The Stem Cellar

The Official Blog of CIRM, California's Stem Cell Agency

One step closer to making ‘off-the-shelf’ immune cell therapy for cancer a reality

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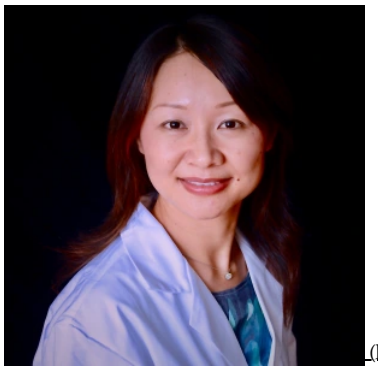
THIS BLOG IS ALSO AVAILABLE AS AN AUDIO CAST (https://anchor.fm/cirm/episodes/One-step-closer-to-making-off-the-shelf-immune-cell-therapy-for-cancer-a-reality-e1ahr2m)

(https://aholdencirm.files.wordpress.com/2021/11/yang-lab-cell-imagehigh-resolution-resized-for-newsroom.jpg-1.png)

Immunotherapy (https://www.cancer.gov/about-cancer/treatment/types/immunotherapy) is a type of cancer treatment that uses a person’s own immune system to fight cancer. It comes in a variety of forms including targeted antibodies, cancer vaccines, and adoptive cell therapies. While immunotherapies have revolutionized the treatment of aggressive cancers in recent decades, they must be created on a patient-specific basis and as a result can be time consuming to manufacture/process and incredibly costly to patients already bearing the incalculable human cost of suffering from the cruelest disease.

Fortunately, the rapid progress that has led to the present era of cancer immunotherapy is expected to continue as scientists look for ways to improve efficacy and reduce cost. Just this week, a CIRM-funded study published in Cell Reports Medicine (https://www.cell.com/cell-reports-medicine/fulltext/S2666-3791(21)00317-7) revealed a critical step forward in the development of an “off-the-shelf” cancer immunotherapy by researchers at UCLA (https://newsroom.ucla.edu/releases/off-the-shelf-immune-cell-therapy-for-cancer). “We want cell therapies that can be mass-produced, frozen and shipped to hospitals around the world,” explains Lili Yang, the study’s senior author.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Lili Yang, the study's senior author and a member of UCLA's Broad Stem Cell Research Center

In order to fulfil this ambitious goal, Yang and her colleagues developed a new method for producing large numbers of a specialized T cell known as invariant natural killer T (iNKT) cells. iNKT cells are rare but powerful immune cells that don't carry the risk of graft-versus-host disease, which occurs when transplanted cells attack a recipient's body, making them better suited to treat a wide range of patients with various cancers.

Using stem cells from donor cord-blood and peripheral blood samples, the team of researchers discovered that one cord blood donation could produce up to 5,000 doses of the therapy and one peripheral blood donation could produce up to 300,000 doses. The high yield of the resulting cells, called hematopoietic stem cell-engineered iNKT (HSC–iNKT) cells,could dramatically reduce the cost of producing immune cell products in the future.

In order to test the efficacy of the HSC–iNKT cells, researchers conducted two very important tests. First, they compared its cancer fighting abilities to another set of immune cells called natural killer cells. The results were promising. The HSC–iNKT cells were significantly better at killing several types of tumor cells such as leukemia, melanoma, and lung cancer. Then, the HSC–iNKT cells were frozen and thawed, just as they would be if they were to one day become an off-the-shelf cell therapy. Researchers were once again delighted when they discovered that the HSC–iNKT cells sustained their tumor-killing efficacy.

Next, Yang and her team added a chimeric antigen receptor (CAR) to the HSC–iNKT cells. CAR is a specialized molecule that can enable immune cells to recognize and kill a specific type of cancer. When tested in the lab, researchers found that CAR-equipped HSC–iNKT cells eliminated the specific cancerous tumors they were programmed to destroy.

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