

Disease in Human Aging: Dynamics at the Level of Molecules, Individuals, and Society—The Focus Area DynAge

Spokespersons for the Focus Area DynAge

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The Focus Area DynAge is a collaborative research alliance between Freie Universität Berlin (FU) and Charité—Universitätsmedizin Berlin (CUB), newly joined by the German Institute of Human Nutrition, Potsdam Rehbrücke (DIfE) as a co-sponsoring institution. Since DynAge

has taken up its work in January 2013, it is our aim to gain insights into factors that set apart disease processes during different parts of the lifespan and to investigate their molecular antecedents and consequences for individuals and society. Our current focus is on four age-related disease groups: tumors, cardiovascular disease, musculoskeletal diseases, and cognitive disorders/depression. They are among the most relevant health challenges faced by aging societies. All aspects of DynAge work are organized in an interdisciplinary and transinstitutional manner, involving members of different departments at the FU, CUB, DIfE, and other regional (e.g., the Max Planck Institute for Human Development, MPIB), national (e.g., German Cancer Research Center, DKFZ), and international institutions (e.g., URPP Dynamics of Healthy Aging, University of Zurich). With experts from natural science, mathematics, pharmaceutical sciences, biocomputing, biomedicine (molecular level); clinical medicine, psychology, neuroscience (individual level); and social sciences and humanities (societal level), a unique platform is provided that supports the initiation and development of interdisciplinary research into disease in human aging.



DynAge Research Aims

The cumulation of morbidity over the lifespan constitutes a public-health challenge for aging societies. Prevention and treatment of human diseases therefore has to take age into consideration, both in contexts of age-related changes in the host and age-associated molecular characteristics of the diseases. As a consequence, systematic knowledge on age-related dynamics of pathogenesis, disease progression, consequences for individuals and their social environments, as well as knowledge on how expected shifts in demography and disease progression can be met by increasingly extended and adapted health systems are of utmost importance.

With the Focus Area DynAge, a collaborative research alliance of the FU and CUB, newly joined by the DIfE, it is our aim to gain insights into factors that set apart disease processes during different parts of the lifespan and to investigate their molecular antecedents and consequences for individuals and society. Specifically, DynAge research focuses on (1) the analysis of molecular, individual, and societal processes that contribute to disease in human aging; (2) the identification of common organizing principles of age-related

disease processes; (3) the assessment of relations between shifts in demography, disease accumulation, and their consequences for individuals, their social networks, and society; and (4) the analysis of relevant limits of governance attributed to disease in human aging and demographic shifts.

How DynAge Works

DynAge is one of currently five Focus Areas based at the FU. It is mainly financed by funds from the FU's "Zukunftskonzept" for the Excellence Initiative II, with additional resources contributed by CUB and DIfE for DynAge project partners from these institutions. DynAge shares the following key goals of all FU Focus Areas: (1) exploration of current research trends in interdisciplinary alliances, (2) pooling skills and expertise, (3) and initiating new projects.

All aspects of DynAge work, including internal funding of DynAge research groups, third-party funding applied for and won, events, promotion of early-career scientists, teaching, publications, and management structure, are organized in an interdisciplinary and transinstitutional manner, involving members of different departments at

the FU, CUB, Dife, and other regional (including the MPIB), national (e.g., DKFZ), and international collaborators (e.g., URPP Dynamics of Healthy Aging, UZH; see the report by LIFE fellows Sabrina Guye and Nathalie Giroud in the last issue of the LIFE newsletter). This is a central hallmark of DynAge put into effect since the Focus Area took up its work in 01/2013.

DynAge's core strategy to initiate and support research into disease in human aging is to fund interdisciplinary trans-institutional research groups with seed money for one year. The composition of project groups is pre-structured by DynAge's request for at least two PIs per project, one from each of the participating institutions, and co-investigators representing different disciplines. Projects are free to use funds for the pursuit of different strategies leading up to the preparation of a proposal to attract third-party funding: pilot studies, doability studies, preparatory review or meta-analytic work, or development of methods. DynAge's funding strategy and seed money approach are already proving to be a useful tool in initiating interdisciplinary research groups. Although seed money is limited in scope and funding periods are brief, they are met with an overall high commitment within DynAge project groups.

