UNIVERSITY OF COPENHAGEN
CENTER FOR HEALTHY AGING

Center for Healthy Aging

Annual Report 2015

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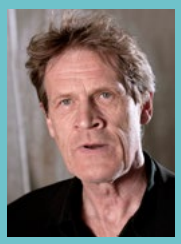

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NORDEA FONDEN
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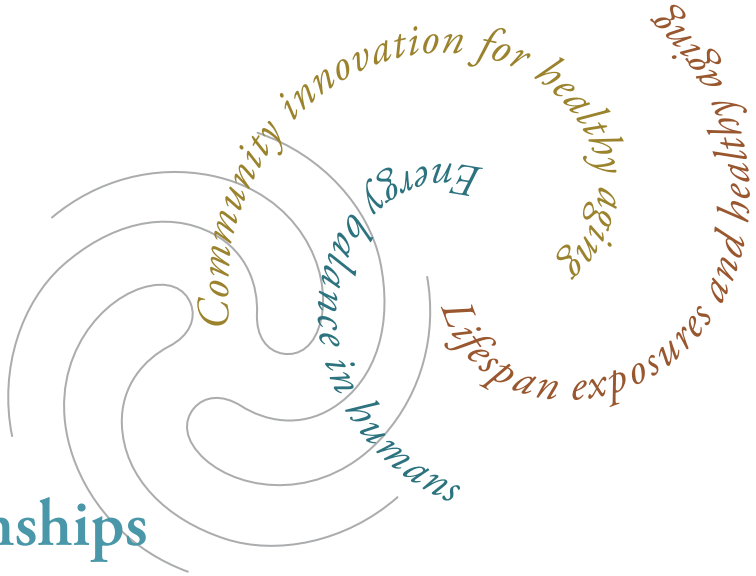
Center for Healthy Aging is supported by the Danish foundation Nordea-fonden



New interrelationships

Never before have human beings lived as long as they do now. But, the quality of a life is not only measured in its length. True quality of life means maintaining high vitality and a feeling of energy at all life stages: this is what we now mean when we say the "Good Life." This is the raison d'etre for aging research: it informs us about determinants of our life span (how we can live longer) and about how to make living longer worthwhile.

Aging research also plays an important role at the societal level. This is especially important as population aging occurs, as the average age of the population increases and working age individuals are called on to support for an increasing number of elderly individuals. In short, population aging has very large impact on socio-economics. In the face of population aging, workforce productivity is likely to decline while the burden on the healthcare sector and health care costs increase dramatically. The overall health of the population could decline, because elderly individuals suffer from age-related disease and disability to an extent not found in younger individuals. For example, age-related diseases include cancer as well as neurodegenerative and cardiovascular diseases. This has major implications for society worldwide, even though population aging varies significantly according to country and geographic region. Nevertheless, there is increasing interest in aging research worldwide.

The Center for Healthy Aging (CEHA) at the University of Copenhagen is positioned at the heart of the national and international agenda for aging research. CEHA has chosen to focus on cause/effect relationships that influence human health at the individual and population levels.

Themed, interdisciplinary research

CEHA research falls into three themes, from the cellular level to the societal level, and is seeking solutions to critical unsolved problems in aging research. These include:

1. *Health-promoting innovations*, in which we investigate the significance of the local community and options for promoting the health and energy of the elderly in the last part of their lives. We also focus on how historical and social change influences both interpersonal and intergenerational relationships.
2. *Aging processes throughout the life course*, are a field in which we investigate the factors that affect aging throughout life, people's motivation for maintaining active lifestyles and what happens to muscles and the brain as we age.
3. *Human energy levels* are a theme in which we focus on the body's inability to repair cellular damage and thus repair damage to cells and hence tissues and organs as we age.

Professor Lene Juel Rasmussen, Managing Director

CEHA has been attracting many excellent researchers from across the world, many of whom want to be part of our special interdisciplinary working environment. The interdisciplinarity of CEHA is one of its unique and very special characteristics, which will be fostered even more in the future by the new and spectacular Maersk Building in the Panum complex. The Maersk Building is expected to be completed in 2016, and will serve as a dynamic physical, social and intellectual resource, that will bring CEHA personnel together and push our interdisciplinary research to a new level. Working under the same roof, we expect to be inspired and be open to new collaborations and ideas. Here is to a great 2016 for CEHA!

An international leader in aging research

In recent years, CEHA has assumed a leading position in the international aging research community. CEHA participates in many unique collaborations, including: IARU (an international collaboration between some of the top universities worldwide), MARRIAGE (an EU-funded collaboration with eight European aging research institutes), and ABRAHAM (a transatlantic research collaboration between Europe, USA and Canada). CEHA is part of the international elite in aging research and we are constantly seeking new international collaborations.

CEHA is communicating in new ways about our research to the world, reaching out to the general public amongst whom we wish to create appetite for more knowledge about aging. We want the public to know about our research and then to want to learn more, ultimately helping everyone live longer lives with a higher quality of life. One example is the exhibition on "Round and about the brains of children and grandparents" which we ran in conjunction with Medical Museion. This exhibit gave young and elderly alike an opportunity to investigate and learn about the aging brain.

CEHA researchers feel that it is important to actively disseminate the results of our research to the non-scientific community. Whilst we investigate, the public has the opportunity to put our results into practice. Therefore, the views and experience of members of the public are extremely important to us. This is why we make a large effort to engage the public, as well as healthcare professionals and political decision-makers in a dialogue about their needs, their experience and how we can interface with all stakeholders in human health.

In 2015, we feel that we lived up to many of our goals, and that many Danes are aware today that CEHA is an important source of knowledge about healthy aging in Denmark.

Professor Lene Juel Rasmussen, Managing Director

Theme I

Community innovation for healthy aging

Community innovation for healthy aging

Group leaders
Astrid Jespersen, Assoc. Professor
Karsten Vrangbæk, Professor
Maria Kristiansen, Assoc. Professor
Bjarke Oxlund, Assoc. Professor
Susan Whyte, Professor

Theme I is focused on community participation and local practices as the foundation for healthy aging. We examine how local settings and practices, as well as socio-economic position affects processes and practices related to aging. Theme I researchers work in many disciplines, from ethnology and anthropology to public health, and work closely together on a range of research topics. In other words, Theme I aims 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 between CEHA and four Danish municipalities: Ishøj, Copenhagen, Vordingborg and Gentofte. These municipalities represent different organizational and institutional conditions and populations that differ by social class, ethnicity, age and health status. In 2015, CEHA started a new collaboration with the Nordfyn municipality in Southern Denmark. This collaboration focuses on the newly established health center in Bogense.

By focusing 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.

We organized three seminars (two in 2015) with practitioners and managers from the partner municipalities focusing on jointly-selected topics, such as inequality, loneliness and interaction with civil society organizations.

Background and hypothesis

The research in Theme I is guided by four questions: What processes contribute to changing cultural ideas about health and energy over the life course within socially contrasting communities? In what ways does historical change affect social relations between and within generations in a specific society? How do different actors/players with diverse initiatives for healthy aging interact within a municipality? 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?

Program performance

In 2015, we reached our recruitment goals by recruiting 1 professor (part-time), 3 post docs and 1 PhD student. The following paragraphs describe currently active projects and sub-projects:

- The project *Local practices of active aging* focuses on the ways international ideals of active aging are translated into local municipal and everyday life practices in three municipalities. The project has taken a particular interest in co-creation, which is a governance technique that aims to break down barriers between the municipalities and civil society by inviting organisations and individuals into the municipal machinery. Co-creation is formed by a specific ideal of active citizenship which positions elderly volunteers as drivers of welfare services.
- *Intergenerational relations in age-related transitions* consist of two sub-projects: Retirement stories where data generation goes along with dissemination of preliminary results and data to a general public through exhibitions, neighborhood walks and oral presentations. The project has a strong educational component and students are involved in experiments, disseminating the research through audio recordings and videos. The other sub-project *Moving to a nursing home* focuses on housing options for older people and how people prepare for future changes related to their aging. Furthermore, the project focuses on how ethnography and audiovisual representations can be tools for interdisciplinary collaboration and professional development in caring for the elderly.
- *Empowering community health* is a cultural analysis of health services for older citizens in the Gentofte municipality. The aim is to examine the understandings and practices of health that are involved in community-based initiatives. This qualitative project is expected to provide insight into how 'good health' and 'quality of life' are evaluated and understood by a variety of actors.
- The project *healthy aging among ethnic minorities* is based on ethnographic fieldwork in Ishøj and Turkey and sets out to investigate how "healthy aging" and "the good life" are achieved by Turkish immigrants. The project focuses on the ethnic and cultural 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* focuses on the practice of enabling care in Copenhagen municipal eldercare services, more specifically how the needs and resources of older people are negotiated between the involved actors. "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.
- 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.
- *Transferring healthy aging* is an umbrella study exploring implementation of diverse interventions and the tension between context-dependency and efficacy on the one hand, and transferability of healthy aging interventions on the other. The study includes (a) Community-based loneliness intervention targeting elderly community-dwelling adults to be followed longitudinally and compared with loneliness interventions in other municipalities, (b) transferability of healthy aging interventions across contexts, target groups and organizational settings, (c) community-based intervention for ethnic minority elderly women conducted in a private-public partnership, (d) register-based study focusing on healthcare utilization across diverse ethnic and socioeconomic groups will further add to the focus on healthy aging, and in particular inequalities in health and disease in older age.
- A new project will evaluate whether *follow-up home visits* improve care, secure cross-sectoral coordination and to prevent re-admission. The project uses register data to analyze whether and how general practitioners use home visits for older patients after discharge, and to what extent follow-up home visits improve cross-sectoral care coordination.
- Another project focuses on *elderly, socially-isolated men* on the eastern part of the island, Møn and is a collaboration with the local health care center. Through ethnographic fieldwork the 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.

- *Aloneness and citizenship* is a project about elderly people living alone and focuses on social relations, prevention, medicine and death. The project examines the significance of aloneness for health, well-being and social relations among the elderly.
- *A community intervention to strengthen social cohesion* applies a mixed-methods approach, in which both qualitative and quantitative data will be collected and analyzed. The study sets out to explore the potential of a community intervention in establishing and strengthening social relations, preventing loneliness and subsequently reducing need and use of health care services among older adults in Denmark.
- *Development or decline? Experiences and practices of aging in enabling care* focuses on the practices of the health professionals working with enabling care in the Municipality of Vordingborg and subsequently on the experiences of the citizens receiving enabling care.
- *Digital rehabilitation* focuses on the processes through which new technologies, health care professionals and patients are associated together in new ways, in order to obtain independence and physical progress in frail elderly bodies. The project focuses on how the technology reconfigure images of care, the elderly and future progression in the encounter between health professionals and patients and in patients' everyday life.
- *Locating practices of old age* investigates old age from a cultural historical perspective. The project focuses on how old age was configured in nursing homes and care facilities, from mid-1 Century. The project examines both the policies and the practices concerning elderly people.
- The project *Implementation of welfare technologies* will investigate the implementation and use practices of welfare technologies. A point of departure is a study of Copenhagen's test center for welfare technologies with the aim of getting knowledge about which welfare technologies are currently being tested and in the initial implementation phase in Copenhagen. The project will also explore welfare technologies in their implementation phase in Vordingborg and Ishøj.
- *Food, nutrition and aging* investigate a range of themes within the wider field of food for elderly in the 20th and 21st centuries. The aim of the study is to understand past and present societal and individual understandings and practices around the health and food of older people in a Danish context- and especially of the importance of and practices with/around protein.
- *Health centers as locus for coordination of care*: The project investigates collaboration, steering and communication in joint local/regional health centers using *Health Center Bogense* as a case study. There is a particular focus on how GPs can function as coordinators of health services. Workshops with key stakeholders provide important forums for dialogue and development of collaborative practices.
- *Involving civic society and organizations*: Civic society and organizations are increasingly engaged in providing social and caring activities for elderly citizens. This project investigates municipal policies and explores the potentials and dilemmas in such collaborative processes. Administrative documents and survey data provide the empirical basis for the study.

Results

A key result for theme I is the active collaboration and dialogue with partner municipalities which constitutes interventions based on research activities. The individual projects have generated a number of insights into the organization and implementation of care for elderly. Examples of specific results include:

- Theoretical, analytical and methodological frameworks for sub-projects identified and outlined.
- Collaboration with partner municipalities, private organizations and international research groups established within sub-projects.
- Case-interventions identified and partnerships formed.
- Elderly people who have lost relatives, friends and network are often alone for many hours during day and night. For various reasons, however, only few of these fragile people want to attend an activity center.
- New governmental techniques in the municipalities, such as co-creation, promote active citizenship. This is in line with international active aging policies and is

taken up by many older people, who engage in their communities through co-creation.

- Developed a database for quantitative questionnaires and screening interviews about food habits, life trajectory and protein habits and perceptions.

Conclusions

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 influences the health and energy of aging citizens. We have consolidated our cooperation with our partner municipalities, each with very different population demographics and organizational character. We have extended our collaboration with an additional municipality and the region of Southern Denmark. 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/players 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. With the LIFESTAT and CALM projects, several of Theme 1 researchers are engaged in cross-disciplinary and cross-theme collaborations.

Selected publications

In 2015, CEHA published 177 scientific publications. Below, we list the 10 most important publications from Theme I. The papers were selected by the Theme Leaders.

Bødker M. The negotiation of needs, resources and potentials in an eldercare paradigm of help to self-help. *European Journal of Public Health*. 25, Supplement 3: 352, 2015.

Ertner, M. Different generalizations of the elderly in design of welfare technology. *STS Encounters*. Accepted 2015.

Handlos LN, Olwig KF, Bygbjerg IC, Kristiansen M and Norredam M. Return migration among elderly, chronically ill Bosnian refugees: Does health matter? *International Journal of Environmental Research and Public Health*. 12(10): 12643-61, 2015.

Holm L, Jespersen AP, Nielsen DS, Frøst MB, Reitelseder S, Jensen T, Engelsen SB, Kjaer M and Damsholt T. Hurrah for the increasing longevity: feasible strategies to counteract age-related loss of skeletal muscle mass. *Scandinavian Journal of Medicine & Science in Sports*. 25(1), 2015.

Kriegbaum M, Hendriksen C, Vass M, Mortensen EL and Osler M. Hypnotics and mortality – partial confounding by disease, substance abuse and socioeconomic factors? *Pharmacoepidemiology & Drug Safety*. 24(7): 779-83, 2015.

Kristiansen M, Lue-Kessing L, Norredam M and Krasnik A. Migrants' perceptions of aging in Denmark and attitudes towards remigration: findings from a qualitative study. *BMC Health Services Research*. 15: 225, 2015.

Lassen AJ and Jespersen AP. Ældres hverdagspraksisser i aldringspolitikken: Om synkroniseringsarbejdet imellem hverdag og politik (Old People's Everyday Practices and Ageing Policy – On the Synchronisation between Everyday Life and Policy). *Kulturstudier*. 1: 79-99, 2015.

Michaelis C, Kristiansen M and Norredam M. Quality of life and coping strategies among immigrant women living with pain in Denmark: a qualitative study. *BMJ Open*. 5(7):e008075, 2015.

Mikkelsen HH. "Vi fandt ungdom i seniorboliger": Aldring, autonomi og kollektiv historiefortælling ("We found youth in senior housing": Aging, autonomy and collective historical narration). *Gerontologi*. 2: 26-31, 2015.

Rudkjøbing A, Vrangbaek K, Birk HO, Andersen JS and Krasnik A. Evaluation of a policy to strengthen case management and quality of diabetes care in general practice in Denmark. *Health Policy*. 119(8): 1023-30, 2015.

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
Rudi Westendorp, Professor

The maintenance of energy in the cells and tissues of the human body is necessary for continued active 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, increased inflammatory levels and increased level of overall fatigue. Theme II aims to stimulate an energetic and active lifestyle in aging individuals analyzing Life course exposures: 1) by investigating cohorts of middle-aged followed from their birth and coupling cognitive and physical function as well as midlife low grade inflammation to exposures throughout their lifespan; 2) by linking detailed life course data with national health and social registries in Statistics Denmark; 3) by establishing a very large Danish Conscription Database.

Theme II also analyzes Age-related cognitive decline: 1) by conducting follow-ups on selected cohort subsamples to complement existing data with data from late midlife and old age; 2) by establishing a new cohort consisting of at least 1800 men followed up with re-administration of the Danish draft board intelligence test in late midlife; 3) by analyzing data on the Glostrup 1914 cohort which has been followed from age 50 to age 100 for the oldest surviving cohort members.

Finally Theme II researchers conduct a *Physical activity intervention* testing interventions in the elderly with different levels of physical fitness in order to compare effects of different physical activity interventions and evaluate the use of *Cholesterol lowering drugs* by investigating the potential benefits and negative side effects, including the metabolic profile of elderly individuals who receive preventive medication.

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 I (2009-2013) cognitive neuroscience project and the results for this sample can be confirmed in a larger sample of 300 subjects.

Physical activity intervention: Program adherence and long-term beneficial effects will be greater for moderate training. We also hypothesize that the overall effect

upon functional ability, cognitive functioning, health promotion and disease prevention will be greater in the long run with moderate physical training than with a high intensity training regimen.

