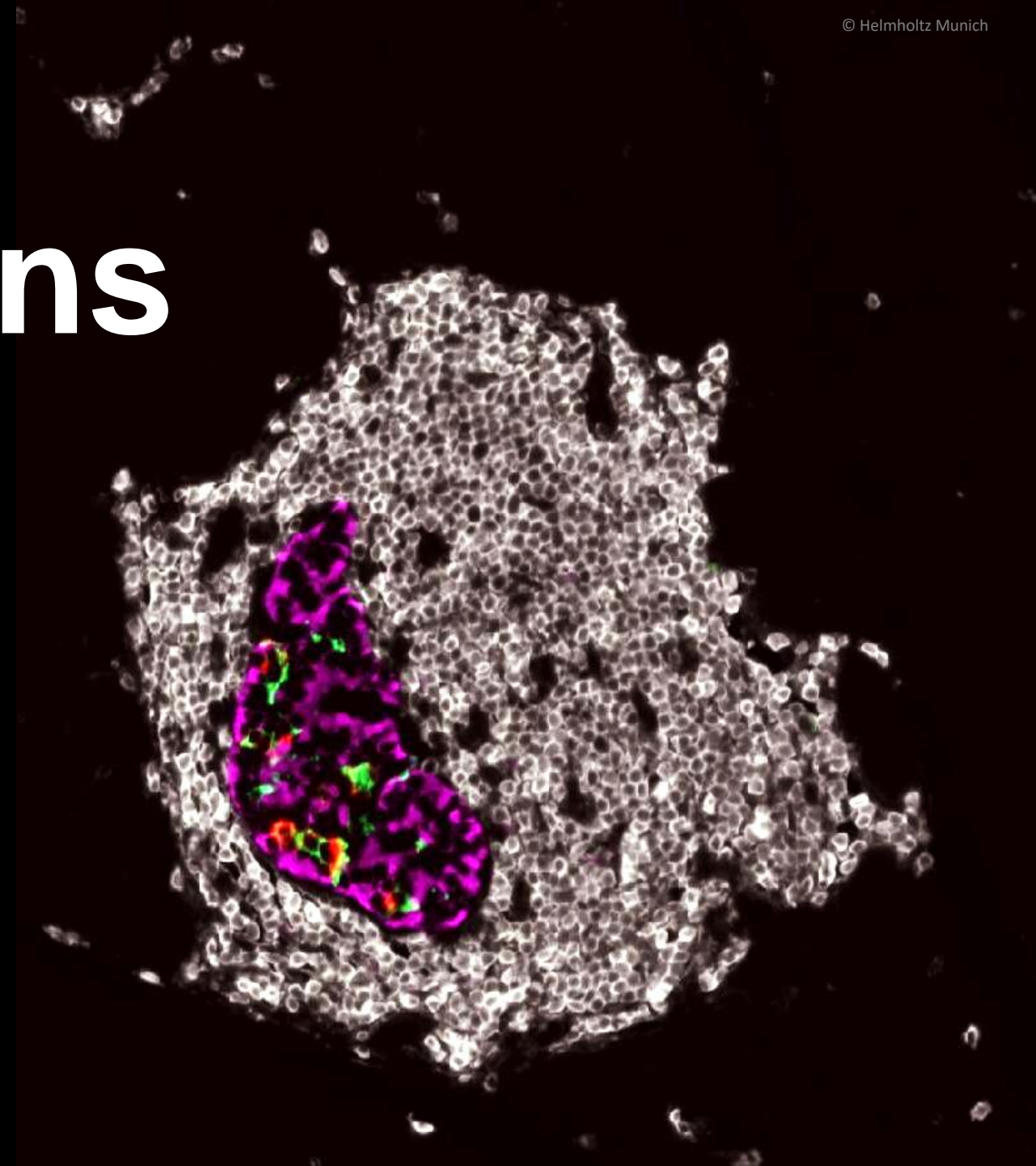


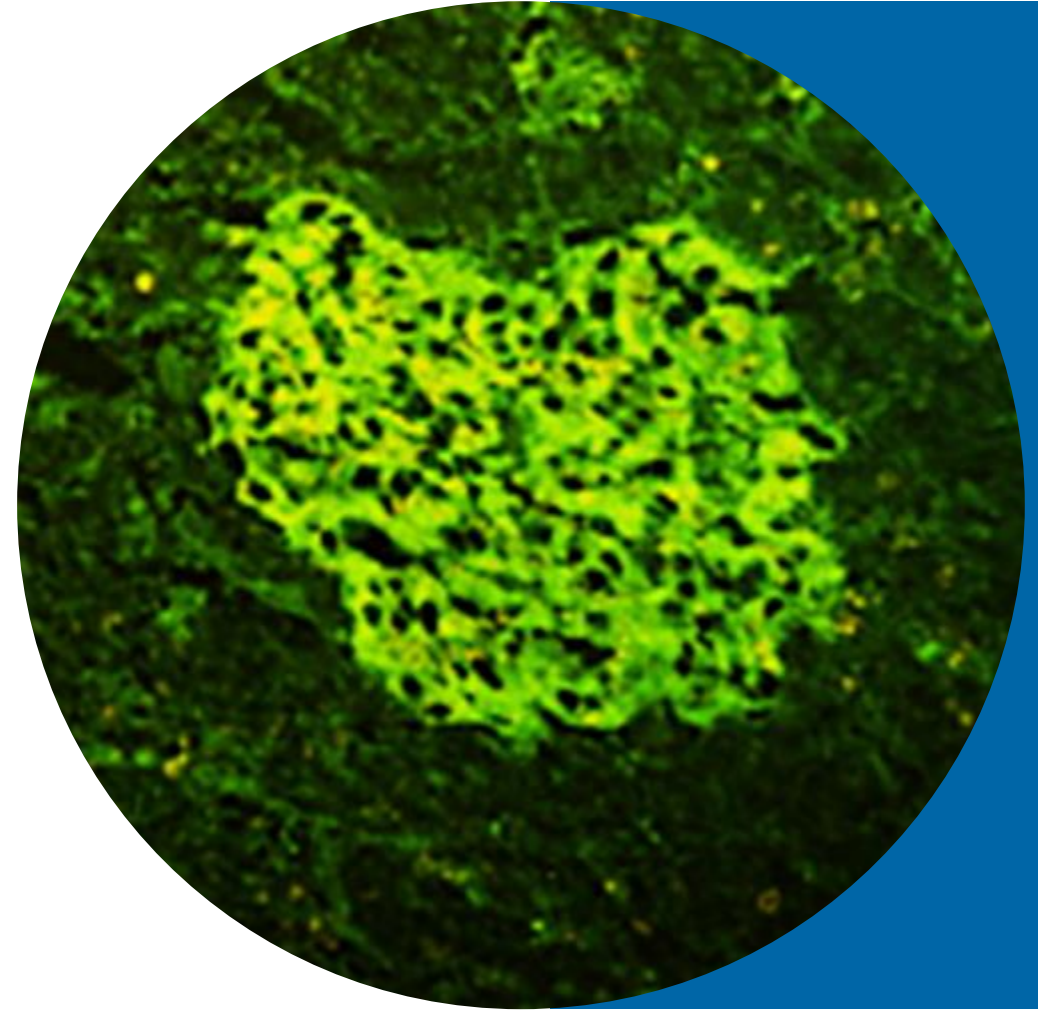
Viral Infections and Type 1 Diabetes



