TRANSCELL BIOLOGICS

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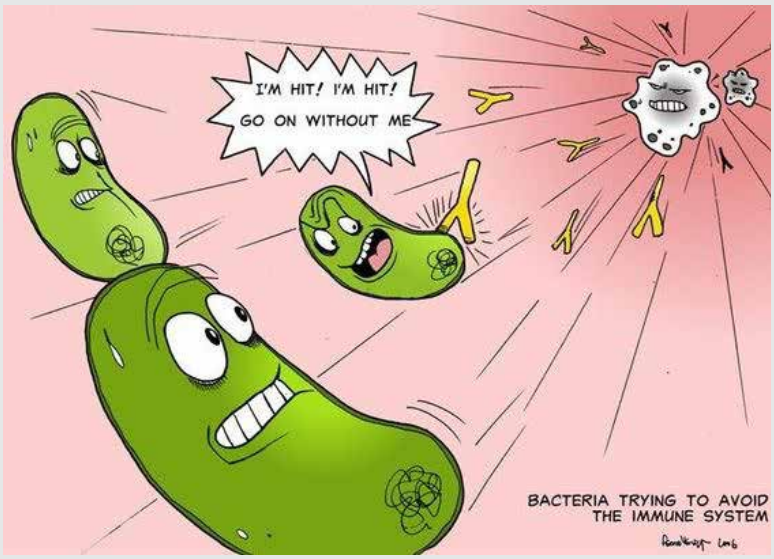
INSIDE

STEM CELLS IN PRIMARY IMMUNODEFICIENCY DISEASES (PID)

The human body, having deployed its white blood cells (WBCs) to the battleground, is in a state of perpetual war against microbes, foreign substances and potentially neoplastic cells. A subset of WBCs survey the entire body through tunnels called blood vessels or guard specific tissues and provide constant reassurance of safety. Together, they form one of the strongest components of the immune system and are well equipped to handle pathogens that may have breached the primary barriers of defence, such as skin. A defect in the development of these cells would leave the body unprotected and susceptible to various infections.

Primary immunodeficiency diseases (PID) is a term used to collectively refer to disorders that result in the absence or maldevelopment of WBCs. PIDs are relatively rare but have a high risk of death from overwhelming infection in childhood.



Early diagnosis and prompt performance of hematopoietic stem cell transplant (HSCT) with an optimal donor and conditioning regimen has shown tremendous results. The essence of this treatment is that the genetically defective immune cells are destroyed with myeloablative conditioning and substituted by normal HLA matched donor stem cells that are allowed to multiply and reconstitute the immune system.This reinforces the body's ability to overcome external stressors and offers a more permanent solution when compared to relying solely on antibiotic therapy.

Stem cells that can be used to replenish low reserves of immune cells are also being explored for their ability to tame a hyperactive immune system as with autoimmune disorders. A small note on the same has been added. Happy reading!

Dr. Sanjana Kareti
Junior research fellow Transcell Biologics

Rare disease Leaves S'pore boy so sick he can't leave home

"In May 2010, when little Stephen was just two months old, he was diagnosed with Chronic Granulomatous Disease (CGD), a hereditary disease that affects the immune system."

"CGD left him susceptible to most common bacteria and fungi found around us, his body defenceless against them. As doctors told Mr Oon and his wife, Karen, of the level of hygiene it would take to keep their boy safe, the Oons realised they had to radically change their lifestyle"

"We used Dettol like it was water," Mr Oon, a sales engineer, said. The family found a suitable stem cell sample from an unrelated donor through the Singapore Cord Blood Bank

He underwent HSCT at KK Womens' and Childrens' Hospital (KKH) 3 years later

Looking on as his boy ran around the playground, Mr Oon said: "We never imagined that this was possible."

GENE THERAPY HAS ALLOWED FOR AUTOLOGOUS HSC TRANSPLANT IN PID

TIME "Bubble baby" disease Cured With Stem Cells

" Evangelina was born with a severe immune disorder caused by a genetic aberration that makes her vulnerable to any and all bacteria and viruses; even a simple cold could be fatal. But doctors at University of California Los Angeles (UCLA) Broad Stem Cell Research Center gave her a new treatment, using her own stem cells, that has essentially cured her disease. She's one of 18 children who have been treated with the cutting-edge therapy, and the study's leader, Dr. Donald Kohn, says that the strategy could also be used to treat other gene-based disorders such as sickle cell anemia."

Courtesy of UCLA
Alysia Padilla-Vacarro and daughter Evangelina on the day of her gene therapy treatment. Evangelina, now two years old, has had her immune system restored and lives a healthy and normal life.

Adenosine deaminase (ADA)-deficient severe combined immunodeficiency (SCID), is better known as "bubble boy" disease, since children born with the genetic disorder have immune systems so weak that they need to stay in relatively clean and germ-free environments.
Ex vivo gene therapy can be used to infect the defective cells with a vector carrying the normal ADA gene. These cells can then be cultured and reinfused into the patient to rebuild the immune system. This has allowed for reduced dependence on a donor and has lowered complications associated with allogenous transplant, such as graft versus host disease (GVHD).

WHEN YOUR IMMUNE SYSTEM LOSES CONTROL!
A Note on Stem cells in Autoimmune Disorders.

We spoke about what happens when the WBCs are absent or less potent.

What if they lost self restraint and multiplied to attack body's own cells?

A study conducted by Joshua A Zimmermann et al. explores ways to develop sustainable immunomodulatory effects of mesenchymal stem cells (MSCs) that allow it to maintain suppression of a hyperactive immune system.

A cytokine trigger is normally required for MSCs to start producing substances that control WBC proliferation. In particular, interferon-γ (IFN-γ)-induced expression of indoleamine 2,3-dioxygenase (IDO) is primarily responsible for MSC suppression of T-cell proliferation and activation. Although pretreatment with IFN-γ is commonly used to prime MSCs for immunomodulatory activity prior to transplantation, the transient effects of pretreatment may limit the potential of MSCs to potently modulate immune responses.

The study demonstrated that biomaterial-based presentation of cytokines within spheroidal mesenchymal stem/stromal cell (MSC) aggregates provides a means of locally concentrating and sustaining presentation of cytokines to potentiate MSC immunomodulatory activity.

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