Cholesterol lowering drugs: Statin induced myalgia can be mitigated via parallel supplement with Q10. Patients in statin treatment experience a decrease in muscular function (strength and rate of force production) and disturbed glucose homeostasis as well as mitochondrial oxidative capacity. Physical training may alleviate these side-effects.

Program performance

Life course exposures

Data from Copenhagen Aging and Midlife Biobank *(CAMB)* form the basis for an increasing number of projects on life course influences on aging, including studies on social inequalities in early aging, exposure to stress, allostatic load, low grade inflammation (LGI), physical functioning, and cognition over the life span. Studies incorporating these factors have focused on both early aging and physical as well as mental health and disease.

A major step forward will be the integration of the detailed information on the CAMB cohorts with the information in National Health and Social Registries. This work is being facilitated by the establishment of a *Public Health Database* on a separate server in Statistics Denmark. Several new projects based on this new facility have been initiated. This includes not only data based on the CAMB cohorts, but also projects based on the large *Danish Conscription Database*, which includes draft board information on 728160 men and makes it possible to conduct detailed analyses of the influence of young adult body size, education and young adult intelligence on health, disease and aging processes over the full life course.

Studies based on the Copenhagen Perinatal Cohort have been conducted on early growth and behavioral milestones as predictors of young adult personality and adult intelligence. Further analyses of associations between early growth and development and personality and intelligence in late midlife are planned.

Age-related cognitive decline

A comprehensive follow-up of a CAMB subsample from the Metropolit Cohort, selected on the basis of midlife cognitive functioning, is being expanded and described in detail below *(Identification of predictors for cognitive function)*. The *Life-Mabs* study will incorporate detailed psychological and MRI follow-up on selected members of the Copenhagen Perinatal Cohort with detailed information on early life exposures and young adult psychological, social and physical development. A special feature of the study will be the re-administration of the Wechsler's Adult intelligence Scale, which the participants first completed as young adults, enabling detailed analyses of cognitive changes from young adulthood to late midlife.

The *Liko-15* project is unique by conducting the first ever large scale follow-up study with re-administration of the Danish draft board intelligence test. The focus of the study is the influence of lifestyle factors and mental and physical disease on age-related cognitive decline. The follow-up will include at least 1800 55-65 year old men. At this stage more 700 men have participated in the study.

Studies on the Glostrup 1914 cohort are being expanded with analyses of both cognitive and MRI data. Recent analyses suggest that social network and social relations may influence age-related cognitive decline.

Physical activity intervention

The LISA study is a large scale randomized trial, testing interventions in the elderly with different levels of physical fitness in order to study if interventions can promote higher energy levels and long-term post-interventional adherence to a physically active and energetic lifestyle throughout old age. The study is described in detail below and a collaborative paper describing the project is in preparation.

The Ubberup project, focusing on the factors that influence the capacity to maintain lifestyle changes after an 11-12 week lifestyle intervention, has included 79 participants in a cross-sectional study and 61 participants in the longitudinal study.

Cholesterol lowering drugs

Studies of elderly individuals who receive preventive medication are ongoing (LIFESTAT), including analyses of the metabolic profile associated with preventive medication. The studies are described in detail below, and this is also the case for the LISA large-scale randomized trial 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.

As part of the LIFESTAT project a national survey of the general population with 3050 respondents has been completed. The purpose of the survey was to study health, health behaviors and information seeking with particular focus on elevated cholesterol and statins. Data have been cleaned and is currently being used by 2 PhD students and 1 post-doc.

Results

- By now there are 46 completed or ongoing projects based on the CAMB database, demonstrating the unique value of CAMB as asset for life course studies of aging.
- The conscription database comprising data on 728160 men has been the basis of several papers and several projects are ongoing or in the start-up phase.
- Body weight at birth is associated with CRP later in life independently of adult body weight.
- Low birth weight, low socioeconomic position and

low intelligence increase the risk of psychiatric disease in late midlife, in particular alcohol and drug abuse.
- Alcohol and drug abuse are strongly associated with inflammatory biomarkers and poor survival in late midlife.
- Personality development is only weakly related to parental socioeconomic status and the association may be mediated through intelligence.
- Age of attaining infant developmental milestones predicts adult intelligence.
- Intelligence in early adulthood is associated with midlife physical performance among Danish males.
- Mobility-related fatigue is not a significantly stronger risk factor for subsequent mobility limitations among those with concomitant exposure to low socioeconomic position, compared with those with high socioeconomic position.
- The accumulation of major negative life events in childhood, private adult life and work life, respectively, is a risk factor for developing type 2 diabetes.
- Early life adversity potentiates the effects of later life stress on cumulative physiological dysregulation.
- Negative aspects of close social relations are associated with higher risk of incident ischaemic heart disease hospitalization and with increased mortality except for conflicts with partner.
- The Liko-15 project has been successfully initiated. About 700 men have by now completed the follow-up examination, including re-administration of the military draft board intelligence test.
- All necessary planning and permissions for the Life-Mabs project are ready.
- Spontaneous brain activity as well as perfusion is decreased in critical brain regions in middle aged subjects with decreased cognitive performance.
- EEG examinations during multisensory processing showed that late midlife men had smaller responses compared to measurements on young adults.
- Visual evoked amplitudes in the gamma range correlated inversely with intelligence.
- Self-reported poor sleep quality is related to cognitive changes, whereas daytime sleepiness is not related.
- Increased deoxythymidine triphosphate levels is a feature of relative cognitive decline.
- The physical training intervention project (LISA) study is currently following the outlined time schedule for recruitment of individuals. Around 3-4 are recruited per week and around 220 individuals are enrolled in the study, and around 70 have completed the 1 year intervention period.
- In studies of statin users for primary and secondary prevention purposes, 69 out of 100 participants have been included.
- Increased post-operative cardiopulmonary fitness in gastric bypass patients is explained by weight loss.
- A minor reduction in daily physical activity for two weeks increased blood lipids in both young and older men. Six weeks of training improved blood lipids along with loss of visceral fatSix weeks' aerobic retraining after two weeks' immobilization restores leg lean mass and aerobic capacity but does not fully rehabilitate leg strength in young and older men.
- Age *is not* associated with impaired mitochondrial function (respiratory capacity and ROS production in healthy adults, but the membrane potential is lower.
- Two weeks immobilization has a strong negative influence on the function of mitochondria, but physical rehabilitation for 6 weeks restores the function.

Conclusions

Theme II researchers conduct observational epidemiological and clinical studies as well as intervention studies. The second CEHA II year has been very successful with a number of significant results based on ongoing research, including results from analyses of CAMB data, and the successful continuation and initiation of a series of new studies: The Glostrup neurocognitive project, aiming at identification of predictors for cognitive function, has been expanded, and supplemented by the large-scale Liko-15 cognitive longitudinal study. The physical training intervention trial and the Ubberup project have been very successful with respect to recruiting participants, and analyses of the statin user cohort are ongoing while the Life-Mabs follow-up study including MRI is ready to assess the first participants early 2016. Theme II researchers collaborate closely with Theme I researchers in studies combining qualitative and quantitative analyses

of aging and description of aging from the perspective of older and elderly individuals. Similarly, collaboration between Theme II and Theme III researchers is extensive, particularly in studies focusing on identifying biomarkers of aging.

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. In 2015 – and in previous years – the results of CEHA researchers have corroborated this general point of view, including a number of studies focusing on the influence of early life exposures on midlife and old age functioning and health. In addition CEHA researchers have strived to identify and understand biomarkers of early aging. These 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). Combining results from studies of early life influences on aging with knowledge on early markers of aging will make it possible to design efficient interventions and health promotion strategies contributing to improving the health and quality of life of the present and future generations of older people.

Selected publications

In 2015, the CEHA published 177 scientific publications altogether. Below, we list a selection of 10 of the most important publications from Theme II. The papers were selected by the Theme Leaders.

Desler C, Frederiksen JH, Angleys M, Maynard S, Keijzers G, Fagerlund B, Mortensen EL, Osler M, Lauritzen M, Bohr VA and Rasmussen LJ. Increased deoxythymidine triphosphate levels is a feature of relative cognitive decline. *Mitochondrion*. 25: 34-7, 2015.

Dich N, Hansen ÅM, Avlund K, Lund R, Mortensen EL, Bruunsgaard H and Rod NH. Early Life Adversity Potentiates the Effects of Later Life Stress on Cumulative Physiological Dysregulation. *Anxiety, Stress & Coping.* 28: 372-390, 2015.

Gram M, Vigelsoe A, Yokota T, Helge JW, Dela F and Hey-Mogensen M. Skeletal muscle mitochondrial H2O2 emission increases with immobilization and decreases after aerobic training in young and older men. *Journal of Physiology.* 593: 4011-4027, 2015.

Larsen S, Danielsen JH, Sondergard SD, Sogaard D, Vigelsoe A, Dybboe R, Skaaby S, Dela F and Helge JW. The effect of high-intensity training on mitochondrial fat oxidation in skeletal muscle and subcutaneous adipose tissue. *Scandinavian Journal of Medicine & Science in Sports.* 25: 59-69, 2015.

Lenskjold A, Kongsgaard M, Larsen JO, Nielsen RH, Kovanen V, Aagaard P, Kjaer M and Magnusson SP. The influence of physical activity during youth on structural and functional properties of the Achilles tendon. *Scandinavian Journal of Medicine and Science in Sports.* 25: 25-31, 2015.

Masters Pedersen J, Budtz Jorgensen E, Mortensen EL, Bruunsgaard H, Osler M, Sørensen TIA, Rod NH an Lund R. Late midlife C-reactive protein and interleukin-6 in relation to body weight history within and across generations. *Obesity.* Accepted 2015.

Meincke RH, Osler M, Mortensen EL and Hansen ÅM. Is Intelligence in Early Adulthood Associated With Midlife Physical Performance Among Danish Males? *Journal of Aging and Health.* 6, 2015.

Osler M, Rostrup E, Nordentoft M, Mortensen EL, Bruunsgaard H and Fagerlund B. Influence of early life characteristics on psychiatric admissions and impact of psychiatric disease on inflammatory biomarkers and survival: a Danish cohort study. *World Psychiatry.* 14: 364-5, 2015.

Rosenkilde M, Morville T, Riis AP, Kjaer K, Rasmussen H, Holst JJ, Dela F, Westerterp K, Sjodin A and Helge JW. Inability to match energy intake with energy expenditure at sustained near-maximal rates of energy expenditure in older men during a 14-d cycling expedition. *American Journal of Clinical Nutrition.* 102: 1398-1405, 2015.

Waller KL, Mortensen EL, Avlund K, Osler M, Fagerlund B, Lauritzen M and Jennum P. Subjective sleep quality and daytime sleepiness in late midlife and their association with age-related changes in cognition. *Sleep Medicine*. 15: 1389-9457, 2015.

PhD dissertations in 2015

Bo Bach Sayad Pedersen: The Alternative DSM-5 Model for Personality Disorders. Submitted March, 2015. Defense, February 9, 2016.

Andreas Vigelsø Hansen: The effect of 2 weeks' immobilization and 6 weeks' aerobic training on muscle function and metabolism in young and older men. June 4, 2015.

Jolene Lee Masters Pedersen: Adverse Psychosocial, socioeconomic, and developmental processes and risk of inflammation and type 2 diabetes mellitus in later life. PhD dissertation. University of Copenhagen ISBN 978-87-997494-0-9, 2015.

Rikke Meincke: Intelligence in early adulthood – associations with midlife mortality and physical performance in Danish men. Submitted December 4, 2015.

Brian Lawrence Odlaug: The Impulsive-Compulsive Spectrum: A Multi-Modal Study of Disease. December 11, 2015.

Nana Julie Olsen: Targeting predisposed children for early obesity prevention. April 29, 2015.

Rasmus Revsbech: Empirical aspects of rationality and social cognition in schizophrenia. October 7, 2015.

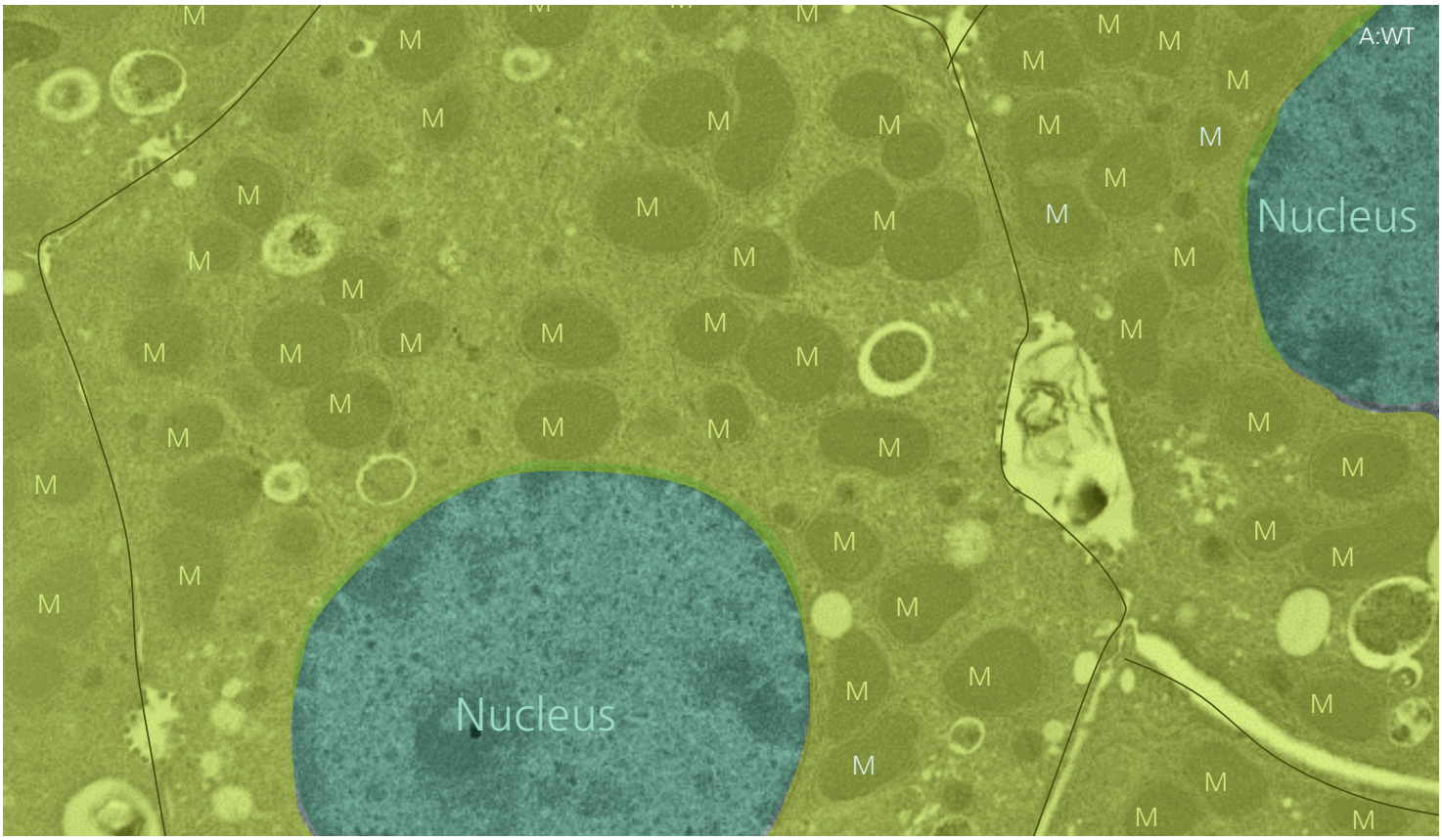
Charlotte Sonne: Trauma-affected refugees: Pharmacological treatment and psychosocial predictors of treatment outcome. Submitted December 29, 2015.

Marie Topp: Do Psychological Factors Predict Adherence in COPD. Submitted October 2, 2015. Defense, February 8, 2016.

Cathrine Lawaetz Wimmelmann: Psychological aspects of obesity and bariatric surgery: A prospective study of psychological factors among bariatric patients undergoing Roux – en –Y gastric bypass. Submitted, May 1, 2015 Defense, January 19, 2016.

