

Propolis Modulates Immune Responses and delays Diabetes Progression in NOD Mice: Preliminary Findings

Jonas Pordel Vind¹, Camilla Hartmann Friis Hansen², Magni Steintún¹, Henrik Munch Jørgensen¹, Julie Antvorskov³, Karsten Buschard¹, Hasim Tekin¹, Knud Josefsen¹ Bartholin Institute, Rigshospitalet Copenhagen Biocenter, Ole Maaløes Vej 5, Copenhagen N, Denmark

²Department of Veterinary and Animal Sciences, University of Copenhagen, Grønnegårdsvej 15, 1870 Frederiksberg, Denmark

³Steno Diabetes Center, Herlev Hospital, Borgmester Ib Juuls Vej 1, Herlev, Denmark

Background & Purpose

Propolis has immunomodulatory properties, but its effects on autoimmune Type 1 Diabetes (T1D) remain unclear.

Problem description

This study examines whether dietary propolis supplementation influences disease progression and immune responses in non-obese diabetic (NOD) mice, a well-established T1D model. By assessing early immune alterations and long-term disease outcomes, it aims to determine whether propolis has protective effects against autoimmune diabetes.

Methodology

Sixty-six female NOD mice were assigned to one of three groups: control, low-dose propolis (1.8% w/w), or high-dose propolis (3.6% w/w), with propolis incorporated into their feed. At 13 weeks of age (before diabetes onset), 18 mice underwent histological assessment of insulitis, serum cytokine analysis, and immune cell profiling of the spleen and pancreatic lymph nodes. Diabetes incidence is monitored until 30 weeks to evaluate disease progression.

Results & CONCLUSION: Propolis supplementation appears to modulate immune responses, as indicated by differences in cytokine levels and immune cell populations between treated and control groups. Preliminary findings suggest that propolis may affect diabetes progression in NOD mice and delay disease onset. This is supported by insulitis scoring, which shows a significant reduction in severe insulitis in the high-dose propolis group compared to controls. If confirmed, these results could provide insights into the immunomodulatory mechanisms of propolis in autoimmune diseases.

Practical Implications for beekeepers

These findings contribute to the understanding of the immunological effects of propolis and its potential role in autoimmune disease management. If propolis demonstrates protective effects in T1D, it could offer a natural, diet-based approach to immune modulation, complementing existing therapies. Identifying active compounds responsible for these effects may also support the development of functional foods or nutraceuticals targeting immune regulation. Further clinical studies are needed to confirm efficacy and investigate mechanisms of action. A clearer understanding of how propolis influences immune pathways could have broader implications for other autoimmune disorders.



Propolis effect on Type 1 Diabetes development in NOD mice

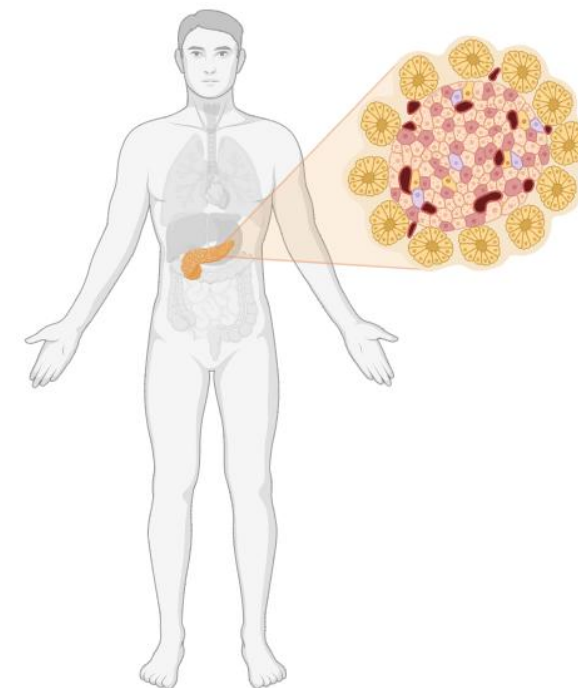
Presented by Jonas Vind, Pharmacist, PhD student

