

SPOTLIGHT

An interview with Deepak Srivastava

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Deepak Srivastava is a Director at the Gladstone Institute of Cardiovascular Disease and a Distinguished Professor in Paediatric Developmental Cardiology at the University of California, San Francisco. As well as caring for sick children as a physician at the Benioff Children's Hospital in San Francisco, he runs an active research group that studies the biology of heart development and regeneration. In March 2015, we met up with Deepak and asked him about his career.

How did you first become interested in science, and was there anyone in particular who inspired you?

Well, I actually grew up around education and science – my father is a biochemist and my mother was a schoolteacher – so I was naturally drawn to both of these areas and those are the areas that I largely focus on today. What I enjoy most is discovery and training the next generation.

How did this then lead to a career in medicine?

In addition to science, I was always interested in medicine: when I was growing up, if a kid got hurt in the playground I was the first to run up and make sure that they were okay. I've always been drawn to helping other people and so marrying medicine and science, as I've done, was just natural for me.

You started off in paediatrics but how did your interest in cardiovascular biology develop?

I did my residency in paediatrics and, during this time, I was repeatedly drawn to understanding the life-death situation seen in children with heart disease. At the time, there were very few scientists involved in basic discovery within the paediatric cardiology field, and I was advised by many that it would not be a good career choice if I wanted to do science. But I followed my passion, which was taking care of those types of patients, who mostly had defects in cardiac formation during embryonic development. Fortunately, the field of molecular developmental biology was just emerging at that time, so there turned out to be a tremendous opportunity to really develop and help the cardiovascular development field grow from its infancy. I've had the opportunity to participate in this field for over 20 years now, and seeing it mature – to the point where we now understand quite a bit about how the heart forms and what things go wrong in the setting of heart disease in children – has been really rewarding.

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In addition to being an active clinician you run a successful research programme. Has doing research always been important to you?

Doing research has always been important. From the moment I decided to go to medical school it was with the understanding that I would combine my medical studies with a research programme. Although this took time, I've been fortunate to be able to leverage both aspects, in terms of understanding the basic biological processes that go awry in disease as well getting the motivation for doing basic science from my clinical experiences. It has been challenging to do both, but I think that the key to many of our discoveries has come from having that clinical perspective.

Much of your research is now geared towards translational goals, with the aim of regenerating heart tissue. But how has basic developmental biology guided this?

The bulk of our laboratory is still doing basic science but we certainly want to drive our discoveries towards translation because, at the end of the day, that's why we're doing the work. But it's certainly true that all of our regenerative medicine work is inspired by our understanding of the developmental biology of the heart. In our attempts to regenerate heart muscle through cardiac reprogramming, we're essentially deploying nature's own molecular tools, which we've learned about from studying the embryo, and reintroducing them into the adult heart to create new muscle.

In terms of that big goal – regenerating the heart – do you think we're close to being able to treat cardiovascular diseases?

I don't think we're close yet to being able to treat humans with the disease, but I think we're certainly making great strides towards that goal, on many fronts. With our knowledge being driven by basic developmental biology, I'm very hopeful that over the next 5 to

10 years we will have viable approaches to either spur existing heart muscle cells to divide again in the adult, like they do in embryos, or to coax non-muscle cells into new muscle cells by reintroducing developmental signals that function in the embryo. We still have a lot of work to do but we're in a much better position today than we've ever been, in terms of being able to at least see the finish line.

You're also a Director at the Gladstone Institutes. What do you think is the key to running a successful research institute?

I think the key to running a successful institute is to be able to bring in talent from multiple disciplines and combine this in a single location, so that people are exposed to a variety of thought processes. For example, on our floor at the Gladstone Institutes we have cardiac biologists, stem cell biologists, chemists, mathematicians and engineers – all in one big open space. This means that trainees in the laboratory are constantly being bombarded with different ways to think about their problem, and this has created a very innovative environment in which new approaches and discoveries are happening all the time. This also means that we're doing the kind of science that no one laboratory could do by itself. Yes, you can do that through collaborations – across an institution, across the country or across the world – but I think the key is getting the trainees in close proximity to one another on a day-to-day basis, so that they're the ones who come up with the collaborations, ideas and innovations.

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What's your advice to young researchers today?

My advice to young investigators is to find out what they're passionate about and follow that relentlessly, even if it's not the easiest path to follow. People shouldn't be intimidated by the current research environment and whether it's difficult to find funding or get jobs; if they work hard, are passionate and commit themselves to a path, good science gets funded and, ultimately, gets rewarded. If you're passionate about what you've chosen to do you'll give it everything you've got. But if you try to make a choice that makes sense in your mind, but not in your heart, then you'll always be half-hearted about it.

Finally, what would people be surprised to find out about you?

That, when I was young, I really wanted to be a professional tennis player. But I soon realised that I wasn't good enough! I still play frequently and I guess that tennis is my biggest passion outside of science.