

## **Longevity Science Interview with Richard Miller**

KYLE JENSEN: Welcome to SAGE Crossroads, the premier online forum in issues of human aging. These podcasts feature lively discussion with the experts on the ethical, political, economic, scientific, and societal implications of aging-related science. Thank you for listening.

I'm joined now with Dr. Richard Miller. Dr. Miller is a professor of pathology and director of research at the University of Michigan's Geriatrics Center.

Dr. Miller, do you believe that policy has a role to play in shaping the future of longevity science?

RICHARD MILLER: Yes.

KYLE JENSEN: What are some of the key issues that the FDA, CMS, and NIH face when it comes to longevity science?

RICHARD MILLER: Well I can comment on most of those but not all of those. Most of the work that I do is at the National Aging Institute, so I'm more familiar with decisions at that level. I think that the aging institute needs to direct more of its time on basic studies of how aging works and how aging is related to late life diseases. In particular, I think the policy of the NIH as a whole to pick on one disease at a time, to have some resources for heart disease, some resources for brain diseases, some resources for bone and kidney diseases, loses sight of the tight linkages of all these kinds of diseases to the aging process. I think understanding how aging works and controls different diseases is probably going to be the quickest and least expensive solution to often good preventions for a wide range of diseases. The systems that the FDA uses for evaluating specific drugs have emerged from a long history of both the needs of the research communities and pharmaceutical firms to focus on diseases that can be evaluated one at a time and agents that have a short term or fairly short term endpoints for study. These might not be fully appropriate for acquiring anti-aging medicines that can do some good in preventing multiple diseases at the same time.

KYLE JENSEN: Now do you see the allocation of resources as the major barrier to getting longevity science?

RICHARD MILLER: Well, I think it is a highly significant barrier, but I think that the point that requires more attention is public education. I mean education of people that listen to this kind of interview and people who have the interest and connections to make changes in policy. There are ideas about what aging research can do. Some of them are accurate and some of them are not in touch with the best modern science. Getting people to understand what has been going on in the last 20 years in the basic fundamental

biology of aging and getting them to think of the potential implications of this for human health is a very slow, long, uphill process.

KYLE JENSEN: Do you think that the science is ready to move longevity science forward?

RICHARD MILLER: Well sure. The science is moving forward as rapidly as can be expected given the resources that are limiting. I'm talking partly about money, but I'm talking also about enthusiasm and scientific momentum. Younger scientists are particularly aware that to build a career they have to find an infrastructure and to work with friends and to work with colleagues and to get good jobs that lead to good long term, stable research laboratories and laboratory relationships. These are hard to do in an area that is considered off the beaten track or a little bit unstable or distinctly unfashionable. Aging has made long strides in the last 10 or 20 years becoming more respectable in the mainline scientific community but there is still an awful long way to go.

KYLE JENSEN: How long do you think it will be before the promises that longevity science claims to make will take hold?

RICHARD MILLER: I don't think that that's a question that's easy to answer. It depends partially on breakthroughs and new ideas in research that are always hard to guess. It's very tough to know five to ten years in advance what the hottest new things will be, but also it depends on political issues and what policy-makers and science educators more generally are able to do. The kinds of mammoth investments in Alzheimer's disease research and AIDS research and breast cancer research and research for a wide range of other diseases, these would have been really hard to anticipate before the change in political climate and the change in relationships amongst those that make decisions about funding and those who do the science. These are things that are hard to anticipate and until one has a better bet as to how aging research will acquire the support of the educated scientific administrators it needs to make progress, I don't think a number of years can really be estimated. It would be nice to have it known, but it's hard to state that with much confidence.

KYLE JENSEN: Any big broad predictions on how we are going to get there? Any hopeless optimism or pessimism about this?

RICHARD MILLER: Well I think when people ask that question, they are too often asking for a number, 5 years, 10 years, 20 years, 40 years, or 100 years. I think it is easy to be optimistic about certain research areas. It is easy to guess that empirical studies of anti-aging drugs and studies of stress resistance and studies of invertebrate genetics, all of these have excellent potential to make major strides given adequate support in the next 5 or 10 or 15 years. Converting that to developments by pharmaceutical scientists, to agents that postpone disease by working through the fundamental levers of the aging process, that may take quite a while longer again depending on what we discover about how aging works. In a sense, aging is still a mystery in a sense that there are lots of good ideas competing for how it works and how it links to diseases. None of these at this stage

can really be ruled out as implausible. Before the discovery of bacteria and viruses, there was a wide range of ideas about what caused diseases, and people would have their best guesses of what they were, but they couldn't really be confident until the basic science was done to document that bacteria and viruses and other microbes play a role in certain classes of diseases. Similarly in aging-science, there are some very plausible ideas about how aging works, some of them based on oxidation, some of them based on somatic mutation, some of them based on combinations of hormones and cellular properties; each of these has its adherence. Each of them makes a certain amount of sense at the first level, and until we get past the point of making these vague guesses it will be tough to really know where to concentrate our efforts.

KYLE JENSEN: The audience of SAGE Crossroads is made up of scientists, policy makers, and curious consumers. If there is one closing statement you would like to make to them about the benefits of longevity science, what would it be?

RICHARD MILLER: Well, it seems to me very clear from comparative medicine, from studies of how mice age quickly and dogs age slowly and humans age very slowly, that there have got to be central aging processes - probably a very small number that regulate a vast number of diseases and disabilities that affect older people. Understanding what those connections are and understanding how so many different diseases and disabilities and problems that older people encounter are coordinately timed, I think it's an enormous intellectual challenge that provides enormous power for simultaneously investigating and slowing down all the bad things that aging brings us. I think that's where the ball game ought to be, and I find it frustrating that it has taken a while for that opinion to catch on and transform how science is funded and transform how scientific research is organized.

KYLE JENSEN: Thank you. On behalf of SAGE Crossroads, I'm Kyle Jensen.