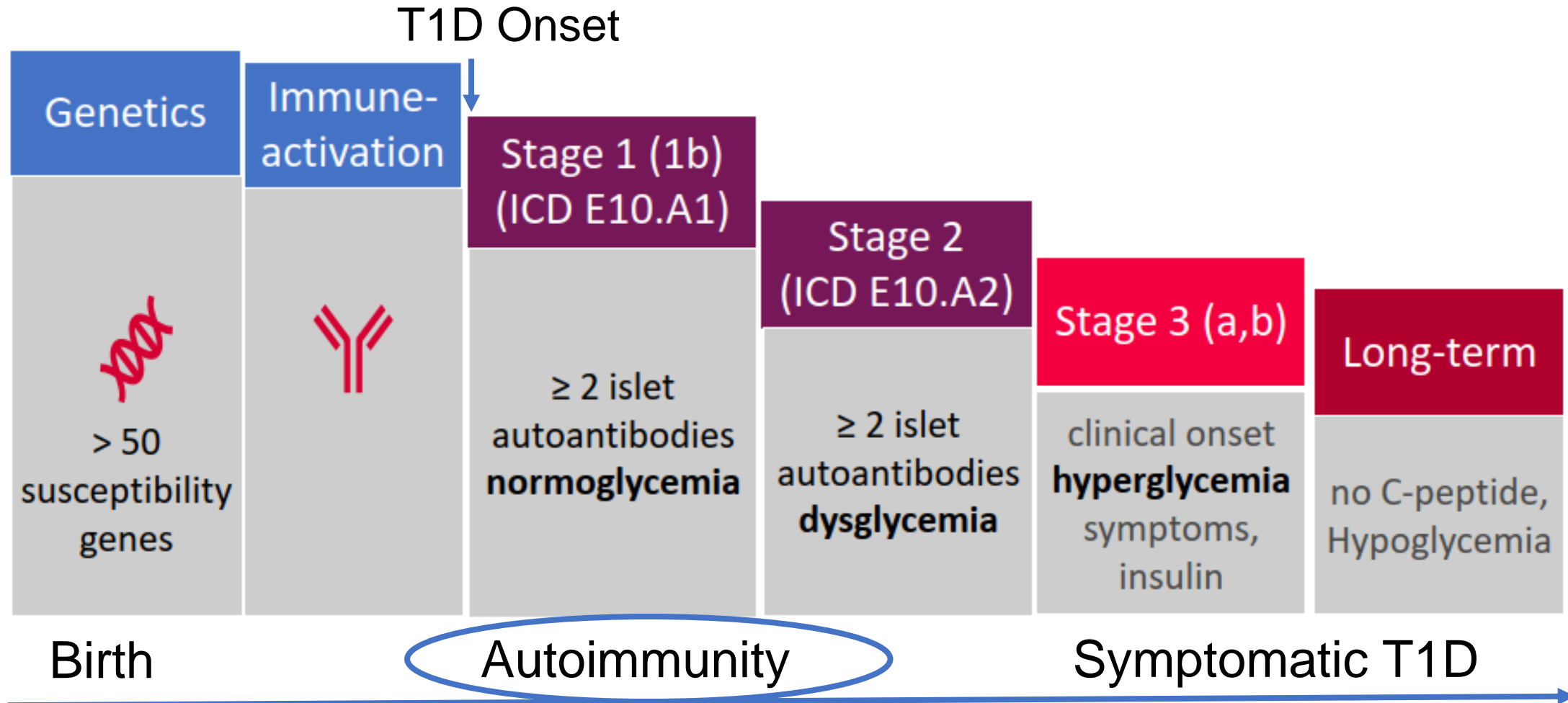
Type 1 Diabetes is an Autoimmune Disease

With a peak incidence of islet autoimmunity in the first few years of life.