Theme III

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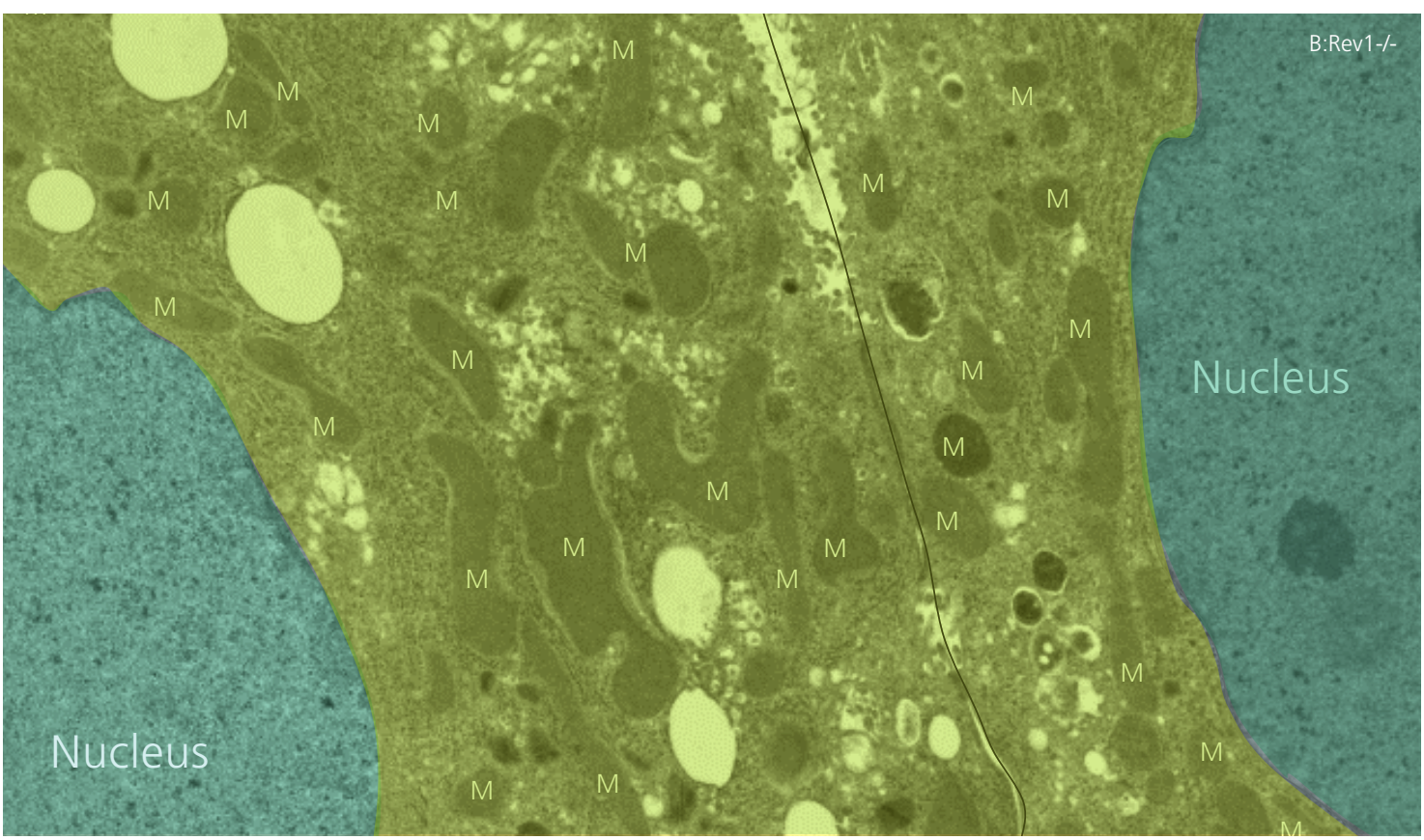
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Energy balance in humans: What are the mechanisms underlying reduced energy?

Group leaders
Lene Juel Rasmussen, Professor
Hocine Mankouri, Assoc. Professor/Ian Hickson, Professor
Michael Kjær, Professor
Jørn Helge, Professor
Linda Hildegard Bergersen, Professor
Vilhelm Bohr, Professor
Javier Peña-Diaz, Assist. Professor
Andrés López-Contreras, Assoc. Professor

Aging is associated with a general decline in energy and/or vitality. Theme III researchers aim to better understand the molecular, cellular and systemic mechanisms that are responsible for age-associated loss of vitality. This knowledge will ultimately lead to the development of novel strategies to counteract age-associated functional decline, and to maintain a high quality of life for all individuals independent of their age.

Figure: Mitochondrial dynamic tendencies were visualized in the hepatocyte of wild type (WT) and Rev1-/- mice. (A) Typically shaped mitochondria were seen in the hepatocytes of wild type mice. (B) Abnormal mitochondrial morphology was found in Rev1-/- mice. There were different shapes like, elongated, aggregated, clustered, and irregular shaped mitochondria in the Rev1-/- hepatocytes. Clusters or aggregates of mitochondria may represent fusion and/or fission dynamic phenomenon. Magnification: 6000 X, 2000 nm scale bar. M= mitochondria. The drawn line shows the individual hepatocyte.

Background and hypothesis

I. Understanding the cellular mechanisms of aging

All cellular components, including lipids, proteins and nucleic acid accumulate damage over time during normal aging. In particular, nuclear and mitochondrial genomes are susceptible to attack by endogenous and exogenous oxidizing agents and other DNA damaging agents. DNA damaging agents include endogenous reactive oxygen species ('ROS'), UV and ionizing radiation. When unrepaired or improperly repaired, DNA damage can lead to mutations, cell death or dysfunction, and eventually, to systemic tissue and organ dysfunction. Over time, it is thought that cumulative cellular damage of this nature manifests as aging.

The impact of DNA damage is mitigated in part by DNA repair and DNA damage response pathways in the nucleus and mitochondria. Deficiencies in these processes cause genome instability, which is linked to premature aging in animal models and in humans. Although cells can efficiently counteract or repair many DNA lesions, the efficiency of DNA repair appears to decline with aging. As a consequence, the levels of unrepaired DNA damage, and damage-induced replicative stress increase during normal aging. The presence of persistent DNA damage is also linked to mitochondrial dysfunction, by mechanisms that are not fully understood. Because the enzymatic machinery that generates ATP is embedded in

the inner mitochondrial membranes, and ATP is the cell's energy reserve, aging-associated mitochondrial dysfunction is thought to contribute significantly to aging-associated loss of vitality. Indeed, mitochondrial dysfunction is directly implicated in age-associated cognitive and/or neurological decline, muscle weakness and fatigue. We are therefore using state-of-the art genetic, biochemical and cellular biology techniques to analyse the relationship between DNA repair capacity, genetic instability, mitochondrial dysfunction and human aging. We also use genetically-engineered mouse models to gain insight into these relationships. Indeed, excellent mouse models exist for studying aging, age-related neurodegenerative disease, and susceptibility or resistance to genomic stress. These models are especially useful to analyse organ- and tissue-specific functions in the context of age-related diseases.

II. Effects of aging on performance

We are investigating the physiological mechanisms of age-associated muscle deterioration (known as 'sarcopenia'), and trying to develop interventions that delay or prevent muscle loss and/or dysfunction in the elderly. In particular, we are examining how physical training induces physiological changes in muscle, and trying to exploit this knowledge to improve muscle function in elderly individuals, and in individuals of all ages who have limited capacity for physical training.

Program performance

I. Understanding how cellular dysfunction affects cognitive function

We are investigating the molecular pathology of neurodegenerative disorders and using what we learn to help understand age-associated cognitive decline/dysfunction. Our preliminary data suggest that defective or partially defective mitochondrial or nucleotide metabolism is frequently associated with Alzheimer's disease (AD). Therefore, we are interested in the possibility of using molecular correlates of defects in mitochondrial or nucleotide metabolism as 'early-warning' biomarkers for cognitive decline and AD. AD is associated with deposits of neurofibrillary tangles, which consist of aggregated Tau protein. We believe there is a direct relationship between Tau regulation and mitochondrial function, and we are exploring this relationship to determine how imbalances can lead to AD. Ataxia with Oculomotor Apraxia Type 1 (AOA1) is a neurodegenerative disorder caused by defects in a DNA repair protein called Aprataxin (APTX). Defects in APTX lead to unrepaired mitochondrial DNA damage and mitochondrial dysfunction. To test if this scenario occurs during normal aging, we are using a mouse model and are examining the level, activity and tissue distribution of APTX as a function of mouse age.

II. Understanding how cells counteract 'Replicative Stress'

Certain chromosomal regions, called common fragile sites, are inherently unstable. This instability arises because delays or errors tend to occur during DNA replication at these regions, which leads to replicative stress. We are trying to understand how cells cope with these difficult-to-replicate fragile sites, and why or how they contribute to aging-related disease and/or dysfunction. We believe that a process that we call 'mitotic DNA synthesis' plays a significant role in counteracting fragile site instability. This could be particularly important as a novel anti-cancer therapy target, as cancer cells use this process to counteract their intrinsically high levels of replicative stress. We are characterizing this newly discovered process, and determining how other difficult-to-replicate regions are stably maintained. For example, we are also investigating how the protective caps on the ends of chromosomes, called 'telomeres', are maintained during our lifespan. Telomeres erode during repeated cell divisions, and are implicated as an underlying cause of aging. We have identified a number of key proteins that are critical for telomere regulation and stability – including human proteins that belong to the RecQ helicase family, and mismatch repair proteins – and we are currently elucidating their functions.

III. Development of mouse models to better understand the aging process

Genetically-engineered mice are very useful as experimental models for understanding human age-related disease and premature aging disorders. In addition, we plan to use mice that are genetically-engineered to have an

increased capacity to repair DNA damage, mitigate replicative stress, or mobilize other DNA damage response pathways. This will reveal if enhanced protective mechanisms can delay aging in specific organs or tissues. We have already established all the animal cohorts for this study, and they will be studied over the next 2-3 years.

IV. How exercise protects against muscle aging
We are analyzing muscle biopsy material from "Master Athletes" of various ages to investigate how age and exercise modulate muscle function. We observe that muscle fibre physiology differs in old vs. young individuals and in active vs. sedentary individuals. For example, lifelong athletes tend to have more skeletal muscle mass, less fat/connective tissue in the muscle, and lower levels of inflammatory markers in the blood. We postulate that inflammation in skeletal muscle can lead to depletion of muscle mass during aging.

We also hypothesize that the Angiotensin II type I receptor may reduce the benefits of resistance training in healthy elderly men. If correct, then short- or long-term exposure to Angiotensin II blocking agents combined with a regimen of resistance training might increase muscle mass and/or improve muscle function in elderly men. Acute exercise did not alter signaling in a significantly detectable way, and currently a 4-month resistance training study is underway and the biopsy analyses and magnetic resonance scans of the thigh will be examined in early 2016.

Results

- Vitality correlates inversely with the abundance of spontaneous DNA breaks, and correlates positively with several parameters of physical performance.
- Increased levels of RRM2 protect cells from replicative stress and increases the lifespan of ATR-Seckel progeroid mice.
- Replicative stress leads to unreplicated regions of the genome in mitosis at fragile sites. We have uncovered a novel pathway of mitotic DNA synthesis that allows cells to cope with this.
- The PICH protein protects cells from defects during cell division in response to replicative stress.
- The FBH1 protein regulates the function of a key player in genome maintenance, RAD51.
- Life-long endurance training is associated with a better maintenance of skeletal muscle and with less accumulation of intramuscular fat/connective tissue in humans.
- Low circulating levels of inflammatory markers is associated with higher maintenance of muscle mass in aging humans.
- Increased deoxythymidine triphosphate levels is a feature of relative cognitive decline.
- Defective mitochondrial respiration, altered dNTP pools and reduced AP endonuclease 1 activity in peripheral blood mononuclear cells of Alzheimer's disease patients.
- Reduced mitochondrial APTX activity leads to neuronal loss.
- Tau protein influences mitochondrial proteomics and metabolism.

Conclusions

Mitochondrial dysfunction and chromosome fragile sites can contribute to age-associated increases in DNA damage and genome instability.

Physical activity leads to an array of physiological changes, improves muscle performance and increases vitality. Muscle mass and function deteriorate during periods of inactivity, but in some circumstances, exogenous growth hormone and/or anti-inflammatory medication can stimulate or help maintain muscle function despite temporary lack of activity.

Several of the researchers in Theme III are engaged in the Center for Cromosome Stability headed by Professor Ian Hickson and in the cross-disciplinary and cross theme projects LIFESTAT, LISA and CALM. See pp. 27-34.

Selected publications

In 2015, the CEHA published 177 scientific publications altogether. Below, we list a selection of 10 of the most important publications from Theme III. The papers were selected by the Theme Leaders.

Agergaard J, Troestrup J, Uth J, Iversen JV, Boesen A, Andersen JL, Schjerling P and Langberg H. Does vitamin-D intake during resistance training improve the skeletal muscle hypertrophic and strength response in young and elderly men? – a randomized controlled trial. *Nutrition & Metabolism*. 12: 32, 2015.

Couppé C, Svensson RB, Kongsgaard M, Kovanen V, Grosset JF, Snorgaard O, Bencke J, Larsen JO, Bandholm T, Christensen TM, Boesen A, Helmark IC, Aagaard P, Kjaer M and Magnusson SP. Human Achilles tendon glycation and function in diabetes. *Journal of Applied Physiology*. Accepted 2015.

Desler C, Frederiksen JH, Angleys M, Maynard S, Keijzers G, Fagerlund B, Mortensen EL, Osler M, Lauritzen M, Bohr VA and Rasmussen LJ. Increased deoxythymidine triphosphate levels is a feature of relative cognitive decline. *Mitochondrion*. 25: 34-37, 2015.

Karlsen A, Couppé C, Andersen JL, Mikkelsen UR, Nielsen RH, Magnusson P, Kjaer M and Mackey AL. Matters of fiber size and myonuclear domain; does size matter more than age? *Muscle Nerve*, 52: 1040-1046, 2015.

López-Contreras AJ, Specks J, Barlow JH, Ambrogio C, Desler C, Vikingsson S, Rodrigo-Perez S, Green H, Rasmussen LJ, Murga M, Nussenzweig A and Fernandez-Capetillo O. Increased Rrm2 gene dosage reduces fragile site breakage and prolongs survival of ATR mutant mice. *Genes & Dev*. 29: 690-695, 2015.

Maynard S, Hejl AM, Dinh TST, Keijzers G, Hansen ÅM, Desler C, Moreno-Villanueva M, Bürkle A, Rasmussen LJ, Waldemar G and Bohr VA. Defective mitochondrial respiration, altered dNTP pools and reduced AP endonuclease 1 activity in peripheral blood mononuclear cells of Alzheimer's disease patients. *Aging*. 7: 793-815, 2015.

Maynard S, Keijzers G, Hansen ÅM, Osler M, Molbo D, Bendix L, Møller P, Loft S, Moreno-Villanueva M, Bürkle A, Poulsen Hvitby C, Schurman SH, Stevnsner T, Rasmussen LJ, Avlund K and Bohr VA. Associations of subjective vitality with DNA damage, cardiovascular risk factors and physical performance. *Acta Physiologica*. 5 (213): 156-170, 2015.

Minocherhomji S, Ying S, Bjerregaard VA, Bursomanno S, Aleliunaite A, Wu W, Mankouri HW, Shen H, Liu Y and Hickson ID. Replication stress activates DNA repair synthesis in mitosis. *Nature*. 528: 286-290, 2015.

Nielsen CF, Huttner D, Bizard AH, Hirano S, Li TN, Palmai-Pallag T, Bjerregaard VA, Liu Y, Nigg EA, Wang LH-H and Hickson ID. PICH promotes sister chromatid disjunction and co-operates with topoisomerase II in mitosis. *Nature Communications*. 6: 8962, 2015.

Olsen RH, Couppé C, Dall CH, Monk-Hansen T, Mikkelsen UR, Karlsen A, Høst NB, Magnusson SP and Prescott E. Age-related decline in mitral peak diastolic velocities is unaffected in well trained runners. *Scandinavian Cardiovascular Journal*. 13: 1-24, 2015.

PhD dissertations in 2015

Christian Friberg Nielsen: PICH stimulates Topoisomerase IIa to promote sister chromatid disjunction in mitosis. April 28, 2015.

Andreas Herchenhan: Collagen fibril development: Factors influencing cells and extracellular matrix during in vitro human tendon construct formation. February 20, 2015.

Rie Harboe Nielsen: Tendon collagen control: Insights from growth factor manipulation, aging and connective tissue disease. March 13, 2015.

Jakob Agergaard: Anabolic effects of light load resistance exercise and distribution of protein intake in elderly – with emphasis on muscle protein synthesis regulation and amino acid transporters. June 9, 2015.

Intervention studies and cross-theme projects

Selected intervention studies and cross-theme projects 2015

LIFESTAT

Key researchers

Professor Flemming Dela (PI; Theme II)
Assoc. Professor Christa Lykke Christensen (co-PI from the Faculty of Humanities, UCPH)
Professor Jørn Wulff Helge (Theme II-III)
Professor Allan Krasnik (Theme I)
Professor Lene Rasmussen (Theme III)
Professor Ian Hickson (Theme I)
Assoc. Professor Bjarke Oxlund (Theme I)
Post doc Steen Larsen (Theme II-III)

LIFESTAT is an interdisciplinary project which is supported by the University of Copenhagen 2016 Excellence Program. LIFESTAT leverages approaches and knowledge from medicine, the humanities and the social sciences to analyse the impact of statin use on health, life-style and well-being in a cohort of Danish citizens. The impetus for the study is the fact that 600,000 Danes take statins in order to maintain good health and to avoid cardiovascular disease (CVD) by counteracting high blood levels of cholesterol. Almost 40% of these individuals take statins as "primary prevention", meaning, high cholesterol is their only major risk factor for CVD. The potential benefit of treatment with statins should be considered in light of evidence that statin-use has serious and prevalent unintended side-effects, including skeletal muscle cell death, muscle pain, and lower exercise tolerance which in turn prohibit healthy habits. Furthermore, glucose intolerance (a risk factor for type 2 diabetes) tends to increase in individuals taking statins.

