Presentation to the Senate Special Subcommittee on Aging – Tackling Diseases of Aging: Why Research Collaboration Matters

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I would like to thank the Senate Special Subcommittee on Aging for the opportunity to speak to you today.

I am the Bill and Gayle Cook Professor of Biology at Northwestern University. I trained at the University of Illinois, The University of Chicago, and Harvard before joining the Northwestern faculty in 1982. My research is in basic biomedical sciences, and I have spent my entire academic career to understand how cell stress and cellular quality control systems function in cells and animals. As biological systems age, we have learned that our molecules accumulate errors and interfere with function, causing tissue dysfunction, and increasing risk for disease. Consequently, we believe that aging is the biological platform and basis by which some succumb prematurely to disease and others age well, retain our health and cognitive abilities. It is now widely appreciated that our ability to enhance our quality control systems may have profound benefits to our cellular health, lifespan, and the prevention of some of the most devastating diseases.

While my perspectives have come mostly from an academic career, I like everyone else here today have worn multiple hats. In my time at Northwestern, I have served in academic administration as the Chair of Biochemistry, Dean of The Graduate School, and Associate Provost of Graduate Education. To alumni, I recently gave a series of lectures in their continuing studies program on the Biology of Aging. For many years, I have served on various committees for the National Institutes of Health, on the advisory boards for the National Institutes for General Medical Sciences and now for the National Institute on Aging, and previously for numerous review panels assessing grants. I have also served on boards and review panels for many disease foundations including Huntington's Disease Society for America, the Hereditary Disease Foundation, and the ALS Association, which has brought me in close contact with patients, their families, and with advocacy groups. With an interest towards human health, I was a founder of a Biotech company, Proteostasis Therapeutics in Cambridge, MA together with Prof. Jeff Kelly of Scripps Institute and Andy Dillon at UC Berkeley in 2008. The purpose of Proteostasis Therapeutics is to develop new therapeutics for age-associated degenerative diseases.

Aging is the common platform for all of biology and the basis for all degenerative diseases. By mid-century in the percentage of Americans over 65 will have grown substantially as we join

Japan, Germany, France, Italy, Britain, and most of Europe. With this demographic shift will be the inevitable explosion in neurodegenerative diseases, dementia, cancer, and metabolic diseases such as adult onset diabetes. The problem facing us is clear, without new drugs or treatments for age-associated degenerative diseases, why would anyone want to know that they are at risk. While at the same time, it will be essential to have biomarkers that detect changes in quality control that predict enhanced risk for age-associated disease. Either alone will be insufficient, so we must find ways to advance both approaches simultaneously.

The adult organism is mostly about replacing its parts as each component wears out. However, unlike the pyramids, the Golden Gate Bridge, or even a fine Swiss watch, biology does not use inert parts. Rather, in biology the replacement parts are transient in nature and often imperfect, and most often they are just good enough. Consequently, all biological systems decline with age, and eventually the system (the body) breaks down. Despite this, there is hope as humans are living longer. But will this be useful and productive if living longer is not living healthy lives? Of what value to society will be a lifespan of over 100 years if the body begins to fail three decades earlier?

Therefore, rather than to wait until disease is evident, which is the current state of medical affairs, we must identify the earliest markers of quality control collapse, when the cell stress response has been pushed beyond its capacity and can no longer protect the cell against damage. Only then, perhaps years if not decades before the inevitable decline can we promote an alternative path, towards healthy aging.

Research on the biology of aging is therefore the base of knowledge onto which we can understand the course of life and transitions from apparent health through aging to disease. An understanding of how cells and animals maintain their robustness, to identify the genes and networks that maintain balance, and how these stress response systems get overwhelmed and become dysfunctional will be invaluable to both health and disease. To accomplish this task will require new investments and new teams. Moreover, these teams should represent new partnerships of academic and industrial researchers working towards a new goal that is not necessarily to cure any particular disease.

The efforts beginning tomorrow at the NIH on the Geroscience Interest Group will bring together over 500 scientists from around the world to discuss how aging affects all organisms and all tissues. Hopefully, these efforts will stimulate new cross-institutional programs, trans-NIH, and between academic institutions and the Biotech and Pharma industry to stimulate progress.