Research shows, that **viral infections** are **one possible environmental trigger** for islet autoimmunity.

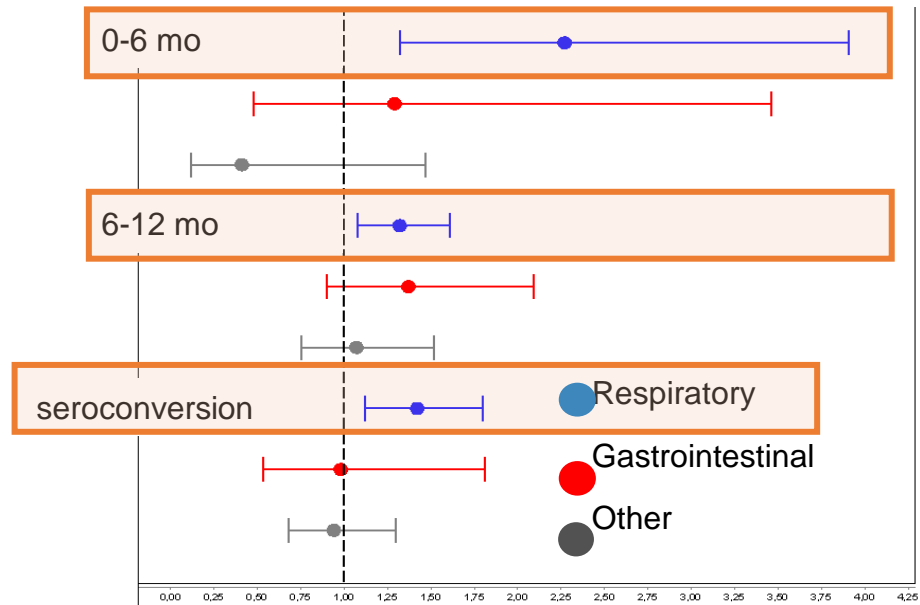


Type 1 Diabetes comes in Stages



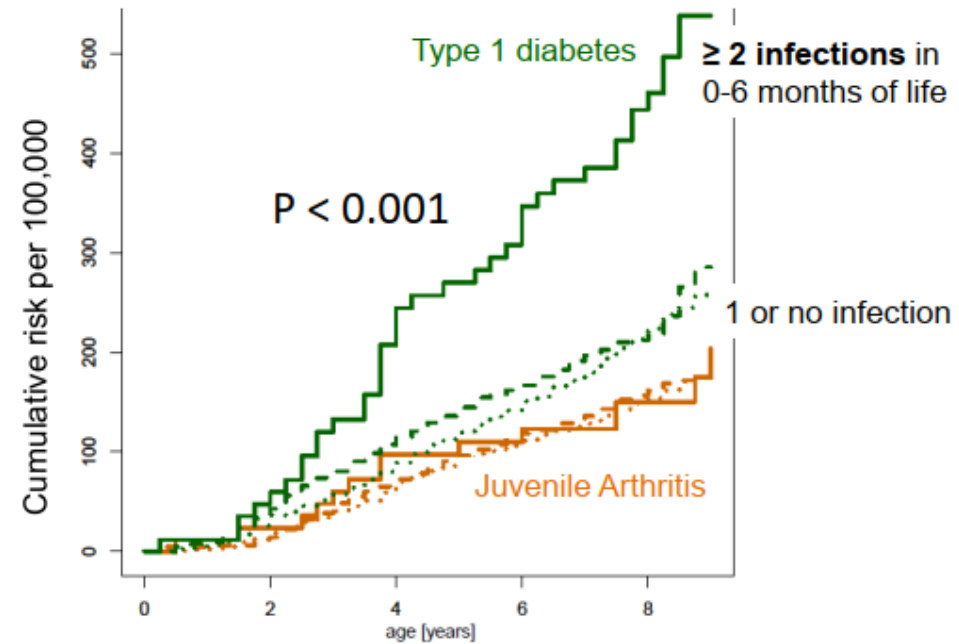
Insel RA et al., *Diabetes Care* 2015; Ziegler, Rewers, Simell, *JAMA* 2013
American Diabetes Association Professional Practice Committee, *Diabetes Care* 2022
Landgraf R et al, *Diabetologie* 2022; 17 (Suppl2):98-110

Viral Infections in Childhood



Beyerlein et al, JAMA Pediatrics 2013

Claims data of 295,419 Bavarian children



Beyerlein, et al; JAMA 2016

Early, persistent and multiple viral infections increase the risk of autoimmunity.

Viral Impact

Viruses can impact the development of type 1 diabetes through...