Funded by Danish Agricultural Agency

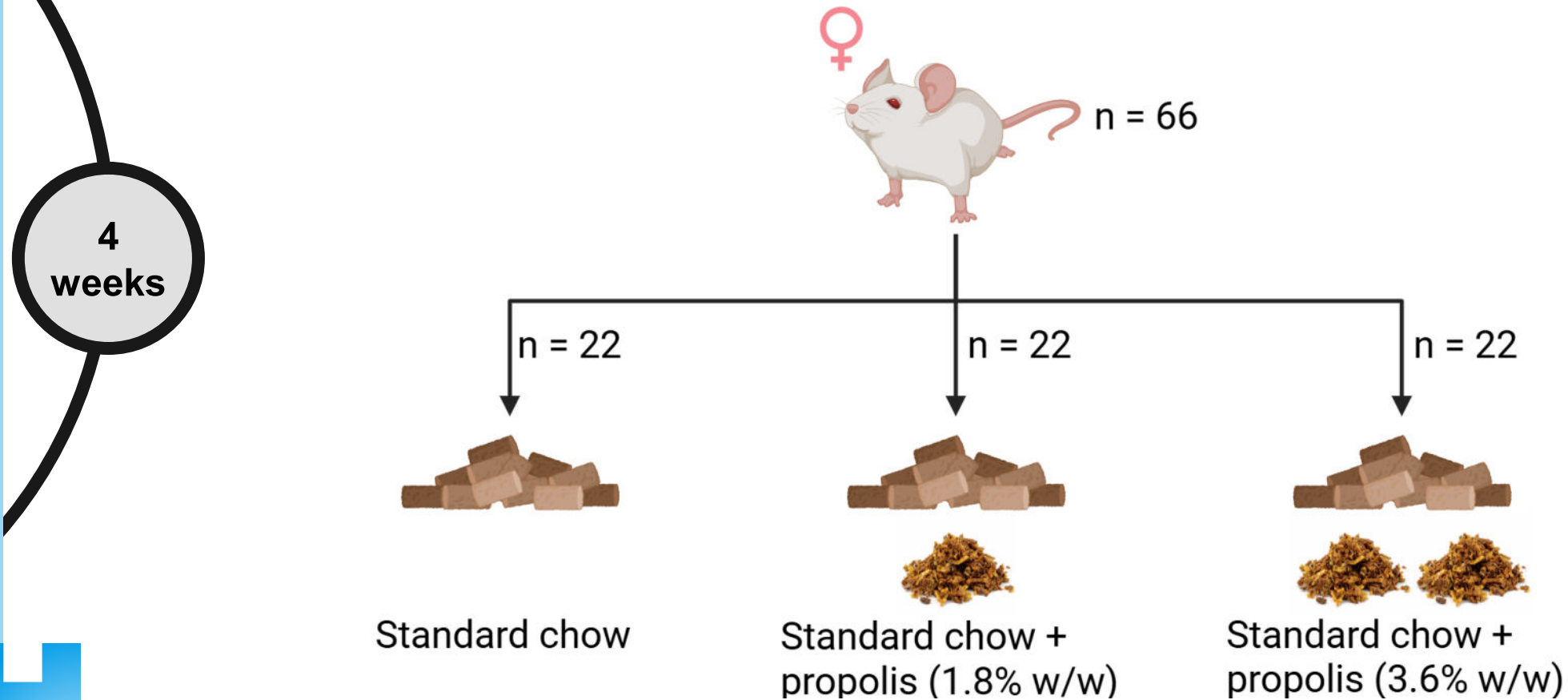
Background and purpose

- **Background**

- Propolis is known for immunomodulatory properties
- Its effects on autoimmune Type 1 Diabetes (T1D) development remain unclear
- T1D is characterized by autoimmune destruction of insulin-producing β -cells $\rightarrow$ insulin deficiency $\rightarrow$ chronic hyperglycemia



