

CellResearch to Further R&D in Stem Cell Therapies and Regenerative Medicine

- *Company launches joint research lab with A*STAR's IMCB for translational research and regenerative medicine*
- *Researchers embarking on projects that use cord lining stem cells from CellResearch for the treatment of Parkinson's Disease and Age-related Macular Degeneration. This project is supported by the National Research Foundation, Singapore (NRF) under its Competitive Research Programme (CR) Funding Scheme*

CellResearch Corporation Pte Ltd ("CellResearch" or "CRC"), a Singapore company that specialises in stem cell technology, and A*STAR's Institute of Molecular and Cell Biology ("IMCB") have launched a joint laboratory based in Singapore's Biopolis. The facility will be named the IMCB-CRC Translational Research and Regenerative Stem Cell Joint Lab ("Joint Lab") and will undertake research and development ("R&D") activities and collaborative projects utilising CellResearch's patented platform technology.

The two groups have been collaborating since 2016 across a broad range of therapeutic targets, and the Joint Lab highlights both groups' commitment to fund and work together on high potential projects including:

1. Age-related Macular Degeneration

Age-related Macular Degeneration ("AMD") occurs from the loss of central vision due to degeneration of the Retinal Pigment Epithelium ("RPE"). It is the leading cause of irreversible vision loss in people over the age of 60. It is estimated that there are 10 million AMD patients in the United States alone where over US\$ 9 billion is spent every year on treating the condition with anti-VEGF therapy.

2. Diabetes

Diabetes is a chronic disease associated with abnormally high levels of glucose in the blood where the insulin-secreting human pancreatic beta cells are either insufficient or dysfunctional. Diabetes can lead to a broad range of complications including, but not limited to, heart disease, neuropathy and nephropathy. As of 2019, there were 463 million diabetics worldwide. It's been estimated that approximately 12% of global healthcare expenditure goes towards the treatment of diabetes and its related complications. It is thought that mesenchymal stem cells have the potential to differentiate into functioning pancreatic beta cells and to help in protecting the body from cellular stress arising from diabetes.

3. In vivo models for human disease and stem cell research

Research into the therapeutic effects of cord lining mesenchymal stem cells ("CL-MS") towards inflammation-driven human major diseases is ongoing. In vivo models of both inflammatory and viral diseases will be generated and treated with CL-MS, followed by a full examination of immune cell phenotypes, immune cell functions, pathological changes and repopulating effects before and after CL-MS treatment. This aims to provide evidence and to help in understanding the mechanisms involved when applying CL-MS as robust cell-based therapeutics.

4. Expansion of haematopoietic stem cells (HSCs)

CL-MSCs will be assessed on their ability to promote expansion of HSCs. Different sources of CL-MSCs, in combination with various cytokines, will be assessed for their capacity of HSC expansion. Such protocols can be optimised into products such as HSC expansion kits for R&D purposes. Additionally, expansion of HSCs is crucial in the context of HSC transplantation and has been a core challenge for cord blood banks. The expanded HSCs have the potential to be used for transplantations in leukaemia or other blood disorders.

The main objective of the Joint Lab is to enable these high potential therapies to proceed from the pre-clinical stage through to the clinical stage. The Joint Lab combines CellResearch's umbilical cord lining stem cell technology with IMCB's expertise in human stem cells, cell biology and diseases, and regenerative medicine. Projects taking place in the Joint Lab will be overseen by CellResearch's Chief Scientific Officer, Dr. Phan Toan Thang and Dr. Jonathan Loh, Senior Principal Investigator at IMCB. Other IMCB Principal Investigators include Dr. Qingfeng Chen, Dr. Xinyi Su and Dr. Adrian Teo.

CellResearch's umbilical cord lining stem cell technology platform has already produced its first clinical stage therapy for the treatment of Diabetic Foot Ulcers. A USFDA Phase 1 trial is ongoing at the University of Colorado, Anschutz Medical Campus.

CellResearch CEO Gavin Tan said, "We are delighted to have formalised our collaborative efforts with IMCB through a Joint Laboratory. We see their commitment as a strong endorsement of cord lining stem cell technology and the high potential of our pipeline therapies. We are confident that cord lining stem cells have the ability to be the source of choice for future stem cell therapies."