**Direct
beta cell
infections**

**Systemic
inflammation
& propensity to
T-cell auto-
reactivity**

**Defect
immune
response
& viral
clearance**

**Beta cell
stress**

Mimicry

Viral Impact

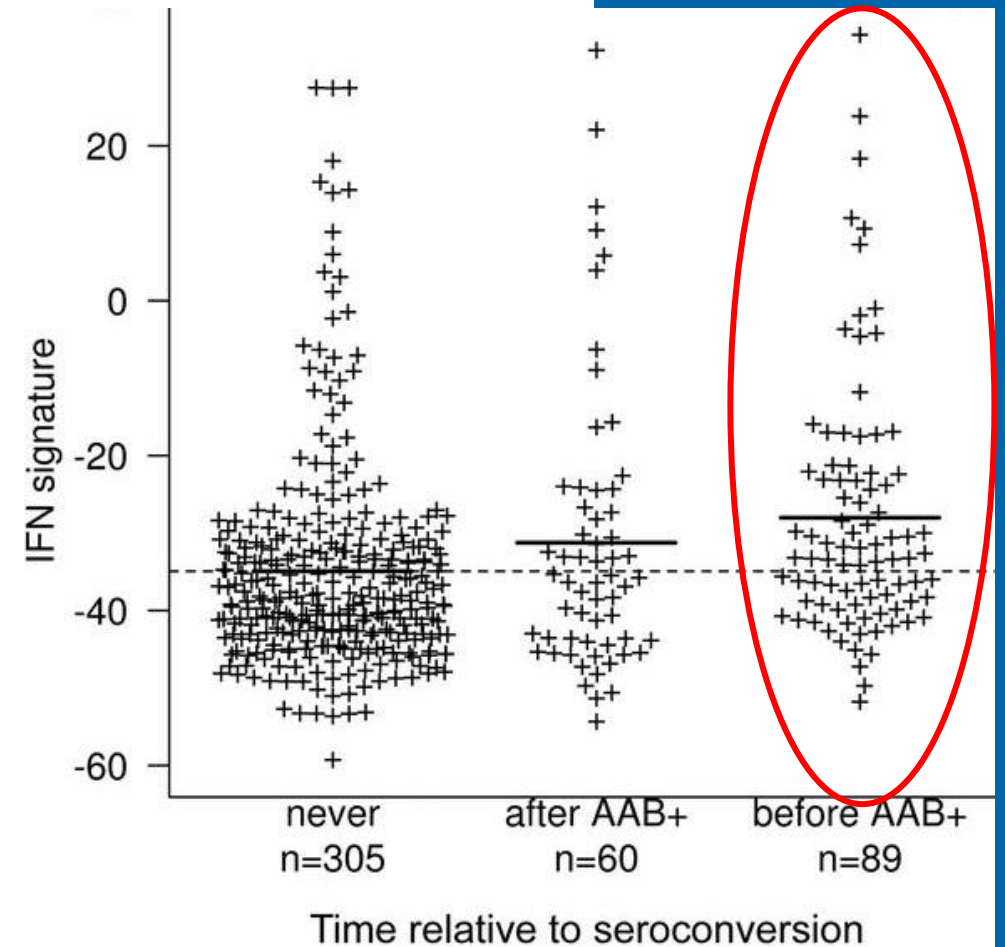
...and at different timepoints of the disease progression.

