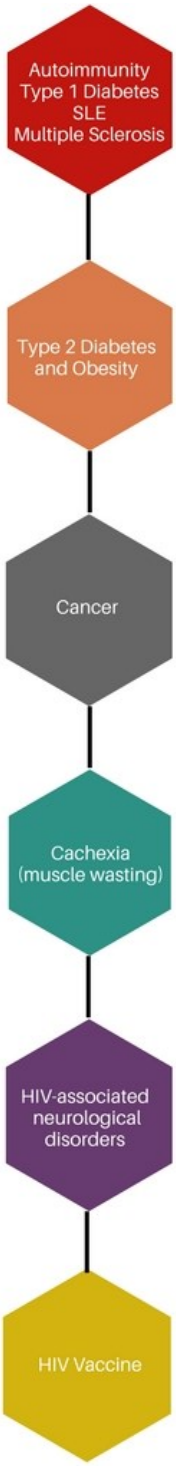
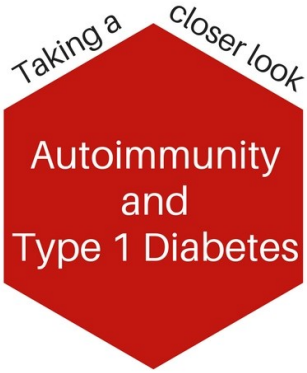
The Bench and Beyond

SAN DIEGO BIOMEDICAL RESEARCH INSTITUTE

February 2018 Volume 1 , Issue 2

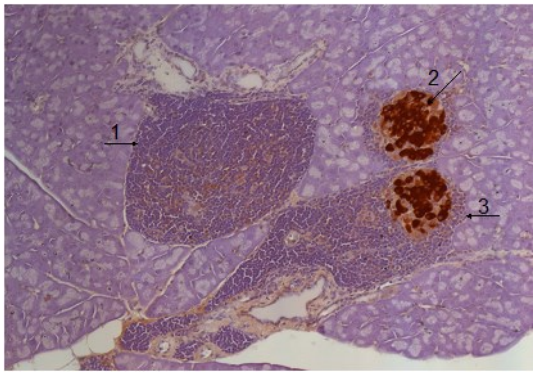




Type 1 Diabetes (T1D) arises when the immune system attacks and kills the body's own insulin secreting cells. The primary function of **insulin** is to control blood glucose levels. Insufficient insulin causes blood glucose to rise to dangerous levels, unless it is controlled with daily insulin injections. There is no cure for T1D, and the constant monitoring of blood glucose levels can be grueling as a lifelong practice. We don't know what causes the immune system to attack the insulin-producing cells, but it is probably a combination of genetic and environmental factors. In healthy people, the main function of the immune system is to defend the body from an attack by invading pathogens such as viruses, bacteria, and parasites. In fact, without the immune system we would die of infection. The problem is that, in some people, the immune system becomes over active and kills the body's own cells by mistake. If those cells make up the insulin-secreting tissue, called **islets**, the result is T1D. T1D is only evident when most of the islets are destroyed.

T1D research at SDBRI When children are first diagnosed with T1D they need high doses of insulin to control their blood glucose level. Within a few weeks of diagnosis, the dose of insulin needed decreases dramatically in most children. This period of low insulin requirement is temporary and can last from a few weeks in some children to over a year in others. We call it a **transient partial remission**, or the honeymoon period. Scientists at SDBRI have found a new immune cell type in the blood of children with T1D. Those children who have a long honeymoon period have a large numbers of these cells, but children who have a short honeymoon period have only a few. Our scientists have isolated these cells from the blood and found that they make a protein that might stop the immune system from killing insulin-secreting cells. If that is true, these new cells might be trying to slow down, or even reverse T1D in the children who have the long honeymoon period. If this information is going to be used to help people with T1D we need to complete the following 3 tasks:

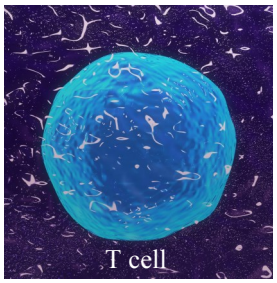
1) Test whether this new immune cell type can stop immune cells from killing insulin-secreting islet cells.
2) See if we can make more of these cells.
3) Use all of that information to design a new drug to reverse and stop T1D.



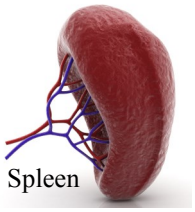
The photo to the left is of 3 islets, identified by 3 arrows, in the pancreas. Each of the islets is under immune attack. The brown color stains insulin and can bee seen in 2 of the islets. Arrow 1 points to an islet that is full of immune cells but no insulin remains. Arrow 2 points to an islet that has a few immune cells surrounding it, and arrow 3 points to an islet that is under attack and almost engulfed by immune cells.

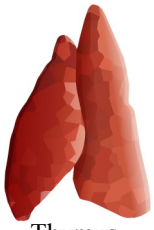
Frequently Asked Questions!

Can adults be diagnosed with T1D? For the most part T1D is diagnosed in children and teenagers, but adults can also be diagnosed with T1D. Once T1D begins, it cannot be reversed so there are many adults, as well as children, with T1D.


T cell

What does the immune system look like? Like many organs, the immune system is made up of many different types of cells that have different functions, but look similar to the untrained eye. The photo on the left is of an immune cell called a **T cell**, the type that kills insulin producing cells. The main difference between the immune system and other organs, like the liver or heart, is that it is made up of a variety of structures of different shapes in different parts of the body. The main structures are; the **spleen**, which is a long reddish organ that looks a bit like a slug and is located on the left of the body just below the rib cage; the **thymus**, which is made up of 2 soft pouches and located just above the heart; and **lymph nodes** which are small roundish structures located all over the body. Immune cells are also found in the bone marrow, and they travel around the body in the blood and lymph. **Lymph** is a liquid that flows in a series of tubes, similar to blood vessels, called **lymphatics**.


Spleen -


Thymus

How many different types of immune cells do we have? It might appear that the immune system has only one function, fighting infection. However, there are many steps in the process that maintain a healthy uninfected person. To effectively carry out these steps a large number of different immune cell types is required, each with a different task. Some cells are very different from each other and perform completely different tasks and others are subtly different and perform similar functions. To use an analogy, imagine that the immune system is a place setting at a dinner table. The overall goal is to get the meal eaten but there is a process that requires utensils of a wide variety of shapes and sizes, all with a specific job to do. For example, you can't cut steak with a spoon, and you can't eat soup with a fork. On the other hand, you might be able to cut pasta with a butter knife but it wouldn't be ideal. Like the table setting, the immune system has many different jobs to do and so it has cells that have specialized functions for specific jobs.

Is T1D related to obesity and diet? No, the type of diabetes that is linked to diet is called Type 2 Diabetes (T2D). It is not primarily caused by the immune system. It is also not always caused by diet – there are people with T2D who are not overweight and there are people who are obese who never become diabetic.

Next Issue:

Take a closer look at HIV vaccine development.

Location

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