

Using tech to replicate the pancreas

HILLEL'S TECH CORNER

• By HILLEL FULD



So much has been said about the creativity that drives Israeli innovation. From crowd-sourced GPS to walking printers, Israeli entrepreneurs have been known to think way out of the box.

This company, Beta O2, is the epitome of innovative thinking. The irony here is that the company has used their out of the box thinking to create a "box" that saves lives. Allow me to explain.

According to the International Diabetes Federation, 425 million adults worldwide suffer from diabetes, and the numbers are on the rise. Anyone who suffers from this disease or knows someone who does, is aware of the complications to daily life. Constant monitoring, injecting, and just always being aware of what goes into your body and how much exercise you are doing.

Of course, the market for Diabetes solutions is extremely saturated with everyone trying to figure out a way to offer patients a life with minimal headaches and hassle. The name of the game is figuring out a way to help patients not worry constantly about monitoring blood glucose, calculating required insulin dose, and injecting the hormone.

Beta-O2 Technologies has developed a device, β Air[®], that basically replaces the pancreas and its functionality of monitoring and controlling glucose levels in the human body. Glucose levels in the human body are controlled by certain cells in the pancreas. Under normal circumstances, the pancreas maintains tight control over the glucose levels in our blood. Loss of this basic control mechanism can have significant impact on patients and their lives. The most significant condition that is caused by the loss of this function is the disease once called juvenile diabetes. That name has been renamed type 1 diabetes, because the disease affects people of any age and not necessarily just juveniles.

A transplant of functioning pancreatic cells is always an option, much like we can conduct transplants of other organs. However, much like any other organ transplant, the result leaves the patient dependent on life-long use of immune-suppressive drugs. Then there are the devices that help patients monitor their glucose levels in the most

non-intrusive way possible. While all of those solutions enhance patients' lives, they still depend on ongoing activity and patient involvement. They are a great band-aid, but we can do more.

Beta-O2 has developed the β Air[®] transplantation of suitable cells without needing to place the patient on immune-suppressive drugs. As opposed to other organ transplants, where a full organ is transplanted, in the case of diabetes only the relevant cells are transplanted, and the β Air[®] device offers the best possible environment for these cells to thrive and function. On top of providing a safe environment for the cells, the cells are protected from the immune system and the recipient is protected from the cells. The β Air[®] device also allows for the active supply of oxygen to the implanted cells, which is a major medical and technological breakthrough.

INSULIN SECRETING β -cells are one of the most oxygen-demanding types of cells in the human body. Therefore, the challenge of adequately supplying the requested amount of oxygen for these hyperactive cells in a poor-oxygen environment is challenging. Beta-O2 has solved this critically important issue with the β Air[®] device.

Beta-O2 holds 10 globally registered patent-families protecting its exclusive technologies around the immune-protection of the encapsulated cells as well as the proactive oxygen supply mechanisms. The company was founded by Yossi Gross and Dr. Pnina Vardi in 2004, headed now by CEO Amir Lichter, has 24 employees, and is located in Rosh Ha'ayin.

Beta-O2 is a clinical-stage company that has already completed two human trials. The results of these studies were published in some of the most prestigious scientific journals, such as the *Proceedings of the National Academy of Sciences*. In parallel, mutual evaluation studies with key biomed and pharma companies are now examining combinations of β Air[®] second-generation devices containing stem-cell derived beta cells. This is what the company is working on now.

In the human trials, which were conduct-



ed in Germany and Sweden in 2014, five human beings underwent the transplant and lived their lives with the device for up to 10 months. This was to ensure there were no significant side-effects and that the device did indeed monitor the glucose levels with functioning pancreatic cells that continue to live and breathe long-term.

The transplantable device needs to be replaced only once every few years and, adhering to FDA guidelines, is easily retrievable.

Upon successful completion of the current parallel pre-clinical activities, Beta-O2 is planning to conduct its second human trial in 2020 in order to prove the readiness of its combined solution.

The company has raised \$40 million to date, the majority of which came from Sherpa Ventures, Aurum Ventures, Kai-Ming from China and a group of

investors from Japan.

The actual transplantation of the β Air[®] device takes just minutes and requires only local anesthesia, making it a very accessible procedure.

While the market for type-1 diabetes solutions is thankfully growing, many are taking a more specific approach and developing products that either monitor and inject the patient externally, or an internal solution that is not feasible long-term. Beta O2 Technologies took a more holistic approach and has created a device that offers patients a bio-artificial pancreas and allows them to live life as if their pancreas was doing its job and keeping their glucose levels where they should be.

If the company's trials in 2020 go as planned, type-1 diabetes will be a much more manageable diagnosis than it is today. That is the dream of this company!