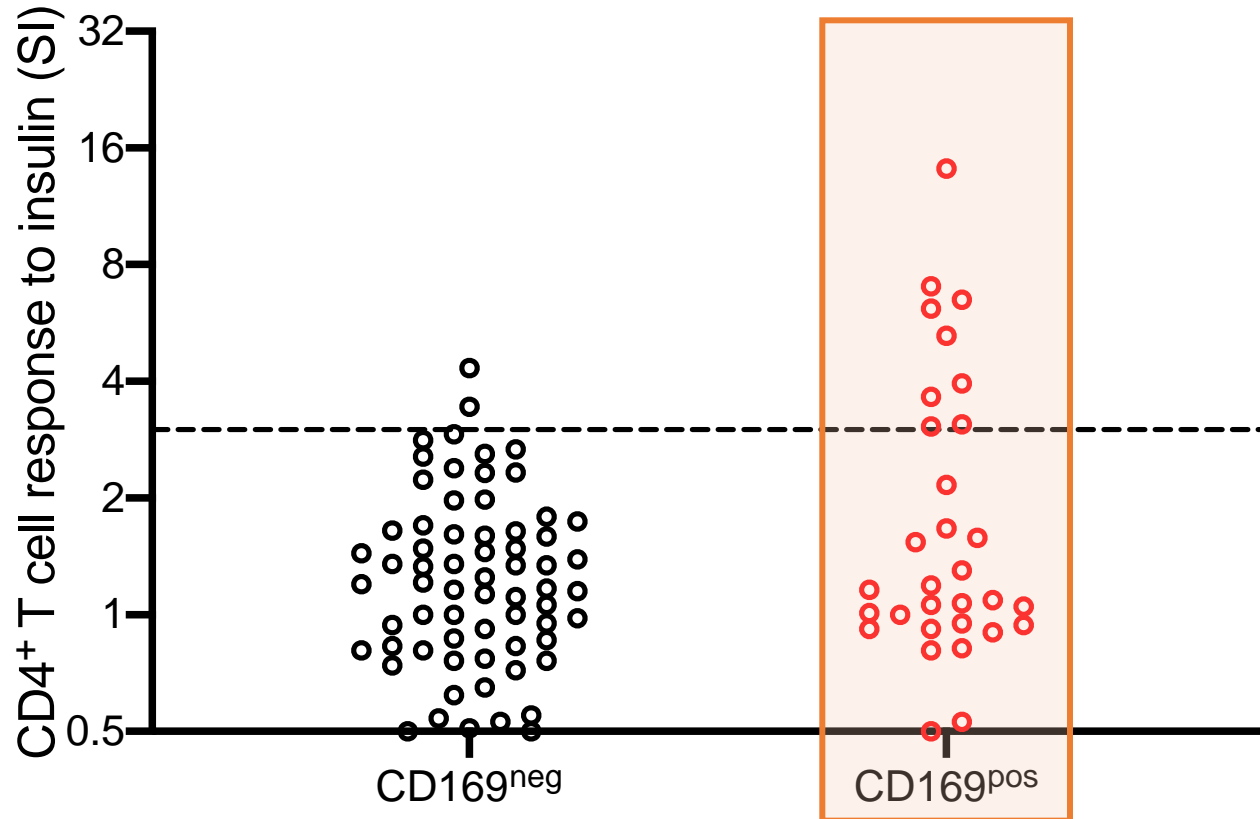


→ There is a complex interplay between viruses and the immune system.

Systematic Inflammation

Type 1 interferon signature precedes the onset of islet autoimmunity.



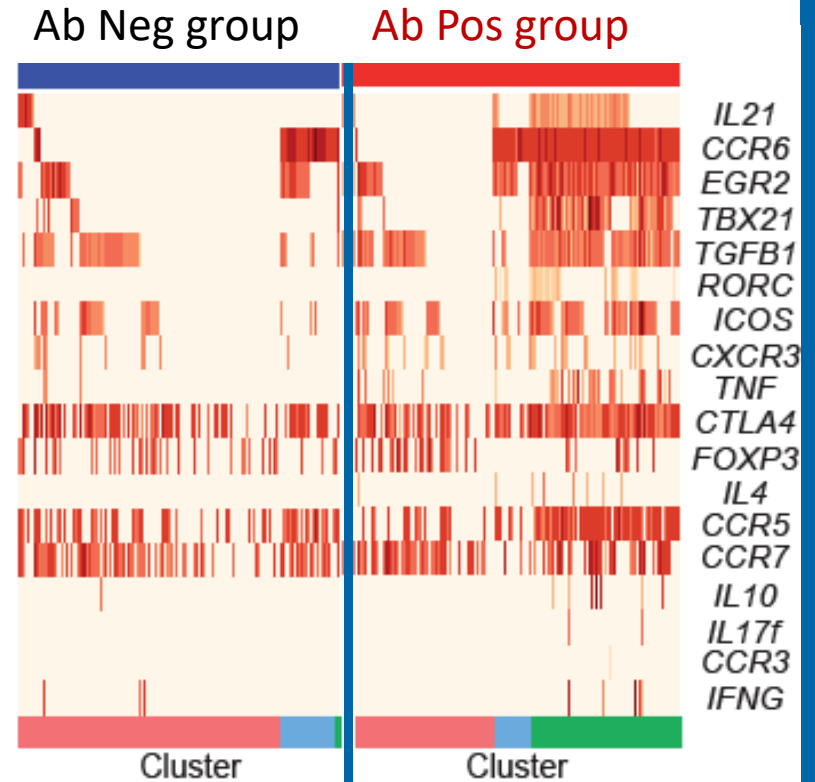
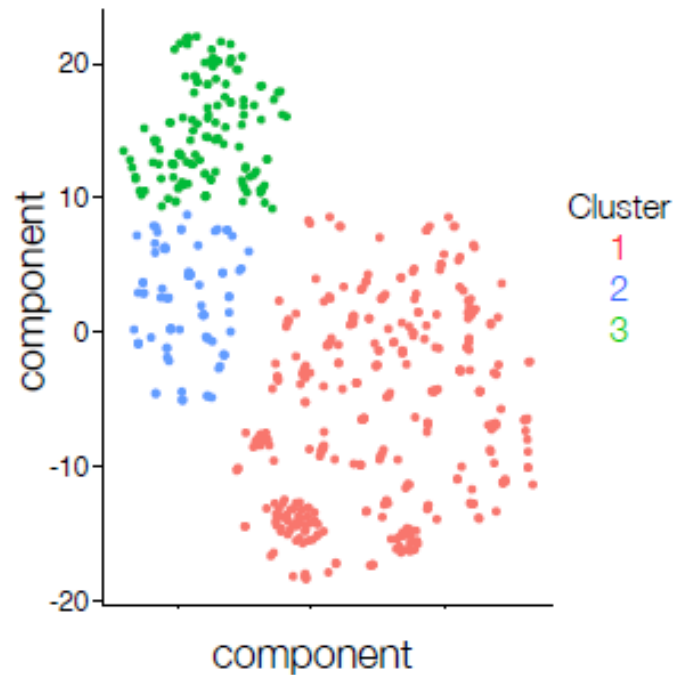


