Healthy Ageing
UMCG
The University Medical Center Groningen (UMCG) is building the future of health. For this reason, our emphasis for the coming years will be on Healthy Ageing: growing older in a healthy and active way. Healthy ageing already begins at conception. Parents pass along their genes, accompanied by opportunities and risks that can lead to a healthy life course or the development of illnesses later in life. Lifestyles, nutritional patterns, the amount of exercise, and the use of medication are all factors that affect the development of health. The influence of these factors and the way they relate to each other is not yet clear. New knowledge is needed. The scientists of the UMCG and the University of Groningen, along with their national and international partners, are contributing by generating this type of fundamental new knowledge. The strength of the UMCG lies in the rapid exchange and application of knowledge and experience within the chain of scientific research, patient care, and education. Within our organization, we are working to generate new fundamental knowledge at the regional level through the Healthy Ageing Network Northern Netherlands, as well as nationally and internationally with our collaborative partners.

On behalf of the Board of Directors,
Bert Bruggeman, Chair
Aging is a continuous process, it starts at fertilization.

What factors determine an individual's health as he ages?

Interactions between:
- Genes
- Nutrition
- Environment
- Lifestyle

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Research focus UMCG: Healthy Ageing
Healthy Ageing Network Northern Netherlands (HANNN)

The question of how we can grow older in a healthy way calls for a rapid increase in knowledge. To this end, the University Medical Center Groningen (UMCG) and the University of Groningen, in partnership with the universities of applied sciences, governmental bodies, and the commercial sector of the three northern provinces of the Netherlands, have established a knowledge cluster around the topic of Healthy Ageing: the Healthy Ageing Network Northern Netherlands – Region of Knowledge & Development (HANNN).

The HANNN aspires to become a leading region in northern Europe in the area of healthy ageing. Top-ranking scientists from the UMCG and the University of Groningen have been working on the issue of ageing for years. Collaboration between knowledge institutes and the commercial sector is accelerating the speed of innovation. By bundling their strengths, the partners are able to maximize the development, valorization, and spin-off of knowledge.

As one of several regions that are experiencing a rapid increase in the elderly population, the northern provinces of the Netherlands offer an ideal setting for a knowledge cluster on Healthy Ageing. In 2008, nearly 11.5 percent of the 2.4 million people aged 65 or older in the Netherlands were living in Groningen, Friesland en Drenthe, accounting for 14 percent of the inhabitants of these provinces. In order to explain why some people develop chronic illnesses during their youth while others grow old actively and in good health, it is necessary to study many genetic and environmental factors by following people for long periods of time. The northern provinces of the Netherlands offer outstanding conditions in which to do this, as the residents of this area are representative of northwestern Europe. The population composition is relatively stable, people are less inclined to relocate, and residents are willing to participate in long-term studies. These conditions are perfect for following large groups of people over long periods. The UMCG and the University of Groningen have thus made the strategic choice to invest in LifeLines and other biobanks, as well as in top-ranking facilities for research. These investments have resulted in a goldmine of medical data that is unique in Europe. Such data are sorely needed in the fight against such conditions as diabetes, obesity, and cancer, as well as in the future prevention of Alzheimer’s, Parkinson’s, and other diseases (or at least helping to improve the course of these diseases). The HANNN is developing rapidly. For current information, visit www.hannn.eu
People with multiple complex conditions are at risk of becoming mired in our system of health care, which focuses on the separate treatment of specific illnesses. Moreover, disease processes develop differently in elderly patients than they do in the average adult. International standards for medical treatment are developed according to the results of research conducted on people between 20 and 45 years of age. What works for this population, however, does not necessarily work for the elderly. In the UMCG, researchers and physicians are searching for better treatment methods for the frail elderly, and they are establishing care plans that are specific to this group of patients.

UMCG Center for Geriatric Medicine

Frail elderly people stand to benefit from an integrated approach centered on health, wellness, and welfare. Curing illness is often no longer the primary concern. The UMCG Center for Geriatric Medicine (Centrum voor Ouderengeneeskunde or UCO) develops care plans for a number of symptoms, including falling, memory disorders, acute confusion, and unexplained declining health. In addition, UMCG personnel are researching the use of multiple medications, emotional disorders, and multiple illnesses. Physicians search for the problems underlying the symptoms and develop customized treatment plans. Within the UCO, specialists in geriatric medicine (internists, nursing home physicians, and clinical geriatricians) collaborate intensively with psychiatrists, neurologists, neuropsychologists, sociologists, and nursing consultants.

