MiCAN Technologies Inc.
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Regenerative medicine cells to fight infectious diseases

MiCAN Technologies has developed Mylc cells, human myeloid lineage cells for use in the study of infectious diseases caused by viruses. The company is also developing a human red blood-like cell product, Mpv. It is hoped that, together, these products will accelerate vaccine and drug development globally.

MiCAN Technologies is applying regenerative medicine to the treatment of infectious diseases. After identifying a gap in the research toolkit, the Japanese company set out to develop human blood-like cells for use in the study of drugs and vaccines against infectious diseases. Having delivered on that objective, MiCAN is scaling up, expanding and globalizing to support the development of products that improve the lives of billions of people.

Kazuo Miyazaki, the founder and CEO of MiCAN, identified the need for a new approach to infectious diseases after seeing colleagues suffer from dengue fever and malaria. The treatments available to Miyazaki's colleagues were decades old and hindered by side effects and drug resistance, leading the now-MiCAN CEO to seek ways to use his years of regenerative medicine and pharmaceutical research experience to improve the treatment of such diseases.

That led Miyazaki to identify the availability of human blood cells as a barrier to progress. As these cells are targeted by infectious diseases, access to them would help researchers discover and test therapeutics and vaccines. However, neither donated blood nor hematopoietic stem cells provide human blood cells at the quantity, quality and cost needed, owing to issues that include low yields and differentiation processes that are difficult to control.

The lack of access to human cells is an impediment to infectious disease research. MiCAN, a startup out of INDEE Japan's Tokyo-based, hands-on accelerator ZENTECH DOJO, is set to clear that impediment using its new, better way to source human cells for use in infectious disease research.

MiCAN uses gene modification to immortalize monocytes and erythroblasts, before applying its differentiation method and stable production technique to create and grow human myeloid lineage cells and red blood-like cells. Using these core technologies, MiCAN is making human cells with the uniformity needed for R&D available at a cost that is low enough to enable widespread use.

Accelerating research into dengue and Zika

The human myeloid lineage cells, named Mylc, are the most advanced application of the approach, having come to market in 2019. MiCAN creates Mylc by immortalizing and differentiating peripheral blood mononuclear cells or induced pluripotent stem cells (Fig. 1).

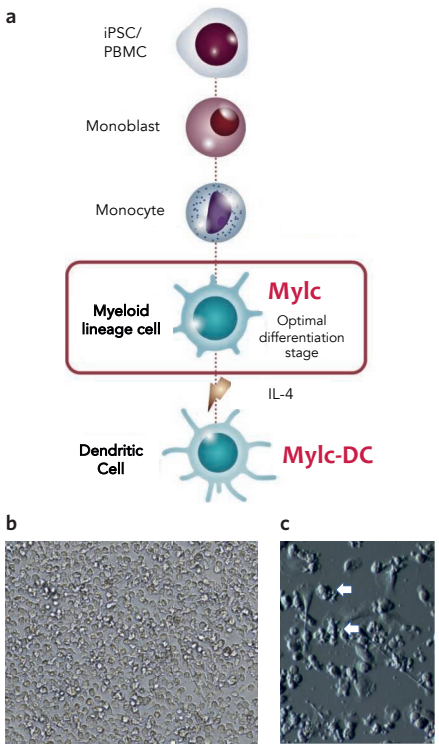

Fig. 1 | Application of MiCAN's technologies. **a**, Human myeloid lineage cells (Mylc) and dendritic cells (Mylc-DC) are grown by immortalizing and differentiating peripheral blood mononuclear cells (PBMCs) or induced pluripotent stem cells (iPSCs). **b**, Mylc cell. **c**, Mylc-DC cell.

Whatever the starting cell type, the process yields immature dendritic cells. These cells are the target of infection with dengue, Zika and other flaviviruses. Currently, researchers working on interventions against those major pathogens use monkey cells, namely, the Vero cell. However, these cells have a low sensitivity to infection and limited distribution.

Mylc cells are 1,000 times more sensitive than Vero cells, as MiCAN demonstrated in a study it presented at scientific meetings in 2019. The study showed that infection with dengue virus was impossible to detect in Vero cells below a multiplicity of infection (MOI) of around 6.4×10^{-5}. In contrast, Mylc cells were sensitive at an MOI as low as 5.1×10^{-8}.

The sensitivity of Mylc cells to infections caused by flaviviruses makes them potentially very useful tools to virologists in their current form. However, MiCAN is continuing to improve the product, for example, by transfecting the cells with GFP-tagged genes to monitor gene expression. In doing so, MiCAN may be able to identify Mylc cell lines that are even more useful to researchers.

Today, the need for such cell lines is greater than ever. With the COVID-19 pandemic creating a dire need for new therapies and vaccines, MiCAN is providing Mylc cells to academic scientists free of charge while running in-house research programs aimed at the SARS-CoV-2 virus.

Targeting protozoa and bacteria

The global availability of Mylc cells gives researchers studying infectious diseases caused by viruses a valuable new tool, but does nothing to help their peers who are focused on protozoal and bacterial pathogens. MiCAN is working to address those gaps in its portfolio.

A human red blood-like cell product, Mpv, is already in advanced development, with MiCAN now providing test and pilot products and preparing to start full-scale production. In Mpv, MiCAN will provide the infectious disease community with a source of the young red blood cells targeted by *Plasmodium vivax*, a protozoal parasite that causes malaria.

Researchers currently source cells from the blood of patients with malaria. The problem is that those cells are a seasonal material and suffer from low reproducibility. Mpv cells, in contrast, will be available all year round and have high reproducibility.

With MiCAN approaching the point at which it will provide tools to protozoal and viral researchers, the company is stepping up its efforts to develop a product for use in the study of bacterial diseases. By expanding its pipeline, MiCAN will use its regenerative medicine technologies and expertise to aid development of treatments and vaccines for the full spectrum of infectious diseases, delivering on the vision that led Miyazaki to found the company and helping researchers save lives.

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