Objective: To investigate the biological consequences of statin treatment, people's perception of disease risk influenced by the media, and the way people manage to live with the risk. In particular, 1) Investigate the real- and perceived impact of statin use on every day practises, including user monitoring technology and self-image/self-perception; 2) Determine how information regarding CVD risk and treatment options, including statin use, is disseminated, and investigate how the typical Dane receives, perceives and uses this information; and 3) Analyse the impact of statin use on muscle metabolism and function.

Approach: Three biomedical studies: 1) Cross-sectional study on 40 statin users (50% with myalgia) and 20 control subjects. 2) Q10 randomized 8 week study on 40 statin users with or without Q10 supplement. 3) Longitudinal training study with 8 weeks training (supervised cycling training 3x per week). 4) A nation-wide survey on health, health behaviors and information-seeking behaviors with particular focus on elevated cholesterol and statins. In collaboration with researchers from Media Sciences (Faculty of the Humanities) and department of pharmaceutical sciences, a register-based study on statin use following media attention on adverse side effects of statins will be implemented.

Outcomes: Thorough metabolic and physical characterisation of study participants will be undertaken. The results will help identify the mechanism(s) leading to statin-induced myalgia. Factors that influence peoples use or non-use of statins will be explored.

Status: In study 1) and 2) 69 out of 100 patients have been included. The experimental component of these studies will be finished and analysis of the data will begin in 2016. The longitudinal study will start recruiting patients early in 2016. A national survey of the general population is complete with 3050 respondents. Data has been cleaned and is currently being analyzed in detail. Further, some data are used in a number of interdisciplinary projects. Analyses from the register-based study on media influence are complete, the results have been described in a manuscript, which is ready for submission to an appropriate journal. A study design manuscript was prepared and has been accepted for publication in the Scandinavian Journal of Public Health.

Predictors of cognitive function

Key researchers
Professor Martin Lauritzen (PI; Theme II)
Professor Erik Lykke Mortensen (Theme II)
Professor Lene Juel Rasmussen (Theme III)
Professor Merete Osler (Theme II)
Assoc. Professor Rikke Lund (Theme II)
Assoc. Professor Egill Rostrup (Theme II)
Consultant Krisztina Benedek (Theme II)

This research program explores how the cumulative effect of morbidity and adverse exposures influences brain function at different life stages in Danish males born in 1953. The primary aim is to identify factors that influence cognitive function over the life course.

Methods: Cognitive test scores at a single point in time in midlife reflect individual differences in age-related decline, as well as inherent individual differences in cognitive ability/potential throughout life. Members of the Copenhagen Metropolit Cohort were cognitively assessed when they appeared before the draft board as young men and again in midlife for those who participated in CAMB in 2009. We compared the IQ scores for each CAMB participant as a young man and as a middle-aged man, and selected 100 each of individuals whose IQ score was substantially higher or lower in midlife than as a young man. These two groups of 100 men, who showed unusually large change in cognitive ability from young adulthood to late midlife, were subject to comprehensive neuropsychological assessment, functional magnetic resonance imaging (fMRI) and their sleep patterns were examined. In 2015 and over the next three years these individuals will be subject to comprehensive neuropsychological assessment, MRI and EEG (electroencephalography) to assess visual attention (quantified as mathematically-modeled parameter estimates, where the measured potential of an EEG event is a correlate of a visual attention event). This study is based on the hypothesis that pre-clinical cognitive decline is associated with cortical and central atrophy, and can manifest as altered sleep patterns, disturbed activation during functional neuroimaging, and/or disturbed EEG/evoked brain signals. Ultimately, we may be able to use the results of these studies to develop predictive markers for aging-associated cognitive decline.

Progress and results: The 200 Metropolit cohort males selected from the 2009 study have been reinvited to participate in a 5 year follow-up series of tests. In addition, 223 new participants were invited in 2015 to enrol in another continuation study, 76 of whom accepted the invitation to date. Sixty-six individuals from that group were already subject to cognitive testing, magnetic resonance (MR) neuroimaging, and EEG exams (as described above). Analysis of the MR imaging data for the first 200 individuals, which provides quantitative information on macrostructural and microstructural features of the brain is progressing. Blood samples for each participant have been stored and will be analysed for biochemical/metabolic and DNA markers. For the EEG and attention test, the behavioral data were modeled according to the computational Theory of Visual Attention. The results are typical for subjects in each age group and estimated parameters of attention correlate with IQ in midlife and in youth.

Conclusions: Potential markers of cognitive decline are being investigated using data from approximately 266 participants. During the next two years, approximately 200 participants will undergo a 5 year follow-up exam to re-assess cognitive performance. The results could provide insight into the association between life course risk factors and rate of cognitive decline with aging. In turn, this could translate to new approaches for predicting and/or preventing accelerated brain aging.

Ubberup Project

Key researchers
Professor Jørn Helge (PI; Theme II-III)
Professor Flemming Dela (Theme II)
Assoc. Professor Clara Prats (Theme II-III)
Post doc Steen Larsen (Theme II-III)

This project is a cross-disciplinary intervention that seeks to identify factors that influence post-intervention behaviour/lifestyle after an 11-12 week intensive lifestyle intervention for obese individuals. The project ended in mid-December 2015 and the results were written up in two papers, which were submitted for publication and are currently under review. The project included a cross-sectional sub-study and a longitudinal sub-study. In the cross-sectional study 79 subjects were examined 4½ to 7 years after the lifestyle intervention; these subjects fell into 3 groups: those who maintained clinical weight loss, those who maintained partial weight loss and those who failed to maintain weight loss. In the longitudinal study, 61 subjects were evaluated before, immediately after, 3 months and one year after the lifestyle intervention. Blood, muscle and adipose tissue samples from both studies were analysed. Additional cross-disciplinary papers are expected to be written within the next year. From a societal perspective, this project will contribute to our understanding of the factors that influence the success of lifestyle interventions for obesity.

The LISA and CALM Projects

CALM and LISA are projects that focus upon the influence of heavy vs. moderate muscular training as an intervention in 60-70 year old individuals. CALM primarily investigates the effect of nutrition and its interaction with physical exercise, with muscle growth as a primary outcome. LISA seeks to compare outcomes of different types of physical training types, with muscle function, and muscle power as primary outcomes. CALM also investigates the health impact of the gut microbiota, and how induced lifestyle changes affect everyday social life. LISA also examines relationships between skeletal muscle function, brain morphology, connective tissue biology, cognition and behavior.

The CALM project

Key researchers

Assoc. Processor Astrid Jespersen (PI; Theme I)
Assoc. Professor Lars Holm (co-PI; Theme III)
Professor Michael Kjær (Theme III)
Post doc Aske Juul Lassen (Theme I)
Post doc Søren Reitelseder (Theme III)

The number of elderly Danish citizens over the age of 60 years will increase by more than 50% over the next decades. This demographic shift brings presents challenges and opportunities at both societal and individual levels. For individuals, aging is associated with changes in functional capacity, sensorial perceptions, economy, everyday life and social relations. For many, these changes decrease their quality of life. For society, the aging population means a greater overall burden of aging-related decline in health status and quality of life. Societal institutions and private actors need to take this into account, when projecting the need for new services, strategies and products. CALM will investigate the role of dietary protein and physical activity on skeletal muscle strength, health status and ability to maintain an active lifestyle among older people. The results will help formulate evidence-based, feasible strategies for exercise training and protein intake for elderly individuals.

CALM is supported by the University of Copenhagen 2016 Excellence Program. The initiative was granted a total of 19.6 million DKK (approximately 2.6 million Euro) involving three faculties and four research groups, including CEHA researchers fromTheme I and Theme II.

In collaboration with other CALM-affiliated scientists, theme 1 conducted a workshop with stakeholders to gather information on protein intake among older individuals. Workshops were also held in Copenhagen, Ishøj and Vordingborg to learn about daily habits of elderly citizens, including taking meals, cooking and exercise. This work is part of the innovation cluster in CALM, which develops new ideas and concepts for protein intake and physical activity among the elderly.

- After retirement, many persons restructure their everyday lives, but still hold on to an idea about work-time and leisure-time. The mornings are often very structured and used for chores in the household as well as exercise, whereas the afternoon becomes leisure time for many, where they engage in a range of different activities.
- Among the older population, there seem to be an idea that the relevant categories with which they measure how healthy a food item is, are fat and sugar. Few think of protein as relevant for their health status and muscle strength.


by casall

LISA: Intervention project on physical activity

Professor Michael Kjær (PI; Theme III)
Professor Erik Lykke Mortensen (Theme II)
Assoc. Professor Ellen Garde (Theme II)
Post doc Theresa Bieler (Theme III)

LISA is an intervention study that is currently following the outlined time schedule for recruitment. Around 3-4 are recruited per week and around 220 individuals are enrolled in the study, and around 70 have completed the 1 year intervention period. In general the intervention is associated with a large compliance and a minimum of side effects have been observed. Only overuse symptoms in the early period of training and a very few late symptoms have occurred. The medium intensity training is being developed with a closer evaluation of the rubber-band work output by electronic sensors. The control group displays a high activity in regards to participating the social activities arranged. The results accumulated from measurements and tests before and after 1 year of intervention are being included in a data base. In addition, an MRI scan of both thigh muscle and brain are performed and benefiting from the community-based approach baseline data are currently assessed with specific focus on brain changes suggesting vascular risk factors. Along with the intervention study, 2 PhD students are currently performing a more detailed study in a subgroup of participants where they are investigating the change in the connective tissue of tendon, and the influence of local and systemic inflammation upon muscle hypertrophy. These data will be coupled to the overall outcome of the study.

Communication and outreach platform

Communication and outreach platform

Group leader
Thomas Söderqvist

Aim and focus in 2015

Establishing, broadening and maintaining interaction between healthy aging research community and non-scientists in the community is the overall focus of the CEHA communication and outreach Platform. CEHA wants to reach out to individual citizens, public authorities and health professionals and share the Center's interest in healthy aging and disseminate the results of the Center's research. It is also important for CEHA to be informed about public perspectives and experiences as it makes plans for the Center's future. The aim is to make CEHA the most important Danish source for news, discussions and opinions about healthy aging research. The program has five major aims:

1) Dissemination

One aim is to disseminate the Center research results via printed and electronic mass media and the Center's website. For this purpose Gitte Inselmann Frandsen, PhD, communication and press relations officer is employed to take on the following tasks:

Mass media dissemination: Successful distribution in the national and international mass media requires a widespread network and continuous contact with journalists from the printed and electronic mass media. In 2015, the communication and press relations officer has further broadened the contact network and been successful in gradually increase the spread of basic news messages and stories about aging to broader segments of the Danish population. Some of the research stories has also been distributed to the international media and has reached especially the English speaking countries.

Dedicated health media dissemination: CEHA contributes to a new newsletter for leaders in the municipalities working on health: Kommunal Sundhed *(Community Health)*. Behind the newsletter is the Danish newspaper for the health sector, Dagens Medicin *(Daily Medicine)*.

2) Social media and web

Another aim is to uphold a strong presence at digital and social media. The Center communication and press relation manager work together with social media officer Annika Holme, MA, on developing the Center activities here:

Website: The Center website was relaunched in 2015 and now integrates information about the Center with news from the Center research and dynamic content from the social media presence.

Interaction with public though social media: The Center runs a successful Facebook page which activity continuously has been growing. The content is curated in collaboration with an editorial board of young scholars of the Center, and upholds a steady interaction within the target group of a general public. Another platform is Instagram where the social media officer is engaging

Professor Thomas Söderqvist.

primarily young CEHA scholars in communicating their research process.

Thereby the social media officer has continued her work of encouraging and helping the Center staff share the findings of their research projects through social media and thus contribute to a broader public engagement with healthy aging research and its societal importance.

3) Events

Another aim is to promote dialogue-based communication through events between researchers, citizens, professionals and politicians. For this purpose event coordinator Signe Flyvbjerg, MA, and interpretation assistant Anne Bernt Jensen, MA, were employed in early 2015. They collaborate with the social media facilitators.

Events: The aim is to develop a series of innovative aging research events in collaboration with researchers in the Center and external stakeholders. These events are aimed at a non-professional general public and also serve the purpose to engage with stakeholders. The activities were being held at great public events such as *Folkemødet* (People's Political Festival) and in other public settings, as well as in the settings of the university museum *Medical Museion*. *Folkemødet* is an annual 4-day meeting between citizens and politicians at the Danish island Bornholm, where Danish politicians, NGO's and the public debate current political issues (www.brk.dk/folkemoedet); see also pp. 77-78.

Museum-based communication platform: With the exhibition space of Medical Museion as point of

departure, the interpretation assistant develops communication methods that engages the museum audience in CEHA research, e.g. through displays, guide tours and games. Researchers from all Themes of the Center has been involved in the developmental process and contributed to the interpretation.

4) Internal communication

The fourth aim is to enhance the effectiveness and internal cohesiveness of the Center by strengthening inter-disciplinary communication and dialogue among researchers in the Center through seminars, workshops and other means, and thereby develop the identity of the Center. This task is the responsibility of the Center management team (see p. 69).

5) Awareness

The fifth aim is to develop the Center brand. This will help raise the profile of the Center both in Denmark and internationally, and help building national and international aging research networks. The activities in the CEHA outreach program contribute to the branding of CEHA and on top of that, we work strategically according to our stakeholder strategy to increase the awareness of the research results created in CEHA towards relevant stakeholders.

The employees in the communication platform are placed in different locations to ensure the relevant support for fulfilling their tasks. The communication and press relation officer is placed at the Faculty of Health and Medical Science's Communication Office and works in close collaboration with the CEHA management team; the event coordinator is placed in the CEHA management team. The social media officer and the interpretation assistant are placed at Medical Museion to get support from the museum's event and social media staff.

Results

For 2015, the communication program reports the following major results:

- Participated in three events at Folkemødet.
- Contributed with columns in the new newsletter Kommunal Sundhed.
- Increased the visibility of CEHA in the press nationally from the baseline in 2012 of 156 articles in Danish media to 235 in 2015.
- Increased the visibility of CEHA in the press internationally with 263 articles in international media in 2015.
- Developed the presence at Instagram with the focus on research processes and further developed the successful presence at Facebook.
- Developed new presentation and engaging event formats; e.g. *Testing your age* and *Tales from retirement*.
- Engaging the museum audience in CEHA research at the Medical Museion, e.g. through displays and guided tours.
- Recruitment of a new platform leader for communication from 2016 and ahead (the former British museum communicator Ken Arnold from Wellcome Collection).

For details on specific activities, see pp. 75-86.

Conclusion

CEHA has compared to other research centers a strong communication and outreach program that supplements traditional mass media with a social media use, events and other activities.

Use of Danish and international mass media for dissemination increased in 2015.

We have developed successful presentations and engaging event formats and engaged the museum audience in research on healthy aging at the Medical Museion. Our presence at the important venue for agenda setting and meeting with various stakeholders, *Folkemødet*, was successful in 2015, and we will be present with own setting in 2016. Moreover, we developed our presence on Facebook and experimented with other social media e.g. Instagram. Additional presence on social media will be developed in coming years.

International recruitment

Professor Rudi Westendorp

Dr. Tiago Moreira

Assist. Professor Morten Scheibye-Knudsen

International recruitment in 2015

Professor Rudi Westendorp

1st January, 2015, Professor Rudi Westendorp accepted an appointment as Professor in Medicine at Old Age at CEHA and the Department of Public Health, University of Copenhagen. Professor Westendorp previously held the position of Professor of Old Age Medicine at Leiden University Medical Centre, Netherlands, where he was responsible for clinical services, research and teaching and was the founding Director of the Leiden Academy on Vitality and Ageing.

Professor Westendorp is well known to CEHA, having served as a valuable member of CEHA's Scientific Advisory Board from 2009-2013. Besides, Rudi Westendorp has played a key role as a collaborator, i.e. in the joint proposal for a *Knowledge and Innovation Community* (KIC, Horizon 2020) with the project *InnoLife – Healthy living and active aging.* In December 2014, the KIC, to be called "EIT Health", was awarded funding equivalent to approximately 395 million euros over 7-10 years (see also pp. 56).

Professor Westendorp possesses a unique interdisciplinary profile. In CEHA, he is investigating innovative solutions for promoting the length and the quality of life of older people. His interdisciplinary research is based on the concept of vitality and focuses on inspiring older people to get the most out of their lives and to remain engaged in their community. He is also investigating how to provide dignity and independence to elderly individuals affected by declining physical and/or mental capacity. His current collaborations are within CEHA Theme I into reablement of older people including risk identification and developing innovative service provisions; within Theme II into the different health indicators throughout the life-course and how these relate to mortality and life satisfaction of older people; within Theme III: into the mechanisms by which systemic inflammation contributes to depression and fatigue.

Representative publications in 2015:

Moonen JE, Foster-Dingley JC, de Ruijter W, van der Grond J, Bertens AS, van Buchem MA, Gussekloo J, Middelkoop HA, Wermer MJ, Westendorp RG, de Craen AJ, van der Mast RC. Effect of Discontinuation of

Antihypertensive Treatment in Elderly People on Cognitive Functioning--the DANTE Study Leiden: A Randomized Clinical Trial. JAMA Intern Med. 175:1622-30, 2015. Commented: *'Methodologically, the value of the present study is enormous. The discontinuation study design represents a paradigm shift in the way we conduct randomized clinical trials (RCTs) of antihypertensive therapy. In addition, this design could be extended to examine other typically lifelong medications. The authors did an exemplary job of designing the right study at the right time to advance the evidence base.' Odden, M.C. JAMA Intern Med.* 175:1630-1632, 2015.