Division of mice into groups



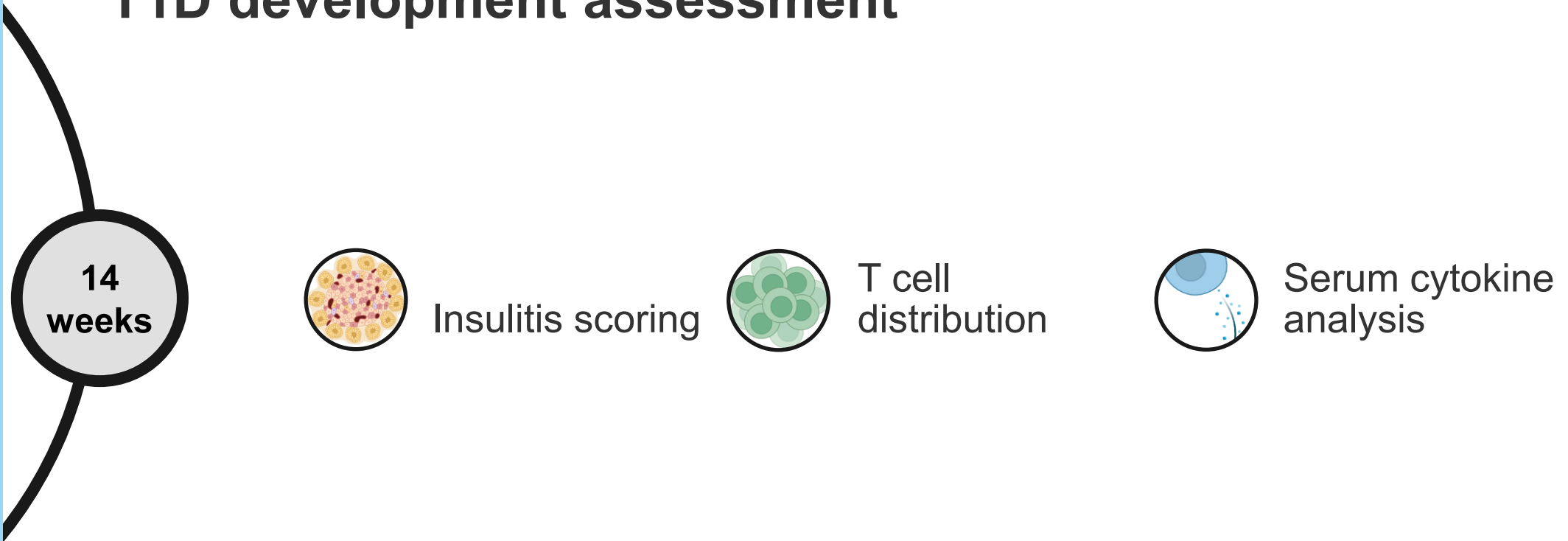
Measuring blood glucose

10
weeks



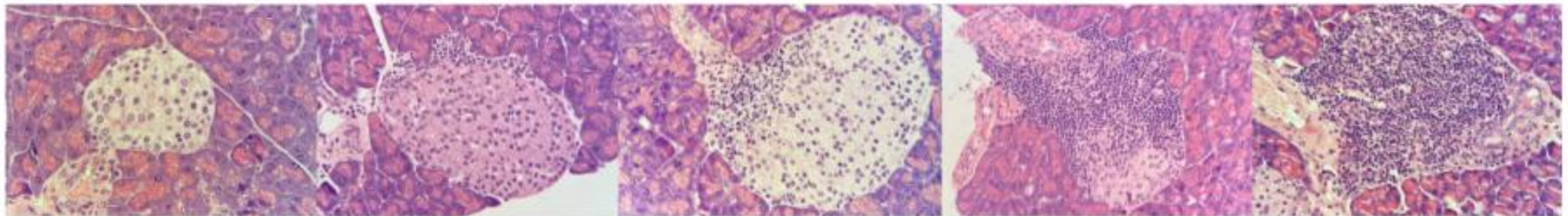
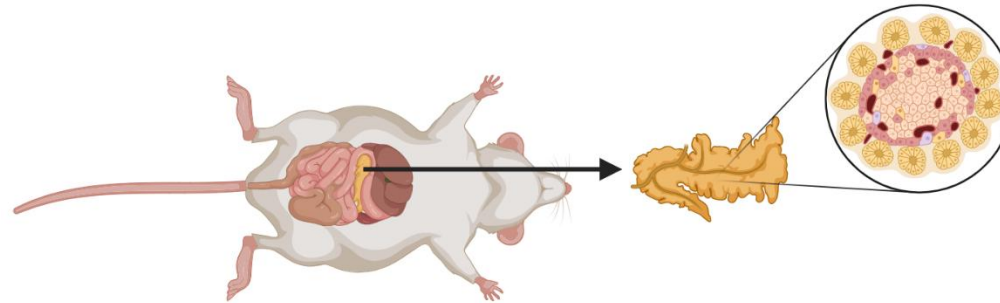
<12 mmol/L
≥12 mmol/L