Geriatric medicine is also a new phenomenon as an area of research. The UCO has an important research component in conjunction with LifeLines and fundamental biomedical research on ageing. The results of this research are followed up in a clinical context within the UCO, as well as by external partners within the Northern Netherlands Education and Training Region (Onderwijs & Opleiding Regio or OOR), which participates in the National Program for Healthcare for the Elderly, Northern Netherlands (Nationaal Programma Ouderenzorg Noord-Nederland or NPO-NN). The UCO plays a leading role in a number of special experiments. One important experiment starts with the basics: charting the vulnerability, complexity, and welfare of the elderly in broad terms. The UCO has developed a measuring instrument for this purpose, making it possible to realize healthcare in a fundamentally different way that corresponds to the actual needs of frail elderly people. The study involves 25 different populations from the entire OOR, including residents of retirement and skilled-care facilities, patients of general practitioners, clients of an institution for mental healthcare, and elderly people receiving home care (e.g., through the Social Support Act). The results of this study play a decisive role in the development of innovative forms of care and support for elderly people in the northern provinces of the Netherlands.
UMCG facility for particle therapy (ultra-precise radiation)

Cancer patients are vulnerable to many problems that can occur as a result of radiation during radiotherapy: tissue damage, cardiovascular diseases, chronic diarrhea, incontinence, cognitive disorders, infertility, dry mouth, and tooth decay. Older patients are particularly vulnerable to negative side effects, as their tissues are slower to heal. In many cases, the likelihood of tumor recurrence is lower than the likelihood of serious damage, either in the short or long term. Carefully focused radiation can sometimes reduce or prevent this type of problem.

The UMCG is involved in the development of particle therapy in the Netherlands, and it has the goal of establishing a facility for particle therapy in Groningen.
With our mission of ‘Building the future of health’, we will focus on life processes, life trajectories, and the consequences of ageing. We are the only university medical center in the Netherlands to embed this issue firmly within the entire breadth of our core activities. Healthy ageing will be an important focal point in our research, patient care, education, and training. The strength of the UMCG’s efforts in the area of healthy ageing is largely due to LifeLines: the biobank and cohort study that will identify risk factors (and the associated high-risk groups) for developing multiple chronic illnesses over next thirty years. The knowledge chain on Healthy Ageing begins with the identification of risks.

The LifeLines project has a unique design and state-of-the-art facilities for the storage and processing of data. The database will eventually expand into one of the world’s largest biobanks. The study will follow a total of 165,000 inhabitants of the northern provinces of the Netherlands: children, parents, and grandparents. LifeLines is the first study to adopt a three-generational approach. At the beginning of the study, most of the participants will still be healthy. During their lives, they may develop chronic illnesses. By following people for at least thirty years, we will be able to show clearly whether and when the first symptoms of a chronic disease appear. LifeLines will provide insight into a wide range of risk factors, including genetic predisposition, lifestyle, metabolism, nutritional habits, medication, physical activity patterns, infections, and stress, as well as such environmental factors as exposure to harmful substances. The results of the LifeLines study will help to improve both prevention and the effectiveness of diagnosis, treatment, and care. They will also allow the food industry, biotechnology companies, and the pharmaceutical industry to track the effects of their products on people’s health.

LifeLines will play a central role in the overarching European biobank project entitled ‘Biobanking and Biomolecular Resources Research Infrastructures’ (BBMRI). The government of the Netherlands has placed high priority on supporting a biobank infrastructure, as can be seen in the allocation of funds for the overarching national biobank initiative BBMRI-NL. The UMCG is a partner in this project, as well as in several cohort studies, including LifeLines. www.lifelines.nl

The UMCG is in an ideal position to combine, implement, and validate new fundamental knowledge regarding cell-level ageing processes, the development and course of illnesses, and the organization of health care. Multidisciplinary research proceeds from fundamental biological and clinical (or pre-clinical) studies and extends to applied research on the social and societal effects of illness and health. The Groningen Institute for Healthy Ageing research (GIHAr) is the platform for the Healthy Ageing research for UMCG scientists, as well as researchers from the University of Groningen and the universities of applied sciences in the northern provinces of the Netherlands. The GIHAr thus serves as the knowledge component of the HANNN. New knowledge will improve the quality of care and the quality of life for the chronically ill and elderly, while ensuring affordable healthcare for future generations. One unique feature of the UMCG’s focus on healthy ageing is that it aims to develop knowledge throughout the entire breadth of the institution’s core operations: scientific research, patient care, educational programs, and the labor market.
European Research Institute on the Biology of Ageing (ERIBA)

The social consequences of population ageing call for the rapid development of knowledge. It is therefore necessary to resolve questions concerning the biological aspects of ageing internationally at a high level. Only a top-ranking scientific institution that is specifically focused on the biological mechanisms of ageing can generate the knowledge that is needed. There are few research institutions in the world that focus exclusively on ageing.

