

## PRESIDENT'S TECHNOLOGY AWARD 2020

### Professor Dario Campana

Professor and Mrs Lee Kong Chian Chair in Advanced Cellular Therapy, Department of Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore

***“For his groundbreaking work in developing methods to convert immune cells into safe and effective anti-cancer therapies that have transformed the treatment of leukaemia”***

Professor Dario Campana is currently the Mrs Lee Kong Chian Chair in Advanced Cellular Therapy in the Department of Paediatrics at the Yong Loo Lin School of Medicine, National University of Singapore (NUS). In just nine years in Singapore, Prof Campana patented 16 new cell-based therapies and set up a highly innovative cell therapy programme at the National University Health System (NUHS). He is recognised for his outstanding work in transforming the treatment of leukaemia, particularly Acute Lymphoblastic Leukaemia (ALL) which is the most common cancer in children.

The main focus of Professor Campana's research is to use immune cells to treat cancer. Among these are the use of CAR-T cells, where the most remarkable results have been obtained in ALL. This represents a noteworthy example of translational research that has converted fundamental biology discoveries into effective therapy.

Despite the discovery of many new drugs, cancer remains the most common cause of death in Singapore. Even when treatment is effective, the side effects of such therapies can be serious. A completely new way to treat cancer is necessary. Harnessing the human body's immune cells represents an attractive option but it was, until recently, elusive.

About 20 years ago, Professor Campana's laboratory set out to develop a more effective and less toxic treatment for ALL using T cells, a type of white blood cell that plays an important role in the immune system. The team designed a special receptor, called the chimeric antigen receptor (CAR), that could recognise a target strongly expressed in ALL. When T cells are equipped with the CAR, they latch onto leukaemic cells, kill them and propagate, mounting a powerful anti-leukaemic response. Clinical trials so far showed that blood T cells that are extracted from ALL patients, modified with the CAR and reinfused back into the patients, could cure ALL even when all other therapies had failed.

The CAR developed by Professor Campana's team eventually became the key component of the first product of its kind approved by the US Food and Drug Administration, and is now marketed worldwide. For this discovery, Professor Campana received the 2019 Jacob and Louise Gabbay Award in Biotechnology and Medicine.

Professor Campana's laboratory at NUS recently developed a new cell therapy for patients with T-ALL, a type of leukaemia different from the more common B-ALL form. The clinical experience at NUHS with children and adults with either T- or B-ALL treated with CAR-T cells made in Professor Campana's laboratory is extremely encouraging and supports the potential of this technology. These results represent the dawn of a new era in ALL treatment, one that promises to produce greater remission rates, lower toxicities and a better quality of life during and after treatment.

Besides ALL, CAR-T cells have been proven to be useful in treating lymphoma and myeloma, and may also benefit patients with other forms of cancer in the future. Possible applications of

immune cell therapy in other areas of medicine, such as autoimmune diseases, solid organ transplant, infectious diseases and aging are on the horizon as well.

Many of Professor Campana's patents have been licensed and he is the scientific founder of three biotechnology companies. He has over 350 publications, including articles in the New England Journal of Medicine, Nature, Lancet, Lancet Oncology and the Journal of Clinical Investigation, and his work has been cited more than 35,000 times, with a h-index of 101 (Google Scholar 2020). He is also an elected member of the American Society of Clinical Investigation and of the American Association of Physicians. In 2020, he was named Researcher of the Year by the Yong Loo Lin School of Medicine, NUS, and was the recipient of the NUS Research Recognition Award.