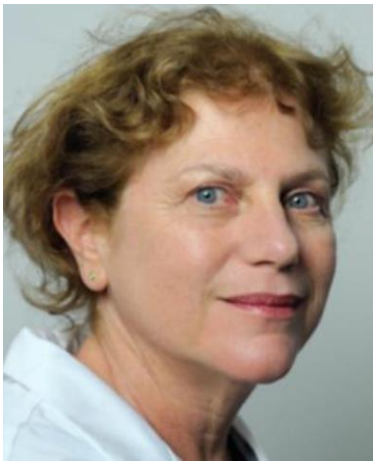
Nansen Neuroscience Lectures 2022

Nansen Neuroscience Lecture 2022: **"The benefits of exercise for brain function"**

Henriette van Praag

Stiles-Nicholson Brain Institute and Charles E. Schmidt College of Medicine, Florida Atlantic University, Jupiter FL 33458, USA

http://med.fau.edu/home/departments/biomedical/vanpraag.php hvanpraag@health.fau.edu



Abstract

There is increasing evidence from human and animal studies that exercise benefits brain function, and may delay or prevent the onset of neurodegenerative conditions. In particular, the hippocampus, a brain area essential for learning and memory, is modulated by exercise training. In rodents, the number of new neurons in the dentate gyrus of the hippocampus is substantially increased by voluntary wheel running. Enhanced adult hippocampal neurogenesis is associated with changes in synaptic plasticity, neurotrophins, neuronal connectivity, spatial navigation and pattern separation ability. Recent research into the underlying mechanisms indicates that there are factors secreted from peripheral organs, such as muscle, that may play a role in exercise-induced changes in the brain. We identified lysosomal enzyme Cathepsin B as a novel myokine that influences hippocampus-dependent memory function. Overall, our research evaluates the relationship between myokines, adult neurogenesis and memory function and aims to further our understanding of effects of exercise on the brain.

Biographical sketch

Henriette van Praag is an Associate Professor of Biomedical Sciences at the Charles E. Schmidt College of Medicine and Florida Atlantic University (FAU) Stiles-Nicholson Brain Institute since 2018, and serves as co-Editor-in-Chief for the Open Access IOS Press journal *Brain Plasticity* (www.iospress.nl/journal/brain-plasticity). After completing her graduate studies at Tel-Aviv University (Israel), she carried out postdoctoral work at Robert Wood Johnson Medical School (New Jersey) and was a staff scientist at the Salk Institute for Biological Studies (California). Before joining FAU she was Principal Investigator at the National Institute on Aging, NIH (Maryland). Her laboratory studies how exercise affects structural and functional plasticity of brain areas that are important for learning and memory.

Nansen Neuroscience Lecture 2022: **“What causes ageing? Lessons from The Worm”**

David Gems

Institute of Healthy Ageing, and Department of Genetics, Evolution and Environment, University College London, United Kingdom

https://www.ucl.ac.uk/biosciences/people/prof-david-gems david.gems@ucl.ac.uk

Abstract

Ageing is now the main cause of serious illness worldwide, yet its underlying biology remains poorly understood. Understanding ageing is key to developing effective treatments for late-life disease and improving late-life health. It is perhaps the most important unanswered question in biomedical science. The nematode worm *Caenorhabditis elegans* shows amazing plasticity in ageing. Recent studies of The Worm have contributed to a new, emerging understanding of the fundamental causes of ageing. According to a recent prototype paradigm, the process of ageing, including development of its constituent diseases, can be understood in terms of a relatively small number of general principles of senescent pathophysiology. Most important among its causes are programmatic mechanisms specified by the normal (wild-type) genome. The pathogenic effects of normal processes in late life are an evolutionary consequence of an age decline in the force of natural selection, combined with biological constraint. New work also suggests that The Worm’s ageing plasticity is, unfortunately, not typical of higher animals. Instead, it may reflect the presence of semelparous reproductive death, as seen in Pacific salmon, and also of altruistic adaptive death, as seen in some colonial microbes.

Biographical sketch

David Gems is a Professor of Biogerontology at University College London, working in the Institute of Healthy Ageing, of which he is a founder member and Research Director. He read Biochemistry as an undergraduate at Sussex University, and then Genetics as a doctoral student at Glasgow University. As a postdoc he worked on nematode parasitology at Imperial College London, before moving to the University of Missouri-Columbia, USA to work on ageing with Prof. Don Riddle. He returned to the UK in 1997 to start his own research group at UCL with a Royal Society University Research Fellowship. The aims of his research are to understand the causes of ageing, and identify general principles of pathophysiology for late-life diseases. Much of his work uses the nematode worm *C. elegans*, but he has also contributed to studies of aging in other nematodes, Drosophila and the mouse, and penned articles on ageing and ethics.