Title: Protecting children from Type 1 Diabetes by harnessing the microbiota of the mom and the Infant

Researchers:

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Research area: Type 1 diabetes

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Summary:

From the moment we are born, every surface of our body becomes colonized by thousands of species of bacteria, fungi and viruses, collectively known as the microbiota. Importantly, imbalances in the microbiota can profoundly impact susceptibility to immune-driven diseases, such as type 1 diabetes (T1D), particularly early in life when the immune system is still developing. As a result, ensuring children develop a healthy, diverse microbiota as early as possible, may prove crucial in preventing such diseases from occurring. To determine how microbes shape T1D development, we have colonized germ-free mice that are genetically prone to T1D with different species of bacteria that have a range of effects on T1D development. To determine which bacterial molecules provide protection, we will screen samples collected from these mice for specific bacterial metabolites that correlate with protection. We will then treat mice with these molecules, to see if they reduce T1D incidence. We will also treat purified immune cells to try and reduce their ability to drive disease.

As well as looking at stable colonization, we will focus on the effects of the maternal microbiota, using genetically modified bacteria that cannot live long in the body, restricting bacterial colonization of germ-free mice to a precise window during pregnancy. All pups of colonized dams will live their lives germ-free. We have found that colonizing pregnant dams with one specific bacterium called E. coli was sufficient to protect a proportion of male offspring from T1D. We will now extend our studies to include additional bacterial species that may be beneficial. As well as evaluating T1D development in the offspring of colonized mothers, we will assess functional physiological and immunological differences in the offspring in response to maternal colonization. Not only will this study enhance our understanding of host-microbiome interactions, but it may also provide new strategies for preventing T1D.