T1D development assessment



T1D development assessment: Insulitis scoring

14
weeks



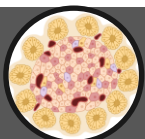
No insulitis

Peri-insulitis

Mild insulitis

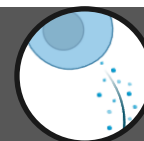
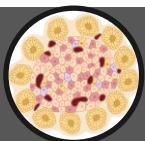
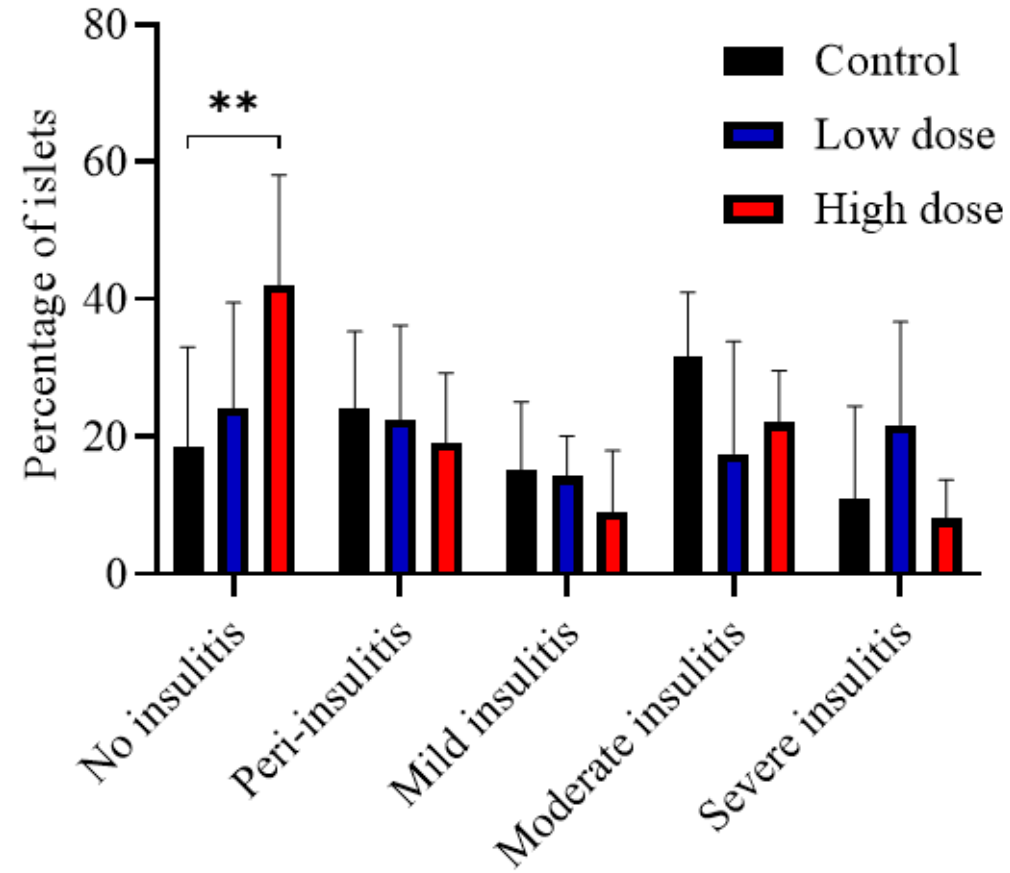
Moderate insulitis

Severe insulitis



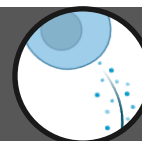
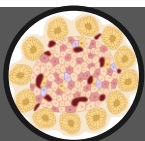