For this reason, the UMCG and the University of Groningen are investing in the European Research Institute on the Biology of Aging (ERIBA). In Groningen, a brand-new building is being realized, which will contain all the facilities needed for top-level research. The close proximity of the facilities of the UMCG, the University of Groningen, and the Hanze University Groningen will allow synergy to emerge. Beginning in 2011, leading international researchers will start to work in this new building. This will offer opportunities for the strong stimulation of the knowledge economies of the Netherlands and Europe. The ERIBA will be established around these leading international scientists; several of them are already working at the UMCG.

1 Scientific research
- Acquiring fundamental insight in the process of ageing (primary prevention)
- Improving the prevention and treatment of chronic, often age-related diseases (secondary prevention)
- Optimizing care for the elderly
- Developing and improving technologies for the elderly

2 Patient care
- Developing treatments and care plans for frail elderly people and people with chronic illnesses with complex conditions

3 Education, training, and the labor market
- Education and multidisciplinary training focused on Healthy Ageing and care for the elderly
- Developing a specific labor-market policy
- Developing programs for careers in healthcare
The collaborative ties that exist with other leading international research institutes generate the focus and mass necessary to achieve interesting scientific breakthroughs. The excellent research infrastructure makes new knowledge possible in the area of molecular processes that lead to ageing and influence the development of somatic and psychic illnesses. In our own country, we are collaborating closely with the universities of Leiden, Rotterdam, and Wageningen. At the European level, we have collaborative ties with the Max Planck Institute in Cologne, the Institute for Ageing and Health in Newcastle, and the University College London. We have also established an alliance with the Mayo Clinic in Rochester, Minnesota (USA) for fundamental and clinical research on ageing. Young researchers from the Mayo Clinic are conducting doctoral research in Groningen, and researchers from Groningen are utilizing the hyper-modern facilities of the Mayo Clinic (and vice versa).

Ageing Brain

Within the UMCG, research on mental and cognitive disorders is bundled in an initiative entitled Ageing Brain. In this project, psychiatrists, psychologists, epidemiologists, internists, neurologists, and other specialists collaborate with each other, utilizing such population studies as LifeLines and TRAILS. Because of its extensive design, LifeLines yields more insight than various smaller studies do. The TRAILS research involves the social, psychological, and biological causes of emotional and behavioral problems during the period between childhood and young adulthood.

The UMCG is one of four Alzheimer’s centers in the Netherlands. The strength of the UMCG research on neuro-degenerative diseases is that the entire chain from fundamental to clinical research works together under a single roof. The Ageing Brain initiative is a part of the national Geestkracht (Mind Power) program, which involves knowledge and applications in the area of anxiety and mood disorders, psychoses, and behavioral disorders. Strengths are also being bundled at the European level; the UMCG is a major proponent of this shared approach.

Technologie

The body tissue of older patients differs from that of younger people in a number of characteristics. Effective medical procedures for elderly patients demand new standards for medication, as well as for implants and other biomaterials that are appropriate for the elderly body. The UMCG has designated research on this issue as an important primary aim.
Technology for ageing people
The UMCG is among the few hospitals in the world in which all forms of organ and tissue transplants are performed. Research on biomaterials supports transplant research with the development of artificial organs, improved preservation techniques, and improved quality of donor organs. In the future, new technologies using stem cells will be deployed for these purposes. The UMCG is already working in this direction. New biochemical markers are being developed, which will make it possible to establish the quality of donor organs rapidly. Donor organs that physicians in the past would have rejected for transplant are now providing years of health for their recipients.

Biomaterials
Biomaterials that are appropriate for elderly people form an area of research for engineers and other scientists who collaborate closely within the UMCG with various medical disciplines, including optometry, ear-nose-and-throat medicine, and transplant medicine. Such collaboration allows for the optimal clinical use of biomaterials. Programs of study offered by universities of applied sciences in Groningen and Leeuwarden in the areas of technology, biotechnology, and laboratory techniques make a valuable contribution as well. Collaboration with these programs takes place within the Healthy Ageing Network Northern Netherlands (HANNN). Many findings have led to spin-offs in the commercial sector. By providing outstanding facilities for start-up companies, the UMCG and the University of Groningen have helped numerous biotechnology companies and partnerships with small and medium-sized companies in the northern provinces of the Netherlands to flourish. Favorable international partnerships exist as well, including collaborations with biomedical researchers from the northern European ‘bioregion’ known as ScanBalt.

Biological artificial kidney
The UMCG is coordinating a study on a biological artificial kidney, which involves the cultivation of human kidney cells. These kidney cells are being used to improve the filters in dialysis machines. The biological artificial kidney removes harmful products that can lead to accelerated tissue ageing. This research is being financed by the Kidney Foundation and by the W.J. Kolff Institute.