Westendorp RG. Growing Older without Feeling Old. On vitality and Ageing. Melbourne, London: Scribe, 2015. Commented: *'The definitive book on a key issue for the 21st century, written by one of the world's leading experts in geriatric medicine. Combining medical, biological, economic, and sociological insights, Rudi Westendorp explores the causes of the ageing revolution and explains how we can greet it with confidence and enjoy leading longer, healthier, and more productive lives than ever before.'* P.S. Cottier, Canberra Times August 8, 2015.

Westendorp, Rudi. Why it's time to unshackle yourself from old ideas about 'the stages of life'. theconversation.com June 15, 2015.

Dr. Tiago Moreira

Dr. Tiago Moreira, Durham University, was affiliated as CEHA professor (10%) in December 2015. Dr. Moreira is anchored at the Section of Ethnology at the SAXO-Institute, University of Copenhagen. As an internationally recognized aging scholar, he forms part of the on-going research projects *Community Innovation for Healthy Aging* in Theme I. Due to his significant experience in conducting and managing research projects on health and aging and his excellent record of publication in this domain, he is an asset in the research capacity building of Theme I, as well as in the ongoing development of Theme I through his engagement in several research applications. He is assisting the theme leaders with strategic issues and is acting as sparring partner in research management. Dr. Moreira is an international expert in social studies of health and aging, was recently Investigator on an EC funded research project, with partners in France, Ireland and Portugal, and is regularly involved in academic platforms with colleagues in Canada (McGill University), France (Minestech), United States (Case Western Reserve), Portugal (Lisbon University), Sweden (Linkoping University), Netherlands (Erasmus University) and Denmark. Among his several tasks in CEHA, Dr. Moreira is also providing supervisory advice for both Post Docs and PhD students and is giving master classes for master and PhD students. As a member of the editorial board of *Sociology of Health & Illness* he is also providing valuable experience regarding publication strategy.

Moreover, Dr. Moreira is currently working on an individual research project about the changing standards of how to measure age. The project started in 2012 and examines the changing role of expertise, quantification and standards in the governance of ageing societies. It takes as its point of departure the proposition that, in the past four decades, there has been a shift from a reliance on chronological age towards a de-standardized life-course hinged on personalized measurements of aging rate, or biological age.

Assist. Professor Morten Scheibye-Knudsen

In October 2015, Dr. Morten Scheibye-Knudsen was recruited to CEHA as an assistant professor. Dr. Morten Scheibye-Knudsen earned his M.D. degree in 2007 from the University of Copenhagen. He worked briefly as a physician in Denmark and Greenland before joining the lab of Professor Vilhelm A. Bohr at the National Institute on Aging, NIH, USA, where he has been since 2008. He has several first author high profile papers in journals such as the Journal of Experimental Medicine, Cell Metabolism and Cell and he has received several highly competitive awards. His focus has been on mitochondrial function in relationship to aging and accelerated aging disorders. Here he has found a substantial component of mitochondrial dysfunction in the accelerated aging disorders Cockayne Syndrome, xeroderma pigmentosum group A and ataxia-telangiectasia. He discovered molecular interventions with potential therapeutic benefit for these incurable disorders. In addition to his scientific endeavors he has shown considerable entrepreneurship and founded or cofounded several companies. One of them, Forsoegsperson.dk, is the most successful recruiter of volunteers for clinical trials in his home country Denmark. In his future work he will focus how mitochondrial and metabolic changes drive the process of human aging.

"In the previous century we've seen an explosion of life – never before have so many people lived for so long. Our emotional and social adaptations however, are truly entrenched in outdated patterns. The time when we lived and worked solely to provide for our offspring before retiring from professional and public life, is definitively over. Now, as a father of children who have flown the nest I've to wrestle with the question of how to fill in the rest of my long live.

Humans have outgrown their biological and social order, and it is due for an overhaul. Everyone says aging is 'normal', that it is 'usual', but is that really so? What can we learn from people who live on healthily into extreme old age? What can we learn from old people who remain full of vitality, despite illness, and infirmity? How do they retain their sense of wellbeing?

The Center for Healthy Aging has a unique interdisciplinary approach, addresses research from cell to society and is nested in a vibrant academic culture. That's why I joined the center in 2015 with an emphasis on the concept of vitality; focusing on inspiring older people to get the most out of life for their own sakes and to continue making a contribution to society.

Aging starts early and affects all aspects of the life course. The Center for Healthy Aging studies how more people can have a healthy life and active old age."

Professor Rudi Westendorp

Professor Rudi Westendorp · Photo: Marc de Haan

Staff list

Staff list

Complete staff list
- ● Paid by CEHA[1]
- ◐ Partly paid by CEHA[2]
- ○ Not paid by CEHA

Total
Paid or partly paid by CEHA: 75 persons
Not paid by CEHA: 163 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
- ◐ Tiago Moreira, Professor
- ◐ Astrid Jespersen, Associate professor
- ● Maria Kristiansen, Associate professor
- ○ Bjarke Oxlund, Associate professor

Theme II
- ○ Erik Lykke Mortensen, Professor
- ◐ Rudi Westendorp, Professor
- ◐ Flemming Dela, Professor
- ○ Hartwig Siebner, Professor
- ○ Jørn Wulff Helge, Professor
- ○ Martin Lauritzen, Professor
- ○ Merete Osler, Professor
- ○ Poul Jennum, Professor
- ○ Åse Marie Hansen, Professor
- ○ Anders Petersen, Associate professor
- ○ Carsten Hendriksen, Associate professor
- ○ Charlotte Juul Nilsson, Associate professor
- ○ Clara Prats, Associate professor
- ◐ Ellen Garde, Associate professor
- ○ Lars Holm, Associate professor
- ○ Rikke Lund, Associate professor
- ○ Signe Vangkilde, Associate professor
- ○ Trine Flensborg-Madsen, Associate professor
- ○ Ulla Christensen, Associate professor
- ○ Helle Bruunsgaard, Senior researcher
- ○ Steen Larsen, Senior researcher
- ○ Egill Rostrup, Chief physician
- ○ Helle Wallach Kildemoes, Assistant professor
- ○ Birgitte Fagerlund, Consultant
- ○ Krisztina Benedek, Consultant
- ○ Niklas Rye Jørgensen, Consultant

Theme III
- ● Ian Hickson, Professor
- ◐ Linda Hildegard Bergersen, Professor
- ● Lene Juel Rasmussen, Professor
- ○ Michael Kjær, Professor
- ○ Peter Magnusson, Clinical professor
- ○ Vilhelm A. Bohr, Professor

- ● Abigail Mackey-Sennels, Associate professor
- ○ Andrés López-Contreras, Associate professor
- ○ Hocine Mankouri, Research associate professor
- ◐ Katja Heinemeier, Associate professor
- ○ Lars Holm, Associate professor
- ● Mansour Akbari, Research associate professor
- ○ Nina Beyer, Associate professor
- ○ Jesper Løvind Andersen, Senior researcher
- ○ Peter Schjerling, Senior researcher
- ● Claus Desler, Assistant professor
- ○ Javier Peña Diaz, Assistant professor
- ○ Mani Paramasivam, Assistant professor
- ○ Sascha Liberti, Assistant professor
- ◐ Morten Scheibye-Knudsen, Assistant professor

Post docs

Theme I
- ● Andreas Rudkjøbing
- ◐ Aske Juul Lassen
- ○ Bodil Ludvigsen
- ● Christian Scheele Elling
- ● Henrik Hvenegaard Mikkelsen
- ● Kamilla Nørtoft
- ● Marie Ertner
- ● Nete Schewennesen
- ○ Tenna Jensen

Theme II
- ● Andreas Vigelsø Hansen
- ◐ Cathrine Lawaetz Wimmelmann
- ○ Iris Wiegand
- ● Jolene Lee Masters Pedersen
- ● Julie Courraud
- ◐ Lene Rask
- ○ Margit Kriegsbaum
- ○ Michael Taulo Lund
- ○ Naja Liv Hansen
- ● Nina Linde Reislev
- ○ Otto Henriksen
- ○ Søren Reitelseder
- ● Therese Bieler

Theme III
- ○ Anna Bizard
- ○ Christian Couppe
- ◐ Guido Keijzers
- ○ Ivan Vogel
- ○ Jesper Strickertsson
- ○ Kata Sarlos
- ○ Mauro Sbroggio
- ○ Monika Bayer
- ○ Nicolai Balle Larsen
- ○ Pernilla Eliasson
- ○ Rahul Bhowmick
- ○ Rene B Svensson
- ○ Sheroy Minocherhomji
- ○ Steen Larsen
- ○ Stephanie Munk
- ○ Yao Qi

PhD students

Theme I
- ● Anders Møller
- ◐ Anne Sophie Bech Mikkelsen
- ○ Amy Clotworthy
- ● Loa Teglgaard Christensen
- ● Malene Bødker
- ● Nanna Hilm

Theme II
- ◐ Andreas Ziegler
- ◐ Anja Birk Kuhlman
- ● Anna Horwitz
- ● Christian Eriksen
- ○ Dinne Skjærlund Christensen
- ○ Ditte Søgaard
- ○ Emilie Just-Østergaard
- ● Gitte Lindeved Petersen
- ○ Gunhild Tidemann Christensen
- ● Kiyana Zarnani
- ○ Linda Waller
- ○ Malene Kristensen Maag
- ◐ Marianne Kristensen
- ◐ Marie Grønkjær Pedersen
- ● Nayome Rey Calvo
- ● Nelly Richard
- ○ Otto Henriksen
- ○ Rikke Hodal Meincke
- ○ Stine Harrsen Bachkati

- ○ Stinna Skaaby
- ○ Sune Dandanell Jørgensen
- ● Thomas Morville
- ○ Tine Lovsø Dohlmann

Theme III
- ◐ Aiste Aleliunaite
- ○ Amruta Shrikhande
- ○ Anders Karlsen
- ○ André Brannvoll
- ○ Andrés Venegas
- ○ Annesofie Thorup Olesen
- ○ Antonis Giannipoulis
- ○ Cecilie Jæger Leidesdorff
- ○ Christian Nielsen
- ○ Daniela Alosi
- ○ Dekang Liu
- ○ Despoina Sakellariou
- ○ Divya Achuthankutty
- ○ Eliene Albers
- ○ Jakob Agergaard
- ○ Jane Frederiksen
- ○ Jon Durhuus
- ○ Kasper Dideriksen
- ○ Lorenza Garribba
- ○ Marya Morevati
- ○ Mette Flindt Heisterberg
- ◐ Nicolai Larsen
- ◐ Nima Fakouri
- ○ Rasmus Bechshøft
- ● Sara Thornby Bak
- ○ Signe W. Jørgensen
- ○ Thomas Lau Hansen
- ◐ Victoria Bjerregaard
- ○ Wei Wu
- ○ Özgun Ozer

Research assistants

Theme I
- ◐ Anne Sophie Bech Mikkelsen

Theme II
- ● Anne Theil Gylling
- ○ Arthur Ingersen
- ○ Else Foverskov
- ○ Kristian Klinkby
- ○ Mia Dyhr Thomsen
- ○ Stine Dam Søndergaard

Theme III
- ○ Ann-Sofie Andersen
- ○ Sharath Anugula

Guest researchers

Theme II
- ○ Carlos de Mendes de Leon, Professor
- ○ Ivan Bautman, Professor
- ◐ Alan Gow, associate professor
- ○ Robert Fieo, post doc
- ○ Carlijn Remie
- ○ Evita Kontopodi

Bachelor/Master students

Theme I
- ● Cammilla Bundgård Toft
- ● Emil Bjarne Johansen
- ○ Jeppe Hæstrup Kamstrup

Theme II
- ○ Camilla Skovborg
- ○ Carina Vestergård Abildskov
- ○ Jacob Frandsen
- ○ Julie Mucha Økjær Jørgensen
- ○ Karina Fabricius Husted
- ○ Magnus Asping
- ○ Maria Dahl
- ○ Marie Pil Jensen
- ○ Ronni Sahl
- ○ Sofie Buurgaard Lionett
- ○ Sofie Greve Dideriksen

Theme III
- ○ Anne Skov Østergaard
- ○ Kenneth Mertz
- ○ Kristina Vile Jensen
- ○ Kristoffer Norheim
- ○ Louise Bang
- ○ Marlene Mathiesen

Pregraduate research students

Theme II
- ○ Ann Damgaard
- ○ Anne Thiel Gylling
- ○ Charlotte Boslev Præst
- ○ Cæcilie Haugaard Langkilde
- ○ Jelena Laban
- ● Kjestine Emilie Møller
- ○ Malene Glerup Nielsen
- ○ Marie Dehlbæk
- ○ Mimmi Torp

- ● Signe Meidahl Petersen
- ○ Signe Nørgaard
- ○ Sofie Drevsholt Jørgensen
- ○ Tine Juul Moberg

Theme III
- ○ Alberte Lund
- ○ Christoffer Cullum
- ○ Julie Vahlgren
- ○ Simone Dalskov

Lab technicians

Theme II
- ○ Jeppe Bach
- ○ Regitze Kraunsøe
- ○ Thomas Beck

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

Secretaries

Theme I
- ◐ Mads Christoffersen

Theme II
- ◐ Eva Jepsen
- ◐ Jacqueline van Hall

Theme III
- ○ Birgitte Kjær
- ○ Elin Erichsen
- ○ Else Pedersen

Other key persons

Theme I
- ◐ Janne Sørensen, Research coordinator, Senior advisor

Theme II
- ○ Drude Molbo, Database manager
- ◐ 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
- ◐ Signe Flyvbjerg Nielsen, Event coordinator
- ◐ Annika Holme, Social Media Curator
- ◐ Hanne Boll Overgaard, Event Curator
- ◐ Anne Bernth Jensen, Event Curator
- ◐ Bente Vinge Pedersen, Head of Section
- ○ Thomas Söderqvist, Professor

CEHA administration

- ● Tina Gottlieb, Head of Administration
- ◐ Line Damberg, Academic Officer (maternity leave)
- ● Tina Weller, Academic Officer
- ◐ Ditte Marie Hansen, Student Assistant
- ◐ Christian Lyngholm Trant, Student Assistant

Internationalization and networking


Natalie Kim
University of Copenhagen

INTERNATIONAL ALLIANCE OF RESEARCH UNIVERSITIES

Internationalization and networking

IARU – International research cooperation

CEHA is closely associated with the prestigious International Alliance of Research Universities (IARU), an alliance that includes the University of Copenhagen. The association between CEHA and IARU is a cornerstone in the efforts to gain international recognition for CEHA. IARU is also 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 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.

In 2014, ALH Steering Committee was formed (see below), whose raison d'être is to increase engagement across IARU campuses and to promote joint activities and funding opportunities for IARU ALH participants. The Committee intends to meet once per year. In 2015, the Committee held a meeting combined with a scientific workshop on 27-28th August in Copenhagen. Participants (underlined below) were members of the Committee, as well as four invited researchers from IARU universities:

- Professor Lene Juel Rasmussen, University of Copenhagen (Chair)
- Professor Kaarin Anstey and Dr. Richard Burns, Australian National University
- Professor. Michael Ristow, ETH Zurich
- Professor Ho Teck Hua, National University of Singapore (represented by Professor Eric Finkelstein)
- Professor Xiaoying Zheng, Peking University (represented by Dr. Li Ning)
- Professor Junichiro Okata, The University of Tokyo (represented by Professor Hiroko Akiyama and Professor Katsuya Iijima)
- Dr. Louise Lafortune, University of Cambridge (absent)
- Professor Sarah Harper and Professor George Leeson, University of Oxford
- Professor William Satariano, University of California, Berkeley (represented by Professor Andrew Scharlach and Dr. David Lindeman)

Also attending were Ms. Michela Gaifami, IARU Secretariat (UCPH), Miriam Sander, Page One Editorial Services and Tina Gottlieb, Center for Healthy Aging (UCPH).

Scientific workshop

The scientific workshop was organized for all IARU participants, as well as for researcher from CEHA and Aalborg University, Denmark. The program included 15 presentations by IARU and CEHA participants, followed

by questions, discussion and networking. A number of joint research focus areas and potential projects were discussed. The workshop served as a valuable platform – and a point of departure – for the following actions of the Steering Committee Meeting on the next day.

IARU ALH Steering Committee Meeting

The Committee discussed future activities, funding and common areas of interests, as well as possibilities for student exchange at master and PhD level. Four scientific focus areas were identified:

1. Cohorts, Cognition and the Brain
2. Changing Demographic, Economic, Social and Physical Environments and Healthy Aging
3. Biology of Aging
4. Technology and Aging

Further, the Committee discussed content and set up for the upcoming IARU ALH Graduate Student Conference and Steering Committee meeting in Tokyo, 2016.

Detailed information on IARU ALH can be found at: www.iaruni.org/research-initiatives/aging.

