Nobel laureate: We've just scraped the surface on the potential of stem-cell therapy

July 4 2014, by Martin Evans

The man who changed stem-cell research. Credit: Cardiff University, CC BY

Martin Evans received the Nobel Prize in Physiology or Medicine in 2007 for "for their discoveries of principles for introducing specific gene modifications in mice by the use of embryonic stem cells".

Mohit Kumar Jolly, researcher at the University of Rice and contributor to The Conversation, interviewed him at the 2014 Lindau Nobel

Laureates Meeting this week.

What is so exciting about cellular reprogramming and its applications in medicine?

First, it challenges what we have believed in for so long that cells can only follow one path – differentiate from being stem cells, say, embryonic or adult, to more differentiated ones, say, nerve cells or heart cells. We now know that they can revert back from being differentiated cells to be stem cells. This is a fundamentally novel concept. We can now confidently say that each state of a cell is not stable, but "meta-stable".

Second, I believe this opens many therapeutic avenues. For example, soon in the future, one can take patient's own cells from an organ and reprogram them to being cells of some other organ which he or she needs to recover from an injury or disease. Shouldn't one in future have the option to choose what kind of cells are injected to cure certain diseases?

I think neither mine nor your generation would live long enough to see the full potential of stem-cell therapy – we're still scraping the surface. It can offer personalised medicine a big boost.

Why don't cells keep on randomly changing their identity, for example, a heart cell becomes a neuron or vice-versa. What prevents this?

That's a very good question, and I believe we still have to find out an exact answer to that. My guess is that since reprogramming is so inefficient, maybe there is some of it going on as we speak, but it's too weak to have our eyes replaced with teeth or vice-versa. There are other

factors too that might be playing a role in "defining" the identity of a cell – for example, the environment around a cell. The body is well-designed to prevent itself from such chaos.

Do you also see cancer as a "reprogramming" process?

That's an intriguing parallel you draw, and I certainly agree with it to some extent. We all know now that cancer cells are normal cells having lost some controls that normal cells have. We have also seen that some tumours start to produce their own hormones which their normal counterparts do not. So, it can be called reprogramming.

Reprogramming has also been in news notoriously recently. Two Nature papers that showed that differentiated cells can be reprogrammed by physical pressure or acid treatment were retracted this week. What's your take on that?

I was surprised why Nature accepted those papers. The data in that paper did not seem to indicate what it was meant to. It looked weird. We're not very sure whether it was deliberate fraud or over-enthusiastic misinterpretation; but clearly the editorial process was very questionable – the peer-review was not good enough.

What is your advice to scientists and, in particular, young ones?

You should not believe in all that you read. Learn to interpret independently. This advice becomes much more necessary in today's world of social media and internet, which is overloaded with

information, some of which can be very misleading. Everyone got excited about the stem cells generated by acid treatment, how many of you actually interpreted their data? So, be careful!

I rate science as a better understanding of the fundamental principles of life and nature. I can understand why scientists often tend to work towards application-oriented science, but I believe we have many basic science questions to understand even today.

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