Medical product development
The UMCG is also working to improve artificial transplants. This type of high-tech applications are important in the context of quality of life, the ability to participate in society, and therefore healthy ageing. A portion of the research focuses on the design of implants for older people. The risks of implants in the body include unwanted reactions in the blood or tissues, as well as infection reactions.
Facilities for top-ranking research

- Genotyping sequencing facilities
- Facility for proteomics and metabolomics
- Research laboratory with the UMCG Mouse Clinic
- Bioinformatics
- NeuroImaging Center
- Animal PET and CT center
- Biobanks
- Flow Cytometrics facility
- Clinical research organization/TCC
- Good Manufacturing Practice Unit
- Confocal microscopy, electron microscopy, laser capture microscopy, high-speed quantitative fluorescence imaging at sub-cellular level, high-speed live cell imaging, in vivo fluorescence microscopy
- Business Generator
Education and training

Because of population ageing, the number of people with complex healthcare issues is increasing. An integral approach is needed to address this situation. The UMCG is working to integrate a multi-disciplinary approach to healthy and active ageing into its education and training programs. In doing so, the UMCG is training a new generation of researchers, physicians, and nurses with an awareness of prevention and a capacity for multidisciplinary collaboration. These professionals will be the ones to promote the concept of Healthy Ageing. As an employer, the UMCG seeks to ensure that its employees are able to continue performing challenging work with vitality and pleasure for longer.

Initial education
The G2010 curriculum for Medical Sciences was implemented in the 2003/2004 academic year. This curriculum strongly emphasizes competencies that transcend disciplinary boundaries, including collaboration, communication, organization, social conduct, science, professionalism, and medical conduct. The development of these competencies is an absolute pre-requisite for working with complex patient issues (as with the frail elderly and people with multiple chronic illnesses). The International Bachelor’s Degree Program in Global Health and the Healthy Ageing Track within the Master’s degree programs in BioMedical Sciences and in Pharmaceutical Medical Sciences are among the courses that are offered.

Doctoral research
In 2009, the UMCG combined its top-ranking research Master’s degree program and its doctoral studies to form the Graduate School of Medical Sciences (GSMS). Doctoral candidates are offered a structured educational program, within which they may choose from among several profiles: Drug Exploration, Life Sciences, Biomedical Engineering, Behavioral and Cognitive Neurosciences, and Health Care Research. Each of these profiles is coupled with a specific Master’s degree program. The profiles correspond to the larger Healthy Ageing research topics of the Groningen Institute for Healthy Ageing research (GIHAr). For talented Medical Sciences students, the Graduate School of Medical Sciences offers the Junior Scientific Masterclass, which is followed by between five and ten percent of the students. In the Bachelor’s degree portion of the educational program, these students work toward an Honors Bachelor’s degree.
Through its program of medical studies, the UMCG is training a new generation of professionals. In the first year of the Master’s degree program, students can submit research proposals that, upon approval, can secure a place in an MD/PhD program. During the MD/PhD program, doctoral research (in collaboration with a researcher of the student’s choosing) is combined with the fulfillment of the internship requirement. The MD and PhD programs are completed simultaneously. Through this program, the UMCG offers a unique combination of education and research, thereby forming a new generation of physician-researchers who will promote the concept of Healthy Ageing in the future.

Poorly coordinated healthcare services results in suboptimal care for frail elderly people. For this reason, the UMCG Center for Geriatric Medicine, the UMCG program in General Medicine, the nurse-practitioner program of the Hanze University Groningen, the Menzis insurance company, and the EVEAN Groep (home care) launched an experiment in 2009 to realize a completely new educational program in healthcare for the elderly. The educational plan is consistent with the chain notion, which involves the simultaneous training of professionals from various disciplines who will come into contact with each other in the course of their work, each in a specific role. The program begins small, with general practitioners and nurse practitioners. For the general practitioners, this falls under the category of continuing education and refresher courses, while it involves the initial educational program for nurse practitioners. All of the vocational groups that are involved with the frail elderly (e.g., general practitioners, nurses, internists, clinical geriatricians, psychiatrists, physical therapists, neurologists) must eventually encounter each other during their training programs. This educational program is being developed within the framework of the National Program of Care for the Elderly, together with the UMCG Wenckebach Institute.

Labor market
The UMCG’s history of collaboration with other educational institutions and the commercial sector with regard to the labor market has allowed its educational programs to grow in response to developments within the region. One example is within the area of technology and services. The UMCG Wenckebach Institute offers continuing education in this area, thereby utilizing the state-of-the-art Wenckebach Skills Center.