Jacob Agergaard, PhD student (Theme II)
- Rikke Hodal Meincke, PhD student (Theme II)
- Andreas Vigelsø, PhD student (Theme III)
- Thomas Lau Hansen, PhD student (Theme III)
- Morten Hillgaard Bülow, Postdoc (Communication team)

CEHA's Facebook page promotes and illustrates CEHA research as well as promoting debate on aging-related topics and information/articles on aging and health from other sources.

Some of the most successful updates in 2014 discussed the effect of arguing on health (reached >23.000), the ability of long distance running to increase health span, and the effect of coconut oil on aging of the brain (reaching approximately 14.000 each).

### Twitter

In July 2014, CEHA began using Twitter at the hashtag *@sundaldring*. The main goal is to stimulate interest in the public debate on healthy aging, why and how we should pursue it. The profile is used to:

- Disseminate interesting content on aging research
- Ask questions related to healthy aging
- Ask perspectival questions

CEHA's social media curator, Annika Holme, is currently tweeting (*@sundaldring*) about health and older people, both content generated by CEHA (e.g., press releases) and taken from other sources. By the end of 2014 *@sundaldring* had 93 followers. A list of CEHA researchers with active Twitter accounts is available at [twitter.com/sundaldring/lists/sund-aldring-forskere](http://twitter.com/sundaldring/lists/sund-aldring-forskere).

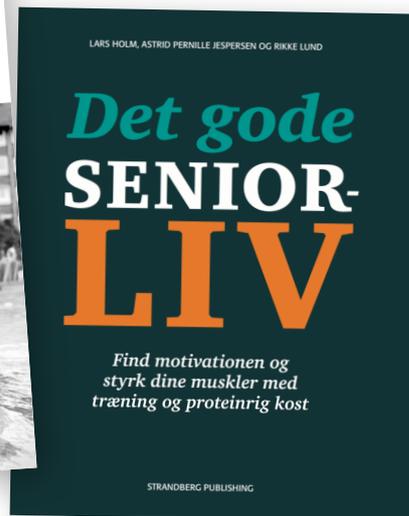
The most successful posts on *@sundaldring* include content relevant to CEHA and ongoing conversations among other Twitter consumers. The results indicate that actively relating to the discussions on Twitter and relatively fast response time are important for achieving a 'presence' on Twitter.

### CEHA researchers communicating on Twitter

A list of CEHA researchers with active Twitter accounts can be accessed via *@sundaldring*. The aims are to encourage greater use of the Twitter platform by CEHA researchers to more widely disseminate CEHA researcher outcomes. The future main goal is that the tweeting CEHA researchers actively can contribute with scientific content and debate on aging and health. Through individual researchers it will be possible to personalize science and show the different aspects of aging research and reach audiences interested in the various aspects of aging research.

### Instagram/Twitter/Facebook at Drawing Science

In November, Twitter was used during the *Drawing science event* (see page 77). 51 live-tweets, including highlights from the presentations and questions from the audience and the answers, got 2,839 views, the highest view to date in a single day. One follower also posted a question on Twitter for the researchers at the event, which was answered live by tweeting back. The use of Twitter was combined with photos on Instagram, which worked well. The Facebook page *Sund Aldring* (Healthy Aging) was also used to document the event; 1,535 followers viewed the update, with an engagement rate of a staggering 9%.



### CEHA profile magazine

A magazine containing nine articles about CEHA was published at Welfare Innovation Day (described above). The magazine is available in Danish ([sundaldring.ku.dk/formidling/profilmagasin](http://sundaldring.ku.dk/formidling/profilmagasin)) and English ([healthyaging.ku.dk/about](http://healthyaging.ku.dk/about)).

### Book: *The good senior life*

See pp 31 for details on the book 'The good senior life' – a joint communication project.

### Press activities

CEHA's visibility in the press continues to increase with 175 articles in 2013 and 228 in 2014. During 2014, eleven Danish and four English press releases on CEHA research were distributed. Two stories based on Associate Professor Rikke Lund's research (Theme II) were among the most successful. A story on physical capacity in middle-aged individuals from different social groups was mentioned in the Danish National Broadcasting Radio DR and the Minister of Health Nick Hækkerup commented on the results. A story on the effect of arguing on health was also popular nationally and internationally, receiving approximately 200 citations, including BBC Health.

Professor Vilhelm Bohr (Theme III) published a paper indicating that coconut oil might postpone brain aging. The story based on the press release was mentioned in more than 65 international media sources, including Indian *Zee News* and the American *Newmax Health*. Aske Juul Lassen's PhD thesis on active aging and exercise also received a significant amount of notice.







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