2023 - TEDDY HAS 156 PUBLICATIONS, BELOW ARE HIGHLIGHTS OF IMPORTANT FINDINGS

TEDDY FINDINGS

What have we learned?

Important terms:

T1D – Type 1 diabetes
IAA/GADA/IA-2A – Diabetes autoantibodies
CDA – Celiac disease autoimmunity
IA – Islet autoimmunity
CD – Celiac disease
TG – Transglutaminase antibody

TEDDY World Wide
8,667 enrolled
445 diagnosed type 1
572 diagnosed celiac

TEDDY Colorado
1,375 enrolled
81 diagnosed type 1
106 diagnosed celiac

Sep 2023

TYPE 1 DIABETES AUTOIMMUNITY

Later introduction to gluten – TEDDY researchers have found an association between later introduction of gluten and IA. The data suggests that TEDDY children who were introduced to gluten after nine months of age had an increased risk of developing IA.[1] (2018)

Order of first appearing autoantibodies – TEDDY researchers looked at the order of development of the four autoantibodies most strongly associated with T1D. They found that in children who developed IAA or GADA first, appearance of any second autoantibody resulted in at least a five times greater risk of progression to T1D. Children with the second appearing autoantibody IA-2A had the highest risk. This information will be important moving forward because it will help doctors and researchers more accurately predict a child's risk of developing T1D.[2] (2020)

Rapid onset T1D – Genetically high-risk children diagnosed with type 1 diabetes before the age of 6 developed autoantibodies earlier and progressed to diabetes more rapidly than those diagnosed between 6 and 13 years old. Diabetes at an early age is likely to be preceded by IAA autoantibodies and is a more aggressive form of the disease in young children. Among older children, there is no association between progression to diabetes and the age of the child or family history.[3] (2021)

Growth rate – Researchers found the risk of T1D development in TEDDY children was linked to gestational age while adjusting for birth weight, growth rate in infancy, and growth rate in childhood. Children with a greater birth weight, a slower growth rate in infancy, and a faster growth rate in childhood were at greater risk of developing autoantibodies and T1D compared to those children that had a low birth weight and higher growth rate in infancy. This link was most strongly observed in children who developed GAD as their first autoantibody. This research will be important moving forward to help identify children who are off the growth curve and mitigate risk for TID.[4] (2020)

Biomarkers - TEDDY looked at biological signals from the body to learn more about IA and progression to T1D. They were especially interested in proteins that can influence how IA and T1D develop, by showing signs of trouble up to six months before the immune system starts to change. By looking for specific biomarkers in the blood, researchers are figuring out how to predict when autoantibodies might show up and when T1D might start.[5] (2023)

TEDDY results describe associations, they do not in any way prescribe guidance or recommendations regarding actions or exposures.Future studies are needed to determine whether interventions can alter disease risk

Celiac Disease

Celiac disease autoimmunity risk in TEDDY – Researchers discovered that 26 percent of TEDDY kids with a specific gene combination developed CDA by the age of five years old and 12 percent developed celiac disease. TG can be found in blood when the body is having an autoimmune reaction to gluten. Scientists also found that TEDDY kids in Sweden have a higher chance of developing celiac disease compared to TEDDY kids in Germany, Finland or the United States.[6] (2014)

An association between vitamin D concentration categories and CDA in children was discovered using TEDDY study data. Very low concentrations and very high concentrations of vitamin D detected during infancy and childhood of the TEDDY children were associated with increased risk of CDA. No significant association was identified for average plasma concentrations of vitamin D. Currently, there are no recommendations for what vitamin D concentrations should be in a healthy pediatric population.[7] (2021)

Exposures and the risk of celiac disease autoimmunity – TEDDY found the risk for CDA went up for children who were born during the winter and who were given their first gluten foods before they were six months old. The risk for developing CDA went down in children that were vaccinated against the rotavirus. These results suggest, but do not prove, that there may be a connection between early life exposures and CDA.[8] (2017)

Three-day food records were collected from Swedish infants at genetic risk up to two years of age. The study assessed CDA, defined as persistent TGA positivity, followed by CD, which is defined as having a biopsy showing a Marsh score of 2 or being persistently TGA positive in two consecutive samples.

Association between daily intake of gluten-containing food groups or grains and risk of CDA was found when gluten intake was compared with reporting no intake. The findings of this study suggest that high gluten intake from infancy to early childhood is associated with increased risk of CD in children at genetic risk.[9] (2022)

NUTRITION / SUPPLEMENTS / VITAMINS

Probiotics – Probiotic supplementation (in formula or supplements) between 0-27 days of age was associated with a decreased risk of IA, the first stage of T1D, when compared with probiotic supplementation after 27 days or no probiotic supplementation. This association was observed in children with the highest risk genetic markers.[10] (2016)

Vitamin D levels and vitamin D receptor gene – TEDDY scientists discovered that low levels of vitamin D in children's blood, combined with a vitamin D receptor gene marker, are linked to a higher risk of developing IA. TEDDY children who were autoantibody positive were more likely to have both low levels of vitamin D in their blood and a specific marker in their vitamin D receptor gene. This receptor gene could affect the way that vitamin D is used by the body.[11] (2018)