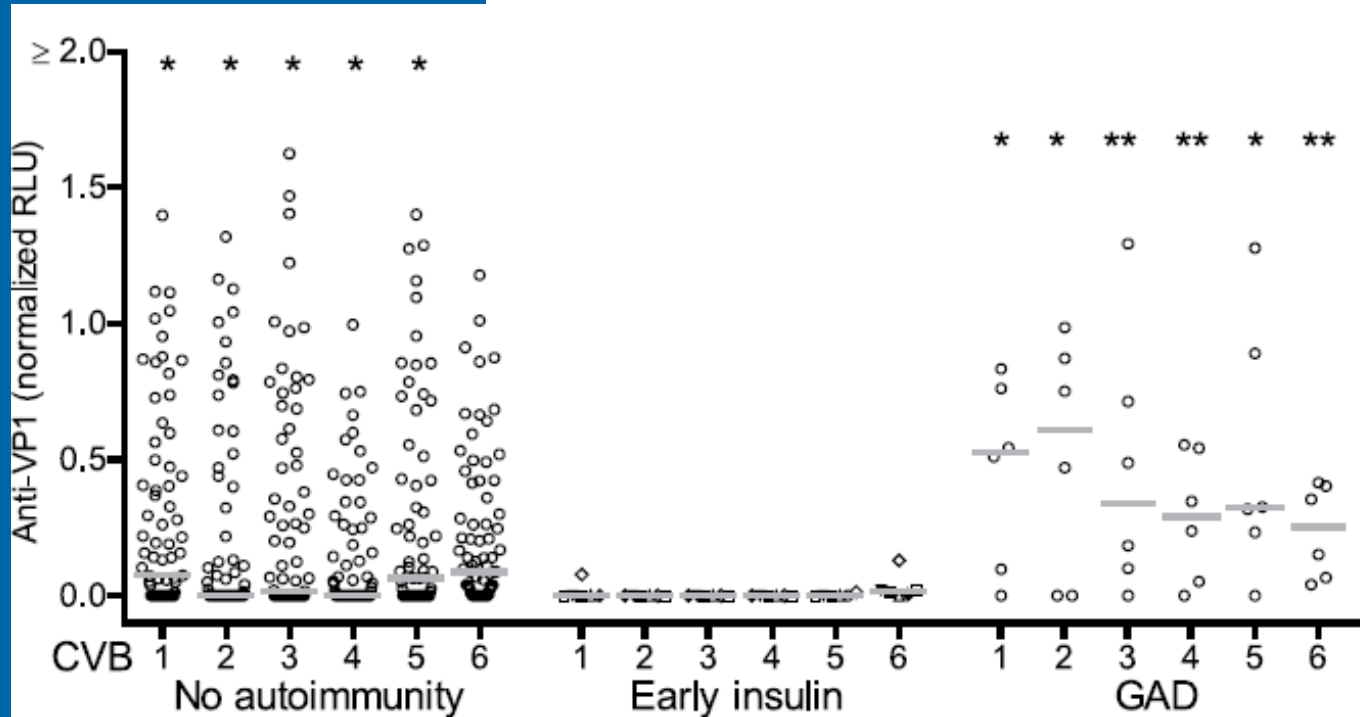
Increased Reactivity of Autoreactive T Cells

In vitro CD4+ T-cell response to insulin in inflamed conditions.

Proinflammatory T Cell Response Signature

Insulin reactive T cells with
Th1 profile precede
autoimmunity.





Defect Viral Clearance

Insufficient antibody response to Coxsackie B in children with insulin autoantibodies