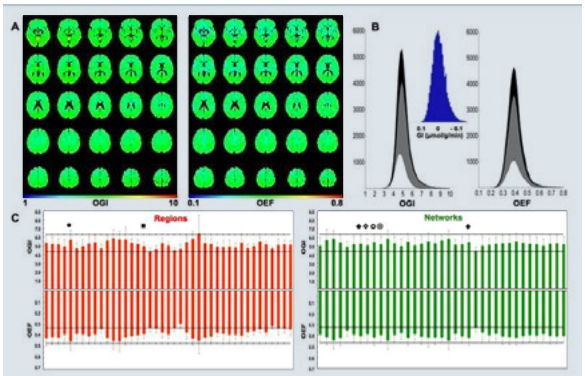


Figure: Uniformity of absolute OGI and OEF values in normal human brain as (A) maps and (B) histograms replacing voxels by regional averages. Histograms shaded in black, gray, and white represent whole brain, gray matter, white matter, respectively. In (C), OGI and OEF values across regions (left) and networks (right) are shown across 41 regions and 37 networks in relation to gray matter means. The uniformity and magnitude of preclude a significant role of aerobic glycolysis in brain structural plasticity.

"Uniform distrutions of glucose oxidation and oxygen evtraction in gray matter of human brain." Accepted, JCBF&M: Fahmeed Hyder Peter Herman, Christopher J. Bailey, Arne Møller, Ronen Globinsky, Robert K. Fulbright, Douglas L. Rothman, Albert Gjedde.

iHAN – International Healthy Aging Network

The International Healthy Aging Network (iHAN) is part of IARU. Researchers of iHAN collaborate on the study of molecular and cognitive biomarkers of healthy aging and age-related diseases, including Type 2 diabetes and Alzheimer's disease, using in vivo methods of neuroimaging, particularly positron emission tomography (PET). Researchers of iHAN include members from Aarhus (Aarhus University), Baltimore (Johns Hopkins University), Berkeley (University of California), Brisbane (University of Queensland), Cape Town (Universiteit van Stellenbosch), Copenhagen (University of Copenhagen), Montreal (McGill University), New Haven (Yale University), Oslo (University of Oslo), and Vancouver (University of British Columbia). In 2015, the researchers of iHAN created three affiliated nodes, including St Kitts (Ross University School of Veterinary Medicine), Tabriz (Tabriz University of Medical Sciences) and Kampala (Uganda National Research Health Organization, UNRHO), St Kitts and Tabriz affiliated with Copenhagen and Kampala affiliated with Oslo, respectively.

Seminars, meetings, symposia

Members of iHAN participated in and had meetings at the anniversary celebration of the McConnell Brain Imaging Center at the Montreal Neurological Institute of McGill University, Montreal, February 9-13; the NIH BRAIN Initiative meetings in Baltimore, February 13-15 and October 18-20; the XXVII ISCBFM Symposium, Vancouver, June 27-30; the Interdisciplinary Summer School on Neuroimaging (ISSN) in Aarhus, July 2-16; the IARU Meeting on Aging, Copenhagen, August 27; the International Symposium of Neuroscience, Neuroradiology, Nuclear Medicine, and Psychiatry, Tabriz, October 5-10; the International Diabetes Federation meeting in Vancouver, November 30 – December 4; the iHAN meeting in Berkeley, December 3-5; and the First International Student Conference of Evidence-Based Medicine, Iran, December 7-9, organized by Professor Sakineh Hagebrahimi of Tabriz University of Medical Sciences, with participation of members of BRAINlab and CEHA (UCPH).

Knowledge exchange between iHAN universities
Dr Kai-Hsiang Chuang, Center of Advanced Imaging at the University of Queensland, Brisbane, and Dr Saeed Sadigh-Etegad, Tabriz University of Medical Sciences, collaborated with local researchers at BRAINlab and CEHA (UCPH) during the period August 17 – September 15. Dr and PhD Student Mostafa Araj Khodaee, Tehran, worked at BRAINlab and CEHA (UCPH) during the period July 1 to December 31. Dean Seyed Kazem Shakouri, Tabriz University of Medical Sciences, visited BRAINlab and CEHA (UCPH) during the period November 9-11.

Publications of iHAN in 2015

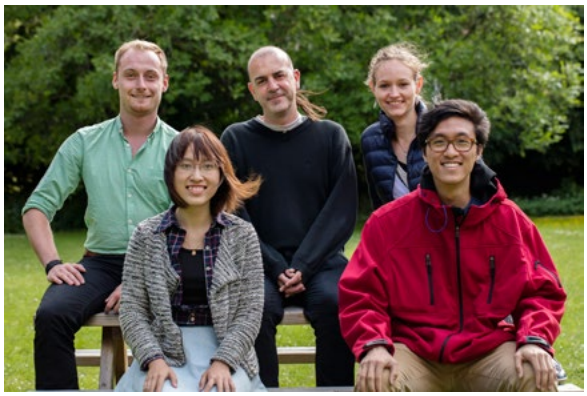
1. Andalib S, Talebi M, Sakhinia E, Farhoudi M, Sadeghi-Bazargani H, Gjedde A. Lack of association between mitochondrial DNA G15257A and G15812A variations and multiple sclerosis. *J Neurol Sci.* 2015 Sep 15;356(1-2):102-6. doi: 10.1016/j.jns.2015.06.022. Epub 2015 Jun 12. PubMed PMID: 26233806.

2. Andalib S, Talebi M, Sakhinia E, Farhoudi M, Sadeghi-Bazargani H, Gjedde A. Mitochondrial DNA T4216C and A4917G variations in multiple sclerosis. *J Neurol Sci.* 2015 Sep 15;356(1-2):55-60. doi: 10.1016/j.jns.2015.04.050. Epub 2015 May 7.PubMed PMID: 26201854.

3. Arnold A, Calvetti D, Gjedde A, Iversen P, Somersalo E. Astrocytic tracer dynamics estimated from [1-11C]-acetate PET measurements. *Math Med Biol*. 2015 Dec;32(4):367-82. doi: 10.1093/imammb/dqu021. Epub 2014 Nov 24. PubMed PMID: 25424579.

The IARU Project: Walkability – mobility and social relations among the elderly

The joint IARU research project entitled *Walkability* involves Oxford University, CEHA and the Helen Hamlyn Center for Design at the Royal College of Art. The goal of *Walkability* is to investigate whether the existence of perceived community assets and/or specific characteristics of the built environment, including streetscape design, and/or characteristics of the social environment influence the propensity of older adults to walk, exercise and/or practice other healthy behaviors. Joint project meetings was conducted in Copenhagen in August and September, and several local meetings were held by the Danish team in November and December to further develop the proposal and identify potential funding sources. The project group expects to be able to submit an application for funding during 2016.



One of the project groups together with their teacher.

IARU – CEHA summer course

CEHA hosted the 5th interdisciplinary summer course on *Interdisciplinary Aspects of Healthy Aging*, 7-26 July, 2015 at UCPH, Copenhagen.

The Summer Course gives students the opportunity to learn and use research methods from other disciplines, and to develop new projects with guidance from summer course teachers. CEHA Associate Professor Ying Liu has developed and implemented the course program, mainly with lecturers from CEHA, but also from CEHA's international IARU network, where Professor George Leeson, University of Oxford, and Dr. Louise Lafortune, University of Cambridge, gave inspiring lectures.

Inspired by CEHA's greater focus on health innovation in connection with the *EIT Health* project (described below), the summer course successfully included lectures and student project work within this field as a new initiative. Director R&D Academic Relations Palle Høy Jakobsen from the pharmaceutical Danish company Novo Nordisk gave lectures on innovation, while Assistant Professor, Till Winkler, Copenhagen Business School, supervised a student project on health and innovation. Summer course students were from Yale University, University of Oxford, Peking University, University of Tokyo, Australian National University, National University of Singapore, University of Copenhagen, University of California Berkeley, Swiss Federal Institute of Technology in Zürich (ETH) and the Medical University of Lodz.

For the second time, CEHA also arranged a visit for the students to the home care facility *Søndervang* in Copenhagen, in order to get insight into the lives of

older people in Denmark. Both students and residents reported that the interaction with the residents was valuable and mutually beneficial. As an example, two student project groups obtained the opportunity to collect data for their student research project at *Søndervang*, as well as at two other home care facilities near Copenhagen. The management of *Søndervang* reported that the results of the student's analysis and findings were educational and valuable to them.

Other international networking

EIT Health – and the Center for Healthy Aging
In December 2014, the project *InnoLife – Healthy living and active aging* was designated the winning *Knowledge and Innovation Community* (KIC), to be called EIT Health, and was awarded approximately a business value of 395 million euros over 7-10 years. KICs are part of the larger European Union (EU) initiative, Horizon 2020.

The *EIT Health* is a consortium of more than 50 core partners and 90 associate partners from leading businesses, research centers and universities from across 14 EU countries. Core partners 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. At the University of Copenhagen, the CEHA is a central player.

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.

One of CEHA's first activities within the EIT Health umbrella is the development of a new summer course. During 2015, CEHA has developed a summer course on "health innovation for the elderly population" together with the Copenhagen Business School, the pharmaceutical company Novo Nordisk and the innovation and entrepreneurship hub *SUND Vækst* – the latter a collaboration between CopenRehab/Faculty of Health and Medical Sciences and the Municipality of Copenhagen. The course is entitled *Alive and KICking – innovative solutions to aging-related challenges*. The aim is to contribute to the education of professional health innovators and entrepreneurs on an international level. The course includes online lectures launched in June, as well as an ON-CAMPUS part at the University of Copenhagen from 8 – 19 August, 2016. Teachers and supervisors come from CEHA, Erasmus University Rotterdam, Copenhagen Business School, Novo Nordisk, Steno Diabetes Center, the Danish company DigiRehab, as well as from the Department of Public Health and the Faculty of Science, both University of Copenhagen.

Finally, the relationship between the University of Copenhagen and IARU is an acknowledged component of the *EIT Health*, 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/eit-community/eit-health

ABRAHAM
CEHA is also active in the network ABRAHAM, which includes researchers, companies, governmental institu-

tions 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 builds 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 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.

CEREHA

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

MARRIAGE

CEHA has been member of the EU funded *Initial Training Network MARRIAGE* since 2012. 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.

MouseAge

Center of Healthy Aging is part of a European network (COST action), *MouseAge*, which is developed for preclinical testing of interventions in mouse models of age and age-related diseases. 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. More information: 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. CEHAs 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. 19-20, 26).

Intelligence in early adulthood – associations with midlife mortality and physical performance in Danish men

Meincke R. CEHA Theme II, University of Copenhagen
December 2015

In this thesis, the associations between intelligence at military conscription and midlife mortality and physical performance were examined in three papers. All three papers were based on male participants from two Danish cohorts: The Metropolit Cohort born in 1953 and the Copenhagen Perinatal Cohort born in 1959-61. Using Cox proportional hazards models, we found an inverse association between intelligence in early adulthood and deaths from natural causes (diseases) and unnatural causes (accidents, suicide, homicide). In linear regression analyses, inverse associations between intelligence in early adulthood and five out of seven measures of physical performance in midlife were observed. Education to some extent mediated the association of intelligence with chair-rise and jump height. Interventions should focus on addressing people with different cognitive abilities and bear in mind that prevention of early aging might need to start early in life.

Anabolic effects of light load resistance exercise and distribution of protein intake in elderly – with emphasis on muscle protein synthesis regulation and amino acid transporters

Agergaard J. CEHA Theme III, University of Copenhagen
June, 2015

Skeletal muscle mass and function declines with aging. Loss of muscle function and/or mass in the elderly limits their mobility, interferes with activities of daily living, and both directly and indirectly limits healthspan and shortens lifespan. The deterioration of skeletal muscle is linked to impaired amino acid sensing and compromised muscle protein synthesis. This thesis explored the acute anabolic effect of resistance exercise with light load fol-

lowed by protein intake; an applicable intervention for elderly that was being tested for its ability to improve amino acid sensing and build skeletal muscle mass in elderly subjects. The results provide evidence that the light load exercise regimen [alone] increased anabolic processes in skeletal muscle in healthy elderly subjects. Furthermore, when ingesting protein after exercise the amino acid sensing mechanisms was improved. Future studies will use a longitudinal study design to explore whether a similar intervention is effective over a longer time period, such that sustained/long-term improvement in skeletal muscle function can be achieved.

PhD courses

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

- *Interdisciplinary research: Aging as a field of study,* organised by the Network for Young Scholars, Course leader Assistant Professor Claus Desler (Theme III), lectures delivered by senior and junior researchers from all CEHA themes (Themes I-III)
- *Composing cultural analysis,* Associate Professor Astrid Jespersen & Post doc Aske Juul Lassen (Theme I)
- *Mitochondrial physiology – From organelle to organism,* organized by Professor Flemming Dela and Assistant Professor Claus Desler, the course had 59 participants from 14 different countries (Theme II and III)
- *Advanced social epidemiology, Life course health and aging,* Associate Professor Rikke Lund (Theme II)
- *Skeletal muscle: Size, signaling and satellite cells,* Associate Professor Abigail Mackey (Theme III)
- *Matrix biology – Physiology and function of extracellular matrix,* Professor Michael Kjær and Associate Professor Katja Heinemeier (Theme III)

Post graduate level

Selected examples:

- *Seminar on CAMB II data collection,* University of Copenhagen, Associate Professor Rikke Lund (Theme II)
- *Motivation – one size fits all?* Danish Physiotherapist's congress 2015, Professor Erik Lykke Mortensen (Theme II)
- *Physical activity in the elderly,* nine Lectures, course for General Practitioners in France, Professor Flemming Dela (Theme II)
- *What is tendinopathy, Does shock wave therapy help?; Pharmaceutical treatment options for tendinopathy; and Is there a place for cortisone injections in the treatment of acute musculo-skeletal injuries?* 7th Advanced Team Physician Course, International Olympic Committee (IOC), Professor Michael Kjær (Theme III)
- *Muscle contraction intensity and nutritional supplementation,* lecture at the PhD course 'Assessment and evaluation of human muscle, nervous system and tendon-aponeurosis function in sports science, clinical science and aging', Associate Professor Lars Holm (Theme III)

Master level

Selected examples:

- *Perceptions of elderly and elderly health in WHO;* and *Health perceptions in Denmark 1964-2015*, supervision of two MA theses, Post doc Tenna Jensen (Theme I)
- *Aging and loneliness; Welfare technologies; and Aging, eating and appetite,* supervision of three MA theses, Associate Professor Astrid Jespersen (Theme I)
- *Working with three groups of ethnology students* – The students are a part of the project "Retirement stories", Post doc Kamilla Nørtoft (Theme I)
- *Life course and health and aging,* Course leader and lecturer, Associate Professor Rikke Lund (Theme II)
- *Gerontology – About the complex issues in dealing with older patients,* Course leader, Associate Professor Charlotte Juul Nilsson (Theme II)
- *Nutrition and physical activity for the improvement of health in the aged,* Co-Course Leader, Associate Professor Charlotte Juul Nilsson (Theme II)
- *Age-related loss of muscle mass – sarcopenia: protein and exercise training as strategies to counteract,* Associate Professor Lars Holm (Theme III)

Pre graduate level

Selected examples:

- *Social medicine and rehabilitation,* Course Leaders, Associate Professor Ulla Christensen and Associate Professor Charlotte Juul Nilsson (Theme II)

- *Psychology and health communication*, Course Leader, Professor Erik Lykke Mortensen (Theme II)
- *Social epidemiology and public health,* Course Leader, Associate Professor Charlotte Juul Nilsson (Theme II)
- *Physiology and pathophysiology,* Course Leader, Professor Flemming Dela (Theme II)
- *Physical Activity and Disease Prevention,* Professor Michael Kjær (Theme III)
- *Molecular aging,* Associate Professor Hocine Mankouri (Theme III)
- *Mitochondria and aging,* Assistant Professor Claus Desler (Theme III)
- CEHA senior researchers also supervise bachelor and masters level students who are affiliated with various 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:

- *Lecture and interactive sessions with elderly ethnic minority women on health and health behaviour,* Immigrant Women's Center Noerrebro, Associate Professor Maria Kristensen (Theme I)
- *Does activity make you younger?* Presentation at the event "European elderly and cutbacks policy", arranged by Globale Seniors, Post doc Aske Juul Lassen (Theme I)
- *Aging and relations,* Open University, Post doc Henrik Hvenegaard Mikkelsen (Theme I)
- *The aged's sexuality,* Copenhagen Culture Night, one

presentation out of three, CEHA Science Slam, Associate Professor Bjarke Oxlund (Theme I)

- *The good life at 60+ – Keep your brain going*, three lectures at Open University in Aarhus, Emdrup and Ålborg, Associate Professor Ellen Garde (Theme II)
- *Loneliness and health/aging*, Seminar at DaneAge, Associate Professor Rikke Lund (Theme II)
- *Perspectives on the importance of socio-economic position throughout life re. physical functional capacity at the age of 50,* Presentation at the Danish Gerontological Society's annual meeting, PhD Student Gitte Lindeved Petersen (Theme II)
- *The aging human body/ Pharmacological aspects of physical training in elderly individuals.* Research symposium for Physical Medicine & Rehabilitation Research, Metropol, Professor Michael Kjær and Associate Professor Abigail Mackey (Theme III)
- *Healthy aging,* three lectures at Open University, Associate Professor Lars Holm (Theme III)
- *Exercise and avoid holes in your brain;* and *Are you younger than you think?* The People's Political Festival, Center for Healthy Aging, Associate Professor Lars Holm (Theme III)

Major grant and prize in 2015

Associate Professor
Andrés J López-Contreras

Major grant

Prestigious grant for research on molecular aging and cancer

In 2015, Associate Professor Andrés López-Contreras from CEHA and the Center for Chromosome Stability, University of Copenhagen, received an ERC Starting Grant of EUR 1.5 million. The grant will allow him to expand his research group and will increase the international visibility of this research area. ERC Starting Grants aim at supporting promising young researchers in establishing proper research groups.