Professor Wanjin Hong, Executive Director of IMCB said, "Cell therapy and regenerative medicine are priorities for our research institute, and we believe that stem cell technology has the potential to ultimately produce ground-breaking therapies. The formation of this Joint Lab with CellResearch will help to advance scientific knowledge in these fields and accelerate the exciting projects towards translational outcomes."

CellResearch and IMCB are also working with a team of researchers led by Vice Dean for Research of Lee Kong Chian School of Medicine, Professor Lim Kah Leong, to develop stem cells from umbilical cords for the treatment of Parkinson's Disease and AMD. The study is supported by the National Research Foundation Singapore (NRF)'s Competitive Research Programme. Professor Lim said, "This collaboration with the new joint research lab will enable us to continue with the strong progress we have made in building on the high potential of umbilical cord lining as a source of stem cells."

Mesenchymal stem cells are an area of strong interest within regenerative medicine due to their ability to differentiate into a variety of cell types. The cells also have strong immunomodulatory potential, can help repair tissue and can be extremely effective in reducing inflammation. While much of the research and clinical development taking place has involved other sources of cell such as bone marrow and fat, umbilical cord lining is thought to have certain advantages including improved yield and reduced immunogenicity, which is particularly important when considering allogeneic applications. Umbilical cord lining has the additional benefits of being a non-intrusive and ethical source.

Professor Brian Freed, Director of ClinImmune Laboratories at Colorado University reports: "As the contracted cGMP production facility for CellResearch Corporation's

“CorLiCyte™” USFDA trial MSC product, we analyzed specific MSC markers and found that CorLiCyte™ achieves 99% purity without manipulation, while bone marrow MSCs only achieves two-thirds of that. This is an important advantage given bone marrow MSCs are considered to be the current gold standard of stem cell work.”

About CellResearch Corporation

CellResearch Corporation was founded in 2002 initially as a contract research provider focusing on skin cells. In 2004, the company made the discovery that the umbilical cord lining of mammals was an abundant source of both mesenchymal and epithelial stem cells. Today, the company owns this technology through a family of patents and holds the rights to commercialise this technology in most of the major markets globally. While the closure of diabetic foot ulcers is the company's first allogeneic therapy to make it to Phase 1 USFDA clinical trials, CellResearch has a broad therapeutic pipeline at the pre-clinical stage. Further therapies include solid tumour therapy, inflammatory diseases, cardiac muscle repair, Parkinson's Disease, Age-related Macular Degeneration and Diabetes.

CellResearch partner, Cordlife offers parents the opportunity to bank their child's umbilical cord tissue alongside their cord blood. Cordlife have what is believed to be the largest licensed bank of umbilical cord tissue globally. As cell therapies move into the clinic, Cordlife will have the ability to expand stem cells from a banked umbilical cord for autologous and donor-related uses.

About IMCB

The vision of Institute of Molecular and Cell Biology (IMCB) is to be a premier cell and molecular biology institute which addresses the mechanistic basis of human diseases and its mission is to conduct cutting-edge discovery research in disease pathways; to groom early career researchers to be future leaders in research; and to collaborate with medical and industry communities for research impact. IMCB plays an important role training and recruiting scientific talents, and has contributed to the development of other research entities in Singapore. Its success in fostering a biomedical research culture in Singapore has catalysed Singapore's transformation into an international hub for biomedical research, development and innovation.

Funded by A*STAR, IMCB's Discovery research comprises 5 major programmes: Cancer Cell Signalling, Cell Biology and Diseases, Epigenetics and Diseases, iPS cell and Regenerative Medicine, and Technology and Translation. IMCB's technologies and platforms focus on Genome-wide RNAi, Humanised Mouse Models, Proteomics and Protein Engineering, Gene Therapy and Gene Editing, and Molecular Histopathology.

For more information about IMCB, please visit <https://www.a-star.edu.sg/imcb>.

About the National Research Foundation Singapore

The National Research Foundation (NRF) is a department within the Prime Minister's Office. The NRF sets the national direction for research, innovation and enterprise (RIE) in Singapore. It seeks to invest in science, technology and engineering, build up the technological capacity of our companies, encourage innovation by industry to exploit new opportunities that drive economic growth, and facilitate public-private partnerships to address national challenges. Under RIE2020, NRF is committed to create greater value in Singapore from our investment in research, innovation and enterprise through 1) closer integration of research thrusts, 2) stronger dynamic towards the best teams and ideas, 3) sharper focus on value creation, and 4) better optimised RIE manpower. Visit www.nrf.gov.sg/RIE2020 for more details.