Questions and Answers - David Sinclair

Q. What inspired you to pursue a career in medical research?

A. I've always been fascinated with how things work – cars, gadgets, computers. But in my view, the most complex and interesting things on the planet are living things. I grew up on the edge of the bush in Sydney where I could spend most days finding insects and reptiles to study. I went into medical research because my mother developed lung cancer just as I was graduating and I chose to devote my life to making lives healthier and longer.

Q. How does the research landscape when you were first starting out compare to the landscape faced by early career researchers today?

A. Its similar in that it's competitive, fast-paced, stressful, and daunting. Money has always been hard to come by for research. What has changed is the technology. What took me years in my PhD can now be done in a day. I can learn more in an hour by reading papers on the internet than I did in a month as a student scouring the basements of libraries. Today, a young scientist needs to find, read and absorb vast amounts of information, then identify the major gaps in knowledge. This is not easy but it is more important than ever.

Q. In an ideal world, how do we best foster the enthusiasm and passion of our young researchers to allow them to achieve their full potential for discovery?

A. We need to give them encouragement by offering awards for success, encouraging them to attend international meetings and to work in labs around the world. But most importantly, we need to give them a reasonable career path - one that allows them to dream big and focus on research rather than worry about if and where their next pay-check will come from.

Q. There have been some massive developments in medical research over the last decade with the explosion of 'omics' and big data, bringing together diverse disciplines such as biology, computer science and engineering, mathematics and statistics, and medical ethics. Your anti-ageing research could be considered to be opening a new frontier.
What do you think the economic and social impact of longer, healthier lives will be?

A. Economically, the world will be a richer place with medicines that delay aging. Far from being ruinous for our economy, an aging population that stays active within the societal grid for a greater number of years may well prove to be the best solution for our ailing economy, allowing us to resolve even the most intractable problems like the pension and out-of-control health care spending. The combination of factors like extra time in the workforce, healthcare savings, and increased productivity will give our economy a steroidal boost.

Indeed, scientists have already calculated what they call "The Longevity Dividend," the combined social and economic bonuses accruing from slowing the rate of aging—a dividend that will begin with those now alive, and continue for all generations that follow. For starters, there will be a sharp spike in productivity, with many fewer days lost to illness amongst the young and the old. And of course, those extra decades of youthful health will mean that people can utilize their decades of learned skills, knowledge and wisdom in the workplace for longer.

From a dollars-and-cents point of view, you might also consider that the average person costs about two million dollars to raise to an adult, and most professionals cost another half a million to formally educate. That's a colossal investment, for what turns out to be a relatively short period of return. So a person in their eighties who has another ten or fifteen years to contribute to society might very well be more "valuable" than a twenty-year old, with no experience, wisdom or contacts.

People who continue working will of course keep paying taxes and adding to their retirement plans. And they won't draw as heavily on Medicare, at least half of which is spent on helping people with

age-related diseases. (According to Victor Basiuk, projecting to 2080, medicines that slow aging in the US alone would reduce the cost of Disability Insurance by about $1.4 trillion – in current dollars, unadjusted for inflation -- in one year alone.)

Kevin Murphy and Robert Topel, award-winning economics professors at the University of Chicago, calculate that a mere 1% reduction in cancer mortality alone would be worth $500 billion. Decrease it by 10% and you save the US two trillion dollars over the long run. So consider the effect of a longevity medicine that reduces all major causes of death by 10%. The economy would not be crippled; it would gain a major boost, with additional funds for other activities such as civil works and education.

While there's no question that these new medications will give way to major societal and economic shifts, the greatest and most immediate significance for all of us will be personal. For instance, what will it feel like to say "I do," when you know that you could be married for 80 years? What will it mean for a woman to be free to delay parenthood until she's in her 50s? What will it mean to choose a first career, when you know you'll have time to build two or three in a lifetime? What would you do differently now if you knew that you'd be playing a vigorous round of tennis before attending the college graduation of your great grandchildren?

- Where do you see the medical research sector heading in the next 10-20 years or even the next 50 years?

