



WEIZMANN *views*

A PIONEER IN THE STEM CELL FRONTIER

Our bone marrow contains stem cells with a special power: they can turn into any other type of blood cells. Transplants of these blood (or “hematopoietic”) stem cells are used to treat patients with cancers such as leukemia and other disorders of the blood and immune system.

“They are sophisticated cells that can go in the direction we need them to,” says Prof.

Prof. Reisner’s technique for performing transplants between a mismatched donor and recipient first helped “bubble children,” then leukemia patients – and now he is adapting it for organ transplants.

Yair Reisner, head of the Weizmann Institute of Science’s Department of Immunology. “If we lose red blood cells, these stem cells will rapidly replenish the red cells, and if we need white cells, they will switch to replenish those.”

Having conducted research on stem cell transplantation for more than 30 years, Prof. Reisner is expert at finding ways to trick the human immune system into accepting transplants that it would otherwise reject.

For a stem cell transplant to succeed, the donor and patient must typically share six immunological markers. Patients lacking a suitable donor among siblings (the most likely source for a full match) then look to other blood relatives, who may be a partial match; if none is found, the patient must turn to donor registries. Unfortunately, many in need of a transplant are unable to find a match in time.

In the early 1980s, Prof. Reisner pioneered

a method for transplanting stem cells from family members who are only a partial match. His technique requires that just three of the six immunological markers match – a revolutionary breakthrough meaning that a suitable donor can nearly always be found among family members.

He collaborated with a team at Memorial Sloan Kettering Cancer Center in New York City to use the technique to treat children suffering from severe combined immune deficiency (SCID). This rare, inherited condition causes severe abnormalities of the immune system, and children with SCID (also known as “bubble children”) are highly susceptible to life-threatening infections.

Using bone marrow from a parent who was a partial match for the patient, the team then treated it with lectin, a soybean derivative, before transplantation. The lectin neutralized aggressive T cells (a type of white blood cell involved in the immune response) that could attack tissues in the recipient’s body.

Once cleansed of these hostile cells, the donor’s marrow stem cells could be transplanted without fear of rejection. The donated stem cells proliferated, creating the immunity the patient lacked. Prof. Reisner’s procedure is today used at hospitals around the world, saving untold numbers of lives.

Next, Prof. Reisner expanded his technique to leukemia patients who can’t find a matched bone marrow donor – not even on donor registries. To accomplish this, he pioneered another new method: greatly increasing the amount of stem cells transplanted, so that their sheer volume overwhelms any residual resistance in the recipient. In order to produce this upsurge of stem cells, he and Prof. Massimo Martelli of Italy’s University of Perugia treated the donor with hormone injections for a week. This releases large numbers of stem cells from



Prof. Yair Reisner



the bone marrow, which are then cleansed of T cells – as with the treatment for SCID – and readied for transplant.

Bone marrow stem cells are powerful: they can become any other type of blood cell in the body. In research spanning more than 30 years, Prof. Reisner has harnessed them to save lives.

In 1993, these “mega dose” transplants were used for the first time to treat leukemia patients in Italy. Now it is offered worldwide – again saving many lives.

Today Prof. Reisner continues to expand his research: he is currently adapting the “mega dose” approach to organ transplantation. With it, “If I transplant my bone marrow stem cells into your body, you will adopt my immune system. Then I can give you my

organs and you will accept them without any need for drugs that suppress the immune system,” he explains.

The immunosuppressive drugs he refers to are known to be very hard on the body, with side effects that can themselves be fatal – and they must be taken by transplant recipients for the rest of their lives. Clearly, the ability to transplant organs without having to use such dangerous drugs would change the state of transplant medicine.

Still passionate about his research, Prof. Reisner enthuses, “This work is very exciting. It’s almost like science fiction.” He feels fortunate to have met and kept in touch with many of those who benefited from the treatments he helped develop; in fact, he was recently invited to the wedding of one of the first “bubble children” cured by his technique – a today-healthy young man who was not expected to live this long. Science fiction? Perhaps. Real-life science for the benefit of humanity? Definitely.

While he describes the technique as “almost like science fiction,” Prof. Reisner sees the real-life victory: he is still in touch with many former patients who were saved by his method.

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