DynAge's Structure and Research

With now over 120 researchers involved in DynAge projects, the Focus Area joins knowledge on the processes of aging from several disciplines and benefits from a rich pool of methodological approaches and technology available at its host- and partner institutions. Cooperation of DynAge members including collaborating partners is organized in a network matrix with intersecting vertical and horizontal elements (see Figure 1). With this approach DynAge also set out to identify common organizing principles of aging processes and their explanatory value for four groups of age-related diseases: tumors, cardiovascular disease, degenerative musculoskeletal diseases, and cognitive disorders/depression. These disease groups constitute the vertical organization of cooperation within DynAge. They are among the most relevant health challenges faced by aging societies. The horizontal organization of the Focus Area entails three perspectives on the investigation into disease in human aging:

1. The molecular level teams up natural science, mathematics, pharmaceutical sciences, and biocomputing with experts in biomedicine. Research themes addressed include the characterization of distinct protein–ligand interactions involved in disease development and treatment as well as the identification of

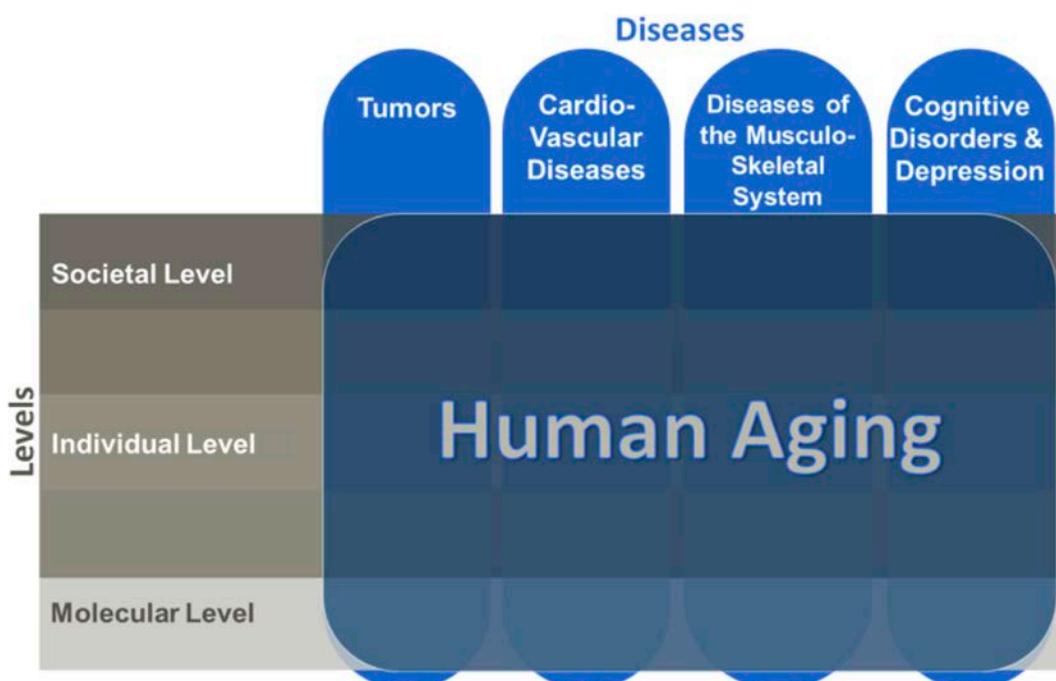


Figure 1. DynAge matrix.

common themes in molecular interaction dynamics; furthering the understanding of the proteomic foundation of selected diseases; and manipulation of protein interactions in the laboratory (e.g., by drugs or directed mutants).

2. The level of the individual joins expertise in clinical medicine, psychology, and neuroscience. Research topics address disease mechanisms, also including behavioral, cognitive, and emotional mechanisms; medical treatment; interventions to change disease-related behavior; individual disease management and co-regulation of disease-relevant behavior by close social network members.
3. The societal level combines experts from the social sciences, humanities, and medicine. The following exemplary themes are addressed by colleagues from the societal level: challenges of demographic change for societies in Germany and abroad; adjustments and new measures in health policy, social market economy, the organization of social security systems; impact of demographic shifts on the governance of societal health and well-being; coordination of reacting stakeholders; efficiency of "centralized governance approaches"; "microfoundations of change," that is, upper- to lower-level path dependen-

cies determining the behavior of actors and contributing to the limits of governance; and integrity, including aspects on lobbying and conflicts of interest.

A defining element of DynAge-funded research groups is a clearly laid-out structure of interdisciplinary cooperation entailing integration of at least two of three horizontal levels within the DynAge matrix and addressing at least one of the four central disease groups: tumors, cardiovascular disease, diseases of the musculoskeletal system, and cognitive disorders/depression. Disease mechanisms, manifestations, and consequences are studied in different age groups that can contrast different phases of the entire lifespan.

Since 2013, DynAge has funded a total of 18 interdisciplinary, trans-institutional project groups in three rounds of funding. New projects identified in the most recent fourth call for proposals will take up their work in January 2016. Currently funded DynAge projects are regularly presented at the Annual DynAge Workshop which also serves as a networking platform for DynAge members and interested colleagues of different disciplines. More information on DynAge research projects and events can be found at www.fu-berlin.de/dynage.



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