López-Contreras's research group study the impact of genomic instability on aging using transgenic mouse models. Research findings indicate that chromosome instability is an underlying cause of aging related disorders, including cancer and neurodegenerative diseases. Changes in DNA can be triggered not only by external factors, but also by intrinsically unstable regions within the human genome itself, and Andrés López-Contreras' research focuses on these fragile regions known as chromosomal common fragile sites, CFS, – how they drive tissue aging and cancer. The fragile sites are highly mutated in cancer and understanding how the sites are regulated could lead to novel treatments for cancer or other age-related diseases.

Prize

Professor Michael Kjær received Nordic Medical Prize

In 2015, Clinical Professor of Sports Medicine Michael Kjær from CEHA and Bispebjerg Hospital, Copenhagen, received one of the greatest medical prizes in the Nordic Countries, the Nordic Medical Prize, in recognition for his extensive and internationally-recognized research on the effects of physical activity on the human endocrine system and fibrous tissue. Professor Kjær's research helped elucidate mechanisms underlying tendon and muscle injuries. Professor Kjær shares the prize with researchers Lars Engelbretsen and Roald Bahr from the University of Oslo, as well as with Jón Karlsson from Gothenburg University.

Next page:
Professor Michael Kjær

Photo: Claus Peuckert

Internal communication and selected joint activities

Internal communication and selected joint activities

The CEHA staff forms a network of independent research groups from various disciplines, who work together despite quite different scientific perspectives. Furthermore, CEHA's researchers are affiliated with three different faculties and seven departments within the University of Copenhagen. This structure demands high level and efficient internal communication.

To this end, CEHA researchers meet frequently to discuss ongoing and proposed joint projects. Further descriptions of selected cross theme projects are described in more details at pp. 27-34.

Frequent scientific events reach across research groups, including workshops, seminars, retreats and meetings. A selection of these activities is described below. Joint PhD projects and cross-disciplinary PhD courses are also important contributions to the internal communication of the Center (details at pp. 72-74).

The work of the Network for Young Scholars (NYS) is of great importance to the internal coherence of the Center, particularly between the young scholars themselves, but also to the benefit of the Center. In NYS, young scholars are collaborating closely to share their experiences and promote their professional growth and career goals in the field of aging research in CEHA and at UCPH. From the beginning of their careers, they interact in many scientific settings and share activities with peers from other disciplines developing an open-minded and cross-disciplinary mind set. A selection of NYS activities is described at pp. 72-74.

These activities are supported by an information flow through e-mail based CEHA news, as well as news on the CEHA website.

Finally, a crucial milestone for the internal coherence is the relocation in 2016 of CEHA researchers into the new and spectacular extension of the Faculty of Health and Medical Sciences, the Mærsk Building. The building is under construction and it is expected to be ready at the end of 2016 (maerskbuilding.ku.dk). Some CEHA research groups will move permanently into the new building, while others will work there on a part-time basis. The building will provide CEHA a dynamic environment with excellent opportunities for scientific interactions and "working together under the same roof" will be critical for strengthen the internal coherence of the Center.

Selected joint activities

CEHA retreats and SAB meetings

CEHA holds a retreat approximately 1-2 times per year, so that CEHA scientists can share data on ongoing projects, accomplishments, concerns and to identify areas of shared interest and opportunities for collaboration.

In May 2015, a full-day CEHA retreat for senior researchers was held. During the morning, researchers presented on-going research with emphasis on future perspectives and development. Later, two parallel workshops on collaboration across CEHA Themes entitled *Health Promotion* and *Brain and Cognition* respectively, were conducted. The day ended with a workshop on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joint funding opportunities, including presentations from researchers with specific experiences with larger foundations.

The fall retreat usually coincides with the annual meeting of the CEHA Scientific Advisory Board (SAB; see below). This year, a combined CEHA retreat and SAB meeting took place on 4-5 September, 2015. The program included presentation of CEHA research, the CEHA Network for Young Scholars (NYS) and parallel theme specific break-out sessions between CEHA research groups and specific SAB members.

Steering Group meetings

The Steering Group represents all three CEHA Themes as well as the Communication and Outreach Platform. The Group meets regularly (once a months or ad hoc, if needed) in order to update each other on research activities, discuss financial issues, recruitment, strategic planning and outreach. See p. 91.

CEHA-BRIC seminars

Throughout 2015, CEHA and the Biotech Research & Innovation Centre (BRIC) conducted weekly research seminars on important topics in biological sciences (www.bric.ku.dk/research-communication/seminars_events/seminars). 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 2015 CEHA-BRIC seminars included:

- *DNA strand breakage and neurodegenerative disease*. Speaker: Keith Caldecott, Genome Damage and Stability Centre, University of Sussex, UK. Host: Ian Hickson, CEHA. January 22, 2015.
- *Endogenous DNA damage, replication stress and ageing*. Speaker: Niels de Wind. Department of Human Genetics, Leiden University Medical Center, The Nederlands. Host: Lene Juel Rasmussen, CEHA. February 5, 2015.
- *Senescence and reprogramming: two opposite cellular fates that work together.* Speaker: Manuel Serrano. Tumour Suppression Group, Spanish National Cancer Research Centre (CNIO), Spain. Host: Andrés López-Contreras, CEHA. March 27, 2015.
- *Homologous recombination: the beginning and the end.* Speaker: Petr Cejka. Institute of Molecular Cancer Research, University of Zürich, Switzerland. Host: Hocine W. Mankouri, CEHA. September 3, 2015.
- *Mechanisms of DNA replication stress and repair pathways in cancer.* Speaker: Thanos Halazonetis. Dept. of Molecular Biology, University of Geneva, Switzerland. Host: Ian Hickson, CEHA. December 3, 2015.
- *DNA repair and damage signalling in malignant glioma and melanoma therapy.* Speaker: Berndt Kaina. Institute of Molecular Biology, University of Mainz, Germany. Host: Vilhelm Bohr, CEHA. December 10, 2015.

Network for Young Scholars

The Network for Young Scholars (NYS) was established in 2010 by CEHA undergraduate and postdoctoral fellows to offer interdisciplinary research training, educational activities, and to improve social interactions among young CEHA researchers.

The NYS Steering group members are:

- Morten Bülow, Post doc, Communications platform/Theme I
- Amy Clotworthy, PhD Student, Theme I
- Malene Bødker, PhD Student, Theme I
- Jolene Lee Masters Pedersen, Post doc, Theme II
- Claus Desler, Assist. Professor, Theme III
- Thomas Lau Lindestrand-Hansen, PhD Student, Theme III
- Jon Durhuus, PhD Student, Theme III
- Elisabeth Holm Diget, PhD Student, Theme III
- Jakob Agergaard, PhD Student, Theme III
- Tina Weller, Academic Officer, CEHA Administration
- Line Damberg, Academic Officer, CEHA, Administration (on maternity leave).

NYS' aim is to contribute to educating outstanding interdisciplinary researchers within the field of aging. To achieve this goal, NYS is striving to balance between developing courses that refines the researchers' individual specialization and providing courses that focus on academic diversification, essential to engage in inter-

disciplinary collaborations. Additionally, the Network is focusing on engaging the young CEHA researchers in a constructive discussion on Interdisciplinarity.

The better part of 2015 has been devoted to developing a course catalogue, offering primarily PhD students within CEHA, a broad range of courses that is focusing on Aging and/or Interdisciplinarity. The courses have been selected on the basis of a survey, conducted among the young researchers in CEHA, to ensure high relevance of the courses provided. Over the next three years, the Network will launch new courses, workshops and seminars each year, and the most successful ones will be repeated annually/biannually depending on the demand and success of the course.

In 2015 the first PhD course from the catalogue was launched: *Interdisciplinary research: Aging as a field of study,* which is described below. Additionally, the Network also organized a number of other exciting events: Two Academic Thursday's: The first one took place in spring and was about "Postdoc applications". The second one was taking place in the fall of 2015 and was on the topic "Valueing Health", presented by Professor Tiago Moriera (Theme I). Furthermore NYS contributed with a session at the CEHA SAB meeting 4 September 2015 and, finally, NYS conducted a mini-conference on *Interdisciplinary projects within aging research – management and communication* in October 2015, also described below.

Aging conference

On the 23 October, 2015, NYS held the mini-conference *Interdisciplinary research projects – management and communication.* The conference was targeted researchers at any career level who could be interested in interdisciplinary aging research and in communication of science to the general public.

The aim of the mini-conference was to grasp the challenges that potentially hinder interdisciplinary projects and collaborations to succeed. Thus, the conference focused on ways to optimize the management of – and communication in and around – interdisciplinary research projects, by concentration on the following themes:

- Tools for interdisciplinary work
- Management of projects
- Overcoming communication barriers
- Integrate data and concepts

Lectures were given by Novo Nordisk's Corporate Vice President Søren Bregenholt, who is the Honorary Industrial Ambassador at the Faculty of Health and Medical Sciences and attached to CEHA and professor Rudi Westendorp (Theme II). The mini-conference also included a workshop on 1) interdisciplinarity and 2) science communication to the public, the latter presented by Anja Philip, former head of projects at the Danish Cancer Society and host of the popular television show 'VidenOm' (Knowledge about) on Danish national television. The workshop was successfully facilitated by postdoc Morten Bülow from CEHA's communication's platform.

PhD course

In 2015, the first course from NYS's course catalogue was conducted: Interdisciplinary Research: Aging as a field of study. The course was organized by all members of the NYS Steering committee and lead by Assistant Professor Claus Desler. The course was supported financially by the Graduate School of Health and Medical Sciences and was attended by PhD students from CEHA, as well as PhD students from outside of CEHA.

The course was primarily intended for PhD students who are working – or will be working – in the field of aging, but it was also relevant for students who wanted to learn more about interdisciplinary research per se.

The course included a series of introductory lectures presented by senior researchers who study health and aging within a broad variation of fields, ranging from biology through demography to sociocultural research perspectives. Although the lectures were covering such a broad range of research fields, they were designed to apply to all attendees, regardless of academic background. As a recurring motif "the effects of aging on cognition" was used as a case study. The students were introduced to how biomolecular changes affect cognitive ability, how neurodegenerative disorders develop, and how society handles aging individuals, particularly those suffering from dementia. Through hands-on experimental sessions and group work, students learned how to analyze data from different research disciplines and engage in an interdisciplinary discussion about their findings. The course took place at different locations, matching the topic and hands-on experimental sessions, which was at the Faculty of Health and Medical Sciences, the Faculty of Social Sciences and Bispebjerg Hospital. Students were awarded with 4.2 ECTS. Based on the great success of the course, the intention is to offer it as an introductory course to all PhD Students in CEHA.

Selected communication and outreach activities

Selected communication and outreach activities

CEHA's communication platform works strategically to communicate to the general public and stakeholders with an influence on ensuring the public can age healthily. In 2015, CEHA drew up a stakeholder strategy to supplement the communication processes. The primary target groups are elderly organizations, municipal decision-makers, healthcare professionals and selected patient organizations.

Nationally and globally, the political focus is on ensuring that people have more healthy, active years. Which is why in our communication, CEHA focuses on healthy living and future aging. The aim is for knowledge about healthy aging to always be on the agenda and for the Center's research to form the basis for research-based recommendations for officialdom, decision-makers and citizens.

Research outcomes – working with stakeholders

Strategic collaborations with elderly organizations

Target group: DaneAge (Ældresagen)
Aim: To strengthen relations with the organization

In Denmark, with its 746,000 members the most influential organization for the elderly is DaneAge. CEHA works constantly to maintain close relations with this organization, so that key personnel know about our research and results. We worked with DaneAge in 2015 on a supplement *Det gode liv (The Good Life)* in broadsheet daily Politiken.

CEHA was also on the DaneAge stand for two events at Folkemødet 2016 (the People's Political Festival; www.brk.dk/folkemoedet) which is a unique platform with open debate and informal dialogue between politicians, citizens, business people and organizations. The reason for our presence was to strengthen relations with primary partners to ensure closer collaboration in implementing our results, future funding and promoting aging as a key issue. The *Festival* had 100,000 visitors in 2015 made up equally of the general public, politicians and organizations.

Flyt dig and undgå huller in hjernen #demens (Get moving and avoid holes in the brain #dementia) was primarily aimed at our stakeholders. Three Professors – Lene Juel Rasmussen, Rudi Westendorp and Henning

CEHA event at the People's Political Festival. Photo: CEHA.

Langberg – talked science and debated with visitors. 50 individuals from relevant organizations were invited, including representatives from the Nordea-fonden, Danish Elderly Commission, Danish Association of Physiotherapists, Danish Knowledge Center for Dementia, IBM, Falck HealthCare, and several municipalities.

Event at CPH:DOX: Film and debate on welfare technology

Primary target group: Healthcare professionals in aging organizations, decision-makers, and also cinema-goers.
Aim: To strengthen relations with elderly organizations

At CEHA, our priority is to strengthen collaboration with partners and to attend events on existing platforms. 2015 saw CEHA again attending the documentary film festival CPH:DOX, this time in conjunction with DaneAge. The pivotal event was a film, Alice Cares, on the problems of welfare technology, elderly care and ethics. The film was followed by a panel debate by experts, politicians and representatives of elderly organizations. CEHA was represented by postdoc Nete Schwennesen (Theme I) and Copenhagen Municipality by Ninna Thomsen, Health and Care Mayor.

Photo: CEHA.

Stakeholder meetings in conjunction with Nordea-fonden

Target group: Selected stakeholders
Aim: To get stakeholders to take up research results

As a new initiative, CEHA and Nordea-fonden hold informal meetings for stakeholders based on the results of CEHA's research. The aim is to report on the current status of the Center's results and to bring together stakeholders to share experience, knowledge and needs and to investigate possible collaborations. The first meeting with Associate Professor Astrid Pernille Jespersen and postdoc Kamilla Nørtoft (Theme I) was attended by architects, municipal leaders, the Healthy City Network and International Federation for Housing and Planning. The meeting addressed the interface between generations, urban space and quality of life.

Column in Municipal Healthcare newsletter

Target group: Municipal leaders
Aim: To put research results on the agenda

We regularly contribute a column to the municipal healthcare newsletter in the Dagens Medicin (Daily Medicine) journal. The target group is senior municipal staff ranging from senior administrators to care home managers. This is a unique opportunity to put the results of CEHA's research on the municipal agenda. At year-end, 80 out of 98 municipalities were subscribing to the newsletter. In 2015, CEHA provided two think-pieces: *På sporet of ældrestyrken (On the trail of Elderly Force)* by Director Juel Rasmussen and *Træn hjernen and forbyg demens (Train the brain to prevent dementia)* by Associate Professor Ellen Garde (Theme II).

CEHA science slam event at the Copenhagen Culture Night.

Communicating to the wider public

CEHA's communication platform works strategically to communicate learning about healthy aging to the general public. We use many platforms and various formats to communicate our research and reach out to target groups. One important setting for outreach activities is Medical Museion, where outreach is inspired by museum formats such as exhibitions, demonstrations and activities.

Coaching young researchers in outreach: a case study

CEHA's communication platform trains our young researchers on outreach to the general public. The aim is for them, in addition to being clever academic and medical experts, to also be skilled communicators with outreach as an integral and important part of their work. One specific example is our collaboration with Andreas Vigelsø Hansen PhD (Theme II). He has been on the Center's Facebook editorial board since 2013. The target group for the Facebook Profile is those aged 25-60 with a general interest in health and healthy living. When the profile started, the editorial team had coaching in good communication on Facebook. The team regularly holds meetings at which investigators are updated on developments in the media, with discussions on the best way to present the Center's research and to receive sparring on posts.

The results of Andreas Vigelsø Hansen's PhD thesis were published in the early summer and led to a media story in conjunction with Communication and Press Relations Officer Gitte Inselmann Frandsen on how 14 days of inactivity affect the body. Andreas was coached in media appearance before the press release was issued. The story was widely picked up by the Danish media, with live interviews on the national television channel DR2 and the radio channel P1 Morning Shows. The story was mentioned 30 times in the Danish media, with more than 160 international reports, including CBS News and Die Welt. Andreas also uses Twitter to report of his and others' research and he also receive coaching from social media curator Annika Holme on good Twitter reporting and the advantages of the medium for outreach. Most recently, Andreas appeared with Rikke Lund (Theme II) and Bjarke Oxlund (Theme I) on a science slam on *Kulturnatten* – the major annual event in Copenhagen. He received coaching in advance from Event Coordinator Signe Flyvbjerg.