Iron - Diet record data was used to measure the iron intake of autoantibody positive children to see if eating too much or too little iron before the age of three increases their chance of IA and T1D. TEDDY researchers found that eating too much iron makes the chance of getting the first autoantibody (GADA) go up in children with high iron metabolism genes.[12] (2023)

Fatty acids – Fatty acids are involved in inflammatory reactions and affect immunity, lipid and glucose metabolism, and insulin responses. Fatty acids in red blood cells may play a role in the inflammatory and metabolic changes that happen prior to the development of T1D. The strongest evidence relates to the intake of long-chain n-3 polyunsaturated fatty acids (PUFAs) in infancy, which may protect from islet autoimmunity.[13] (2021)

GENETICS

TEDDY scientists found that there are certain pieces of our genes that play a role in the development of autoantibodies and type 1 diabetes. Researchers identified eight such gene regions (single nucleotide polymorphisms or SNPs) that are associated with an increased risk for autoimmunity in TEDDY participants who already have an increased genetic risk.[14] (2015)

The development of detectable IA precedes T1D. Highest sensitivity and positive prediction for T1D was achieved by IA screening at two years and again at 5-7 years of age. Progression to clinical T1D after seroconversion is variable and age-related islet autoantibody incidence could improve screening for genetically at-risk patients.[15] (2021)

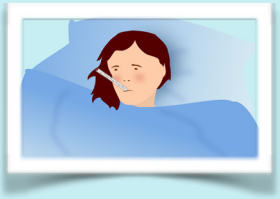
VIRUSES & FEVERS IN TYPE 1 AUTOIMMUNITY

Viruses – TEDDY scientists wanted to investigate if the number of viruses and illnesses were different between those who had rapid onset of T1D after becoming antibody positive and those who developed T1D much later. They did not find more viruses in plasma samples of participants with rapid T1D. When analyzing the data from the TEDDY book, they also did not find a higher number of illnesses reported compared to those who progress later. In fact, the number of fevers in the rapid onset participants was lower compared to the slow progressing participants. Based on these findings, the scientists could not conclude that a viral infection just before development of autoantibodies led to rapid onset T1D.[16] (2013)

When analyzing the stool samples among TEDDY participants who were and were not autoantibody positive, TEDDY investigators found children who developed IA were more likely to have been exposed to the Coxsackie B virus, commonly known as hand, foot, and mouth disease.[17] (2020)

During the COVID-19 pandemic, TEDDY studied the virus and found that T1D cases did not go up a lot in those who had COVID-19. This means the virus did not directly cause diabetes in this particular group.[18] (2023)

Acetaminophen and ibuprofen use for fevers – TEDDY scientists found that the use of fever reducing drugs, like acetaminophen and ibuprofen, was not associated with IA. The use of fever reducing drugs was significantly higher in the US compared to Europe.[19] (2017)



Respiratory infections – TEDDY researchers found an association between high number of stressful life events and increased susceptibility to respiratory infections in the first four years of life.[20] (2019) In addition, TEDDY researchers found detection of human mastadenovirus in the stool samples, a respiratory virus, was associated with an increased risk of IA in children.[21] (2020)

PHYSICAL ACTIVITY

TEDDY researchers discovered that children in the United States are less active than children in Finland, Sweden and Germany when comparing the data from activity meters. Children at TEDDY centers in Georgia and Florida have the lowest levels of physical activity. This information will be useful to researchers moving forward targeting physical activity interventions and learning why activity is lower in children in the United States.[22] (2020)

Starting at age five, researchers tracked activity levels in three risk groups of children and found that increased daily moderate to vigorous physical activity is linked to a lower risk of progressing to T1D in children aged 5-15 with multiple autoantibodies.[23] (2023)

TEDDY children's physical activity was measured through accelerometers, and the study explored the connection between daily moderate to vigorous physical activity, HbA1c, and OGTT in 209 children with multiple autoantibodies. The research indicated that higher levels of physical activity were linked to improved OGTT results in children aged five and older with persistent autoantibody positivity.[24] (2022)

TEDDY FAMILY ADJUSTMENT TO TYPE 1 DIABETES

Scientists compared diagnosed TEDDY participants to children diagnosed who were not in the TEDDY Study. They found that TEDDY participants showed a higher quality of life. Families of TEDDY participants reported lower parental stress after diagnosis.[25] (2018)

Co-occurrence

TEDDY found children with autoimmunity for both T1D and celiac disease (CD) usually developed autoantibodies for T1D before those for CD. This means there may be shared factors that influence both diseases.[26] (2017)

Antibiotics

The use of antibiotics during the first four years of life did not show any association with the development of autoimmunity for CD or T1D. These results suggest there is no reason to avoid clinical antibiotic use in children at risk for CD and T1D.[27]

More TEDDY Publications

Want to learn more? Go to the link below our use the QR Code to access the PubMed list of all TEDDY Publications

https://www.ncbi.nlm.nih.gov/sites/myncbi/1DIwbbhHIQq5u/collections/45444834/public/Or

https://tinyurl.com/y4fs223f