Anti-CBV VP1 antibodies at age 3 years

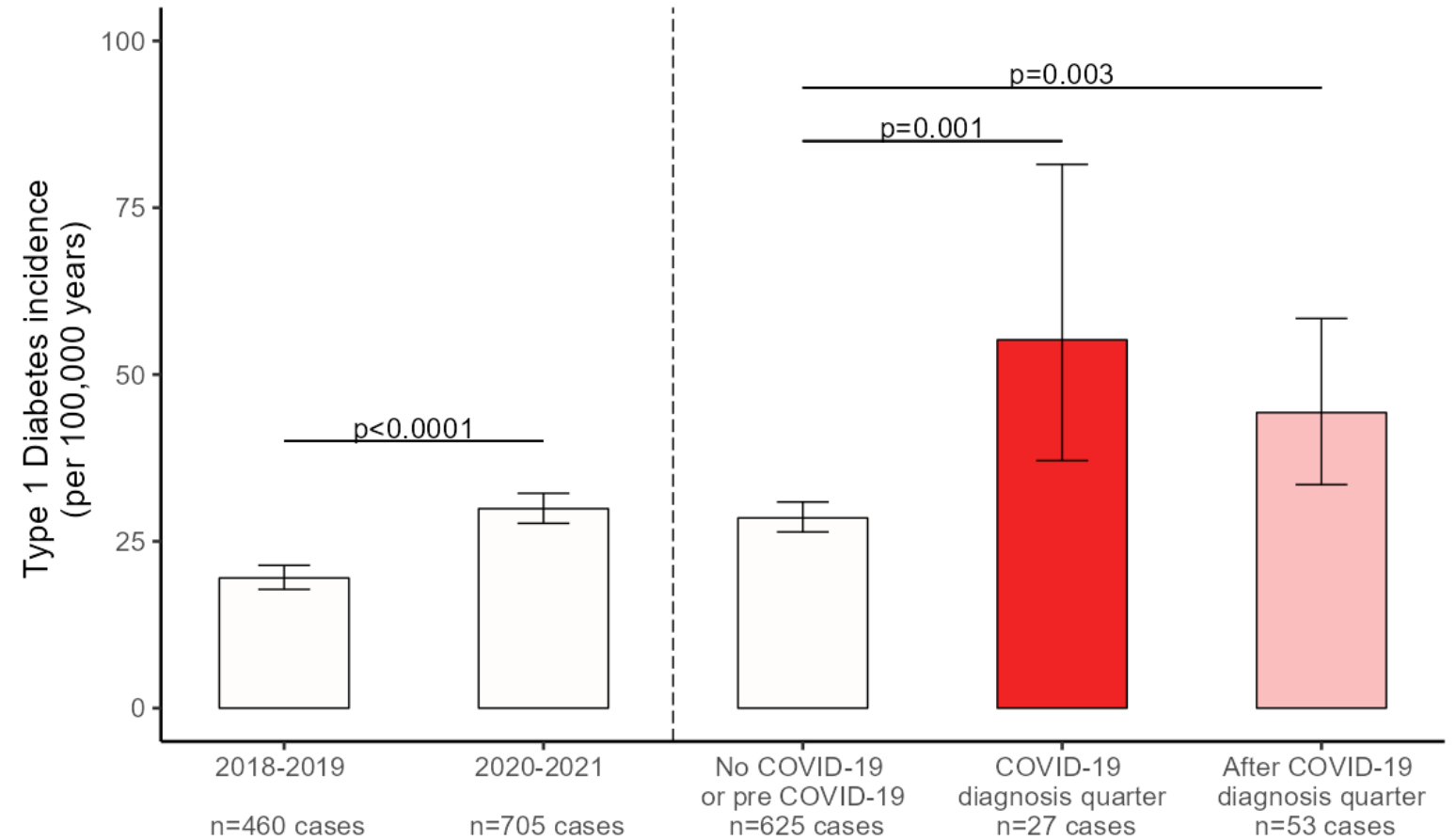
Viruses and Islet Autoimmunity

- Viral infections often **precede** islet autoimmunity.
- **Duration and frequency** of infections may be critical.
- **Enteroviruses** (e.g., Coxsackie B) are potential key players in type 1 diabetes.

- Only a small proportion of cases with autoimmunity test positive for Coxsackie B virus - **other viruses** or causes might contribute.

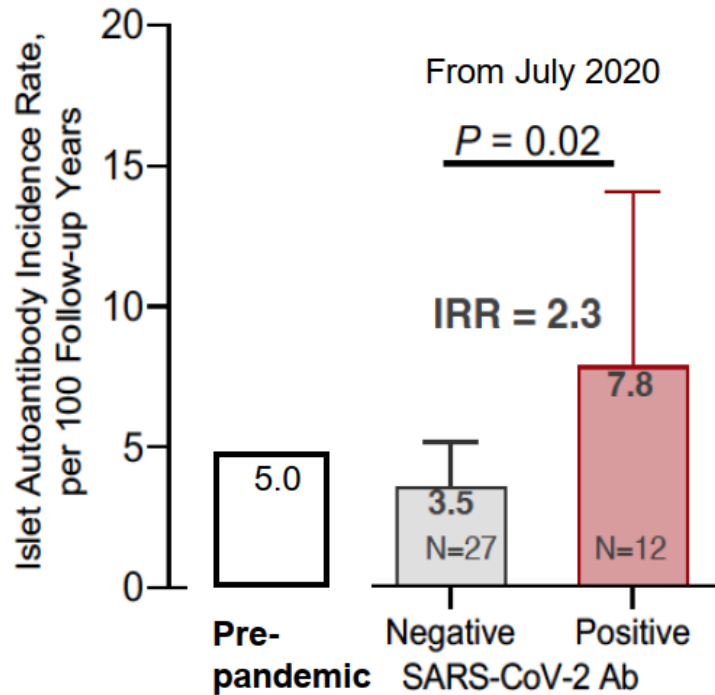
Increased T1D during COVID-19

The type 1 diabetes **incidence** rate was increased in children with a diagnosis of **COVID-19** (Bavaria).



Weiß et al. JAMA 2023

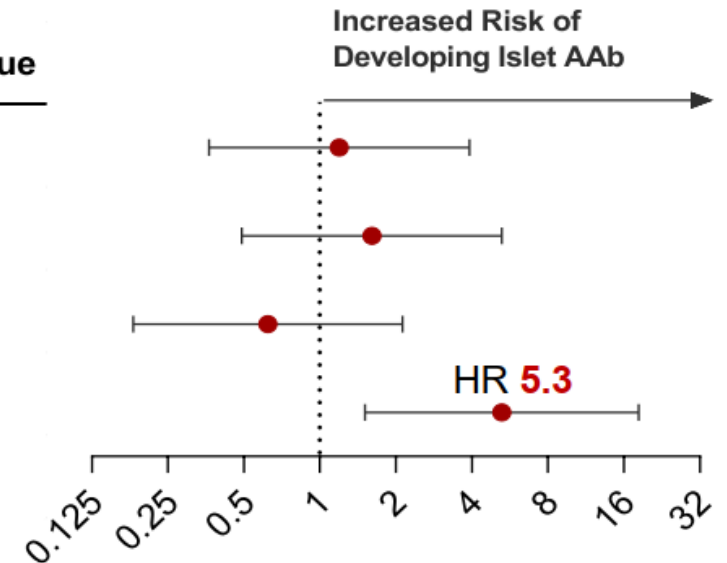
Modified Islet Autoimmunity Risk



- SARS-CoV-2 infection **increases risk of islet autoantibody** at least 2-fold
- If infection occurs before 18 months of age, the risk increases at least 5-fold.

