

An Interview with Norio Nakatsuji

Founding Director, Institute for Integrated Cell-Material Sciences, Kyoto University



Dr. Norio Nakatsuji

How did you first become involved in stem cell research? Which is your main area of research interest?

I started my research career as a developmental biologist working on early amphibian and mammalian embryos. I found mouse embryonic stem (ES) cells a very interesting research subject when I was staying in London during 1983 to 1984. When I came back to Japan to have my laboratory, I worked on mouse ES cells and germ cells. Then, immediately after the first derivation of human ES cell lines by Prof. James Thomson in Wisconsin, I started a new project for derivation of monkey ES cell lines in collaboration with animal reproduction scientists and a company group, and we succeeded in 2000. Next we started the project to derive human ES cell lines and distribute them to other stem cell researchers, and we succeeded in 2003. Since then, research and development (R&D) of human pluripotent stem cells has been my main area of research interest.

You were the founding director of the Integrated Cell-Material Sciences (iCeMS) at Kyoto University. Could you tell us how iCeMS was created? What is iCeMS's vision? What do you consider are iCeMS's major accomplishments?

iCeMS was founded in 2007 as one of several new research institutes selected for special funding by the Japanese government. This project aimed to create novel international multidisciplinary research institutes in Japan. Our proposal from Kyoto University was aiming at cross-disciplinary integration of cell-

material sciences. We have accomplished, for example, developing smart chemical compounds and functional polymers that can support three-dimensional growth and differentiation of human pluripotent stem cells. Such new technologies are necessary for further advancement of stem cell research and medical application.

What is the role of Kyoto University moving forward in the burgeoning field of stem cell research and regenerative medicine both in Japan and worldwide?

I am very proud that Kyoto University is one of the leading research organizations in the stem cell field, and I have been heavily involved in these activities. First, Kyoto University reorganized research institutes to create the Institute for Frontier Medical Sciences (the Japanese name is Institute for Regenerative Medicine) in 1998. There, our group pioneered derivation and distribution of human ES cell lines in Japan. Then we recruited Prof. Shinya Yamanaka to join our institute, and he succeeded in creating mouse and human iPS cell lines. Thereafter, Kyoto University founded two new research institutes with different but complementary missions, our iCeMS for interdisciplinary research and innovation using stem cells and smart materials, and the Center for iPS Cell Research and Application (CiRA) directed by Prof. Yamanaka. Thus, Kyoto University has been playing central roles in the research and application of human pluripotent stem cells.

Japan has pioneered several initiatives seeking to advance the regenerative medicine field. One of them is the Forum of Innovative Regenerative Medicine (FIRM). Could you briefly explain FIRM? What is FIRM's core mission?

As everybody knows, involvement of the industry sector is crucial for practical application of the stem cell technologies in medicine and drug discovery. FIRM is a relatively loose association of many companies interested in the new commercial domain of stem cells and regenerative medicine. It has been created and encouraged by joint efforts of industry and government sectors of Japan and expected to play major roles in advancement of the stem cell/regenerative medicine industry in Japan.



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This is the third year that you are serving as co-chair of the World Stem Cell Summit (WSCS) and that iCeMS is a co-organizer of the event. How has this affiliation impacted iCeMS?

The WSCS has distinct and important functions that create a joint forum by all stake holders around stem cells and regenerative medicine. Of course, there are many events for stem cell scientists, but their aims are mainly exchange of research activities. However, we definitely need another kind of event that facilitates meeting, connecting, and developing collaboration among all sectors, including scientists, industry, regulation, and policymakers. Participation of iCeMS and myself in the WSCS has given us wonderful opportunities to expand our R&D activities and collaboration beyond the academic domain.

In your opinion, what is the future of the regenerative medicine field?

I am sure that stem cell-based regenerative therapy will be realized at least for several



The Forum of Innovative Regenerative Medicine is expected to play a major role in the advancement of the stem cell/regenerative medicine industry in Japan.

diseases in the near future, including macular degeneration, Parkinson's, and diabetes. Then there is a good possibility for other diseases also. However, I like to stress that we still need to develop innovative technologies, such as those for large-scale cell production and cost

reduction, before we will realize novel regenerative therapies for many patients at affordable costs. This is exactly the current focus of my research interests, and I am expanding my efforts from stem cell research to entrepreneurial activities.

Finally, what was the best advice you were given? What advice would you give to other scientists entering the field?

When I was thinking of going into the stem cell field from basic developmental biology, I learned from my last mentor, Dr. Anne McLaren, that I need to keep proper social engagement and scientific/ethical integrity, because intense social and political issues are involved in the stem cell field. Therefore, I also like to give the same advice to other scientists entering this field that we must try hard to maintain the confidence and support of not only funding bodies and government but also of society and the general public.