Stem cell database to inform future healthcare treatments

More effective personalised medicine for treating human diseases will be possible in the future through a project funded by Bioplatforms Australia. Bioplatforms through the Commonwealth Government NCRIS programme have contributed $1 million for a collaborative pluripotent stem cell data initiative, which will provide Australian researchers with vital foundation information. This information will elucidate stem cell behaviour, differentiation and efficiency and will allow definition of the key molecules that drive formation of tissues and organs in a dish. The data will underpin a wide range of current and future programs of research and provide a resource of international significance.

"Stem cells allow the study of fundamental processes in tissue growth, development, ageing and disease," said Bioplatforms General Manager, Andrew Gilbert. "Delineation of stem cell populations into tissues and organs from diverse populations is a complex and ill-defined process. Using modern 'omic methods will provide insights into the biology and potential applications of stem cells."

Stem cell research is one of the most important areas of modern research, and many of the international efforts in this area have arisen from landmark efforts of Australian scientists. This project leverages investment in 2012 by the Australian Research Council to establish Stem Cells Australia (SCA). Investigators at SCA will collaborate through this project with other researchers, organisations and industry entities in Australia, and also internationally including: Harvard Stem Cell Commons and California Stem Cell Research Institute in the US, Lunenfeld-Tanenbaum Research Institute in Canada, Sheffield University in the UK, RIKEN and Kyoto University in Japan and Leiden University in the Netherlands. The group of collaborators are highly interdisciplinary and span a range of expertise in cell and development biology, engineering and material science, and bioinformatics.

"Through this proposed collaborative data initiative, Australia has the opportunity to take a leadership role internationally in the use of state-of-the-art techniques to generate a sophisticated portfolio of molecular profiles of a range of human stem and progenitor populations," said Gilbert.

Stem cell research provides an important window into the fundamental biology of cells. Stem cell discoveries further leverage applied research in agriculture, molecular biology, drug discovery, disease mechanism and human health. This project aims to overcome barriers to understanding how stem cells differentiate to contribute to the specific cell types that make up tissues and organs. Reprograming of patient-derived material is an essential step for the development of molecular assays of disease.

This project will provide wide access to important data needed to resolve the relationships between tissues differentiated in a dish in comparison to cells and tissues grown in a healthy person. The data will help to refine the conditions needed to obtain high quality lab-grown tissues.

"The knowledge generated from the data will be used by the stem cell research community, the biotechnology and pharmaceutical industry, and regulatory agencies responsible for setting standards for cellular therapeutics," said Gilbert. "Importantly, the databases will also serve the biomedical research community as a whole, as pluripotent stem cells come into wide use in human functional genomics, disease modelling and drug discovery."

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