SARS-CoV-2 Ab positive

Covariate	P Value
Sex (Girls)	0.77
HLA (non DR3/4-DQ8)	0.43
No T1D First Degree Relative	0.44
Age of infection (<1.5 y)	0.009



SARS-CoV-2 and Type 1 Diabetes

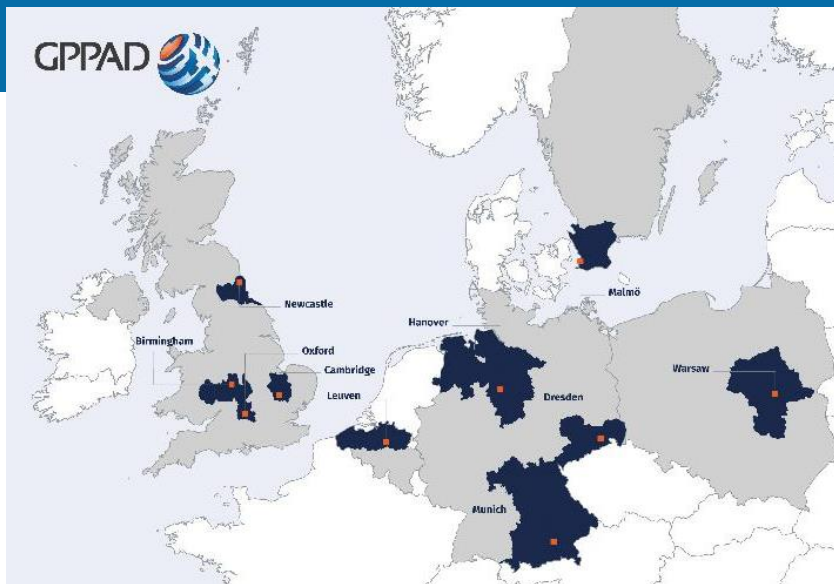
- During the pandemic, there were **fewer childhood infections** across several European countries, including Coxsackie B.
- The incidence of **islet autoimmunity remained unchanged.**
- The presence of **SARS-CoV-2 antibodies** was associated with an increased risk of islet autoantibodies and clinical T1D.
- **Evidence suggests SARS-CoV-2 as another potential key virus in the development of childhood T1D.**

GPPAD

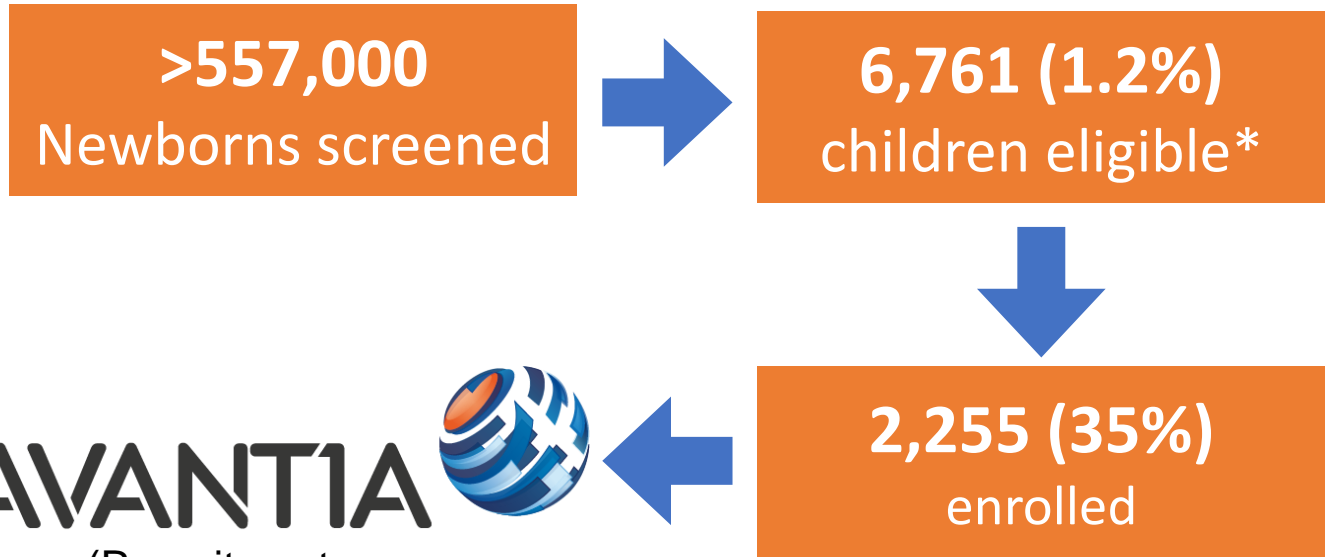
GLOBAL PLATFORM FOR THE PREVENTION
OF AUTOIMMUNE DIABETES



Primary Prevention in Europe



Path to Prevention: Genetic Risk Screening and Prevention Studies



AVANTIA 
(Recruitment
started: 2024)

GPPAD 
GLOBAL PLATFORM FOR THE PREVENTION
OF AUTOIMMUNE DIABETES

Prevention Study Anti-Viral Action against Type 1 Diabetes Autoimmunity

Vaccination against SARS-Cov-2
age 6, 7, 9 months or placebo to
reduce islet autoimmunity

Infection surveillance to
understand the role of virus in the
etiology of type 1 diabetes



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GLOBAL PLATFORM FOR THE PREVENTION
OF AUTOIMMUNE DIABETES



More Info:

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