We are about to be hit by a tsunami of changes caused by head-spinning developments in genetics, fertility, stem cells and monitoring devices. In genetics, the cost of sequencing your genome has gone from $1,000,000,000 ($1B) to $1000 in the past decade and shows no sign of stopping. Our ability to increase fertility is about to change radically, as is the replacement of cells and organs. There are dozens of companies developing wearable or implantable micro-devices to monitor our bodies constantly and provide useful feedback to improve health or head-off illness. This will soon make our "annual" checkup by a doctor seem archaic.

Q. You now spend most of your time at Harvard, home to the world's best medical school. What makes it so great?

A. The people and the entrepreneurial spirit. The technology is not better than most places but the university attracts the best students and postdoctoral trainees. You can walk 200 m in any direction and find a world's expert who is happy to help you. Then there's the ecosystem of venture capitalists, lawyers, and pharmaceutical companies who make it relatively easy to move technology out of the lab and into the clinic.

Q. What are the main differences between the research landscapes in the US and Australia?

A. The concentration of scientists is the biggest difference. In Boston, there are 25 universities and colleges, and at Harvard Medical School alone there are thousands of labs. Distance also makes a difference – within the US its simple to send people and reagents but for Australians the cost of travel and the strict quarantine rules make it harder to get things done fast. That said, Australia has reached a critical mass of scientists who, with continued government support, will compete favorably with US universities. It also helps that the world is shrinking. Thanks to technology I can now run two laboratories on opposite sides of the planet so distance is not the obstacle it was even 5 years ago.

Q. How critical is close interaction between basic and clinical research and industry? Is better interaction likely to expedite translation?

A. For the development of medicines it is critical. At a place like Harvard, there are all the major pharmaceutical companies that provide collaborations and even ex-employees who can start new businesses. Better interaction is always better for innovation. In Australia there are some faculty who still see academic-industry collaborations or commercialization as a sell-out, but there are no

alternatives if your goal is to make drugs and have them go through the lengthy and costly approval process.

Q. To what do you attribute your success in medical research, and what advice do you have for early career researchers aspiring to reach similar heights?

A. As Churchill said: "Success is not final, failure is not fatal: it is the courage to continue that counts." Many times I wanted to quit. It's a tough career, arguably one of the toughest. But giving up would have felt worse. So I kept going hard at it. Success comes from getting out of bed everyday and working hard towards a goal with no fear of failure. Knowing how to convey excitement and vision, build teams, and get the most out of them is also key, especially later in your career. And find a partner who is supportive and forgiving.

Q. Reduced investment into research is a growing concern for many researchers across the globe. What measures are required to better support the medical research sector and to address the big problems posed to medical research?

A. Governments are the only source of capital large enough to make a major difference in a country's ability to advance science and grow the economy. This is especially true for basic research where results are often serendipitous and the future benefits hard to foresee. Ten years ago I used to think about science constantly. Now, like most scientists, most of my time is spent applying for money because it is so hard to come by. I'm one of the lucky ones.

My heart goes out to young scientists who have dreamt about making a big impact in the world, sacrificed big paychecks, and spent two decades studying. The career path of our young scientists is tenuous due to the uncertainty of government funding.

If the 20th century was the age of physics and computing, the 21st century is the age of biology. Australia has a unique opportunity to lead the world and to profit from revolutions occurring in genetics and medicine. The US and Europe are poorly funded at present. And unlike most of Asia, Australians are rebellious, optimistic and egalitarian – the three traits that foster scientific discovery and innovation. We are a highly educated English speaking Western nation adjacent to Asia. We should be richer as a nation. Increased support of laboratory research combined with tax and grant incentives will help ensure that Australia takes economic advantage of the revolution in biology that is occurring right now,

Q. Are you optimistic about the future of the health and medical research sector?

A. Extremely. Technological change is increasing exponentially. In the past few years, advances in genetics and bioengineering have been staggering. Ten years from now, we will live in a world where you can have your genome sequenced before you leave the doctor's office and a monitor implanted that will tell your doctor in real time how you are feeling, how your body is doing, and if you should change your medications, your lifestyle, or even come to the hospital before you experience a stroke or detect a lump.