Innovative outreach concepts for the general public

Communicating research processes on Instagram

Target Group: 18-40 year-old women
Aim: To communicate research processes

This project is a collaboration between researchers and social media curator Annika Holme who communicates investigators' day-to-day work. The target group is Instagram's largest user group, women aged 18-40, who also account for the majority of the profile's 84 followers. In outreach, the focus is on the whole process of research up to achieving results. The aim is to better equip citizens to assess and understand the research outcomes they come across on media platforms. We wish to demonstrate the breadth of the Center's research and draw attention to the various aspects covered by the aging theme.

The first case of the project was a collaboration with Rikke Meincke PhD (Theme II). The case ran for a month and in addition to marking the launch of the project, it was also used to test the concept. A second case was tackled with Jakob Agergaard PhD (Theme III) which addressed another segment: strong young men interested in physical training and nutrition. A third case was a research project, *Pension Stories* with Kamilla Nørtoft (Theme I), who routinely communicates via Instagram. The material has also been used on other social media platforms to reach other population groups and to network with international research centres.

Tales from retirement: When research meets outreach

Primary Target Group: Retirees and those approaching retirement; secondarily public education
Aim: To develop new outreach concepts

The *Tales from Retirement* project is also an example of how research meets outreach right from the beginning. The project investigates identity and attainment associated with retirement and life's transitions but it is also a participatory outreach process, with the emphasis on storytelling. The aim is to investigate the communication potential of material and to challenge common outreach concepts and to experiment with public education.

Participants in the research project take photographs of situations that are important for them as retirees. The pictures then form the basis for interviews and often reveal something much more than interviews, while acting as a conversation guide and permitting participants the opportunity for double reflection, first when taking pictures and then at interview. Although personal, for the public the material is suitably fragmented, allowing them to identify the real stories in the material but also to take things further on the basis of their own experience or imagination. *Tales from Retirement* thus pave the way to a considerable degree of contribution from the public.

In the first phase, communicating *Tales from Retirement* has become a tour of parts of the Nørrebro quarter of Copenhagen, with an exhibition and talks at Nørrebro Library, and an event at the St Joseph activity center for the elderly. CEHA has also communicated events and research on Facebook and Instagram. The material for the exhibition and city tour is to be reused for library exhibitions, in school, high school, community centers, care homes and cafes in 2016. Kamilla Nørtoft and event coordinator Signe Flyvbjerg have also been visiting lecturers on an ethnological outreach course at the University of Copenhagen in which students got the opportunity to use Tales from Retirement as an exam case. Three groups proceeded with the project and designed podcasts and postcards for their exams in January 2016.

Communicating brain research at a museum and nationwide

Brain research was the focus of three different concepts in 2015: A mini exhibition on *The brain as we age* and a special event on *Exploring the brain for children and grandparents* at the Medical Museion and a lecture about the aging brain by Associate Professor Ellen Garde (Theme II).

The brain as we age is about how the brain has been understood and researched from olden times and to date. The exhibition is based on a topical example of brain research in which the public is enclosed in the engine room of Ellen Garde's research. The main theme

is what happens to the aging brain and how researchers investigate changes using MRI scanning. The exhibition opened on 1 October and was curated by Interpretation Assistant Anne Bernth Jensen.

During the summer holidays, CEHA and Medical Museion gave a special exhibition on *Exploring the brain for children and grandparents* – exploring the brain for children and grandparents and through life. The exhibition used events round and about the museum to give children the opportunity to study the brain and cranium at close quarters and to learn about young and aging brains. The exhibition moves from ancient Egypt where the brain was regarded as an unimportant organ to nowadays when researchers regard the brain as plastic and changeable. In addition to the historic approach, the exhibition gave insights into how the brain looks, how it works and how it changes during life. The exhibition was repeated in the autumn.

Associate Professor Ellen Garde (Theme II) communicated her research during the year in nationwide presentations at *Folkeuniversitetet* (Open University), night school and other venues. The talks are aimed at a public that invests time in learning about an issue in detail, often people aged 50+. This also involves a core target group who leave events with a high level of learning about specific themes and CEHA's work in general.

Pop up event: Test your age

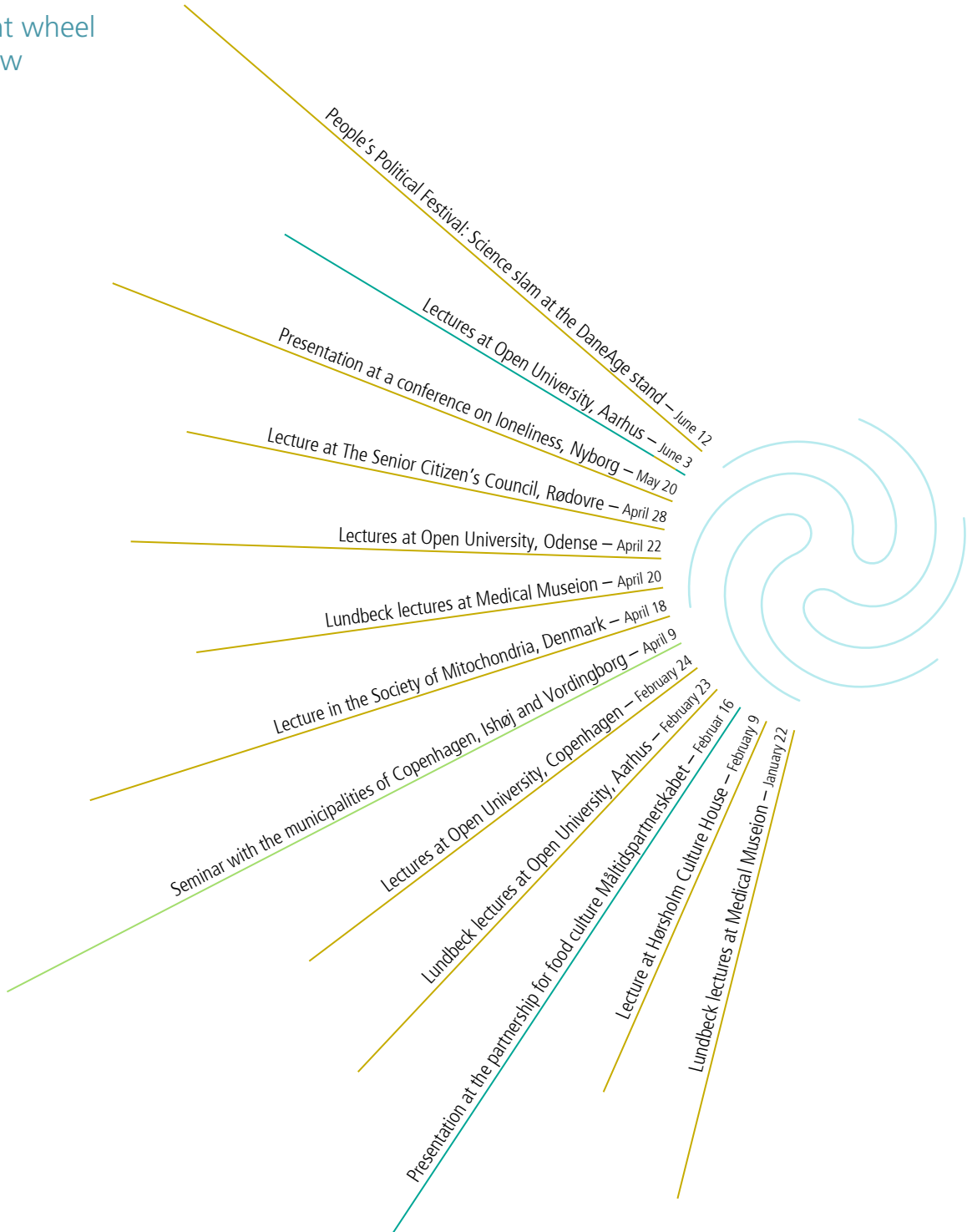
Target Group: The general public
Aim: To brand CEHA and engage the public in physical activity

In 2015, CEHA developed an activity: *Are you older or younger than you think you are?* The aim was to raise public awareness of the Center and to engage in physical exercise. The activity was developed in conjunction with Associate Professor Lars Holm (Theme III) with respect to the *Folkemødet Festival* and the Capital Region's Greater Copenhagen collaboration. Participants could learn simple exercises for domestic use and find out what fun it is to exercise using welfare technology, here on technological training tiles. Participants could also test the strength of their grip and ability to get up and sit rapidly as simple determinants of physical aging. Further, participants could compare themselves with results from a major Danish study and compare themselves against average figures. The "Get up/sit down" test and measuring the strength of hand grip was repeated at the inauguration of a new bridge, *Cirkelbroen* – by Nordea-fonden in Copenhagen, and at Medical Museion at the major annual Culture Night event in Copenhagen. The museum also opened *Space for Aging* as a constantly changing dynamic event and activity space.

2015

CEHA's Event wheel – an overview

- Exhibition
- Lecture
- Activity
- Meeting
- Presentation
- Lecture series



July 13 – People's Political Festival: Test-yourself at The Capital Region of Denmark's stand

July 1 - August 9 – Guided tours on the brain at Medical Museion

August 22 – Test-yourself at the opening of the Circle Bridge in Copenhagen

September 2-23 – Course at Open University, Copenhagen, 4 double lectures

September 11 – Stakeholder meeting at Nordea-fonden

September 28 – Lecture at the folk school for seniors, AOF Hvidovre

September 29 – Lectures at Open University, Copenhagen

September 30 – Lectures at the Senior Citizen's University, Silkeborg

October 1 – Opening of the Exhibition on the Brain, Medical Museion

October 10-18 – Guided tours, Exhibition on the Brain, Medical Museion

October 9 – Lecture at Senior Center, Hørsholm

October 9 – Copenhagen Culture Night: Science slam, University of Copenhagen

October 9 – Copenhagen Culture Night: Lecture, test-yourself & game, Medical Museion

October 28 – Lecture at the Folk School AOF, Greve

November 2-27 – Tales from Retirement: Exhibition at Nørrebro Library

November 4 – Lectures at Open University, Aalborg

November 5 – Citizens seminar at Migrant Women's Center, Copenhagen

November 11 – Film and debate at the CPH:DOX Film Festival

November 19 – Lecture at Dragør Library, Copenhagen

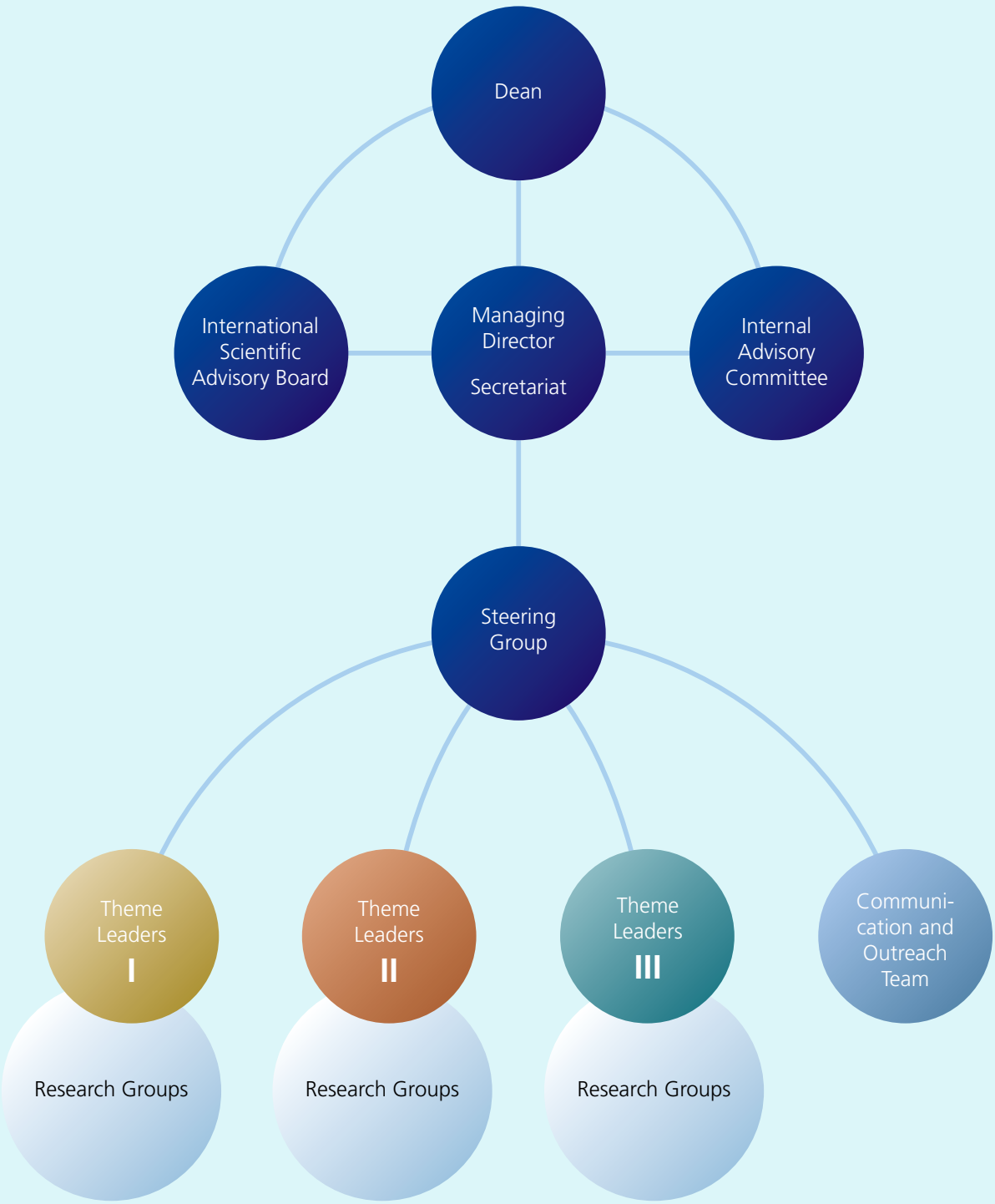
November 11 – Film and debate at the CPH:DOX Film Festival

November 26 – Seminar with the municipalities of Copenhagen, Ishøj and Vordingborg

November 27 – Tales from Retirement: Closing event at Senior Center, Copenhagen

Management

Organization Chart



Management

CEHA management is organizationally within the Dept. of Cellular and Molecular Medicine, Faculty of Health and Medical Sciences. CEHA administrative duties are carried out by the Managing Director, a Steering Committee, an International Scientific Advisory Board and Administrative Staff. The Managing Director reports 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.

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 approximately eight times per year.

CEHA Steering Committee members:

- Managing Director – Professor Lene Juel Rasmussen (Chair)
- Assoc. Professor Astrid Pernille Jespersen (Theme I)
- Professor Karsten Vrangbæk (Theme I)
- Professor Erik Lykke Mortensen (Theme II)
- Professor Martin Lauritzen (Theme II)
- Professor Rudi Westendorp (Theme II)
- Professor Michael Kjær (Theme III)
- Professor Ian Hickson/Hocine Mankouri (Theme III)
- Professor Thomas Söderqvist (Communication and outreach)

Meetings in 2015: 3 March, 14 April, 25 August, 20 October and 22 December. The CEHA Steering Committee also organized:

1) The joint retreat between CEHA senior researchers on 21st May 2015, as well as
2) the combined CEHA retreat and SAB meeting on 4-5 September 2015.

CEHA International Scientific Advisory Board.

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 took place on 4-5 September in connection with the annual fall CEHA meeting. The program included meetings with the Theme Leaders, presentation and discussions of scientific progress, and consultation with CEHA management (see also p. 70-72). The SAB reports to Dean Ulla Wewer.

The SAB members are:

- Professor Boo Johansson, Göteborg University, Sweden (Chair)
- 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, US
- 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, Professor Ulla Wewer MD DMSci (Chair)
- Managing Director, Professor Lene Juel Rasmussen, PhD (Vice Chair)
- Professor Vilhelm Bohr, MD DMSci, Lab Molecular Gerontology NIA/NIH, US (International PI, Biomedicine)
- Professor Carlos Mendes de Leon, PhD, University of Michigan School of Public Health, US, (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, Professor Ulf Hedetoft
- Faculty of Social Sciences, Assoc. Professor 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 2015, it includes three full-time employees: Tina Gottlieb, Head of Administration; Line Damberg (on maternity leave most of 2015)/Tina Weller, Academic Officer.

Professor Boo Johansson, University of Gothenburg, Sweden. Chair of the International Scientific Advisory Board (SAB).

"The mission of CEHA is to improve our understanding of healthy aging and the pathophysiological processes underlying diseases and compromised functioning in aging. Success in this mission is vital for the future, not only for science but also for the societal challenges we are facing as an effect of increasing longevity and population aging. The multidisciplinary structure and the recently adopted thematic format of CEHA provide unique opportunities also for interdisciplinary inquires and for translational research.

The University of Copenhagen is to be congratulated for its support of CEHA and for bringing together world-leading scientists to conduct state-of-the-art research on critical aging-related topics from the molecular biology of aging to societal aspects of the aging process. The Green House component of CEHA is of great significance in attracting new scholars into the field of aging and in launching new research initiatives.

It will be a privilege to follow CEHA in its progress in the coming years. I expect an even greater exposure of CEHA, in various outreach activities in the local and Nordic context, at the international scene, in addition to a continuous output of important publications on novel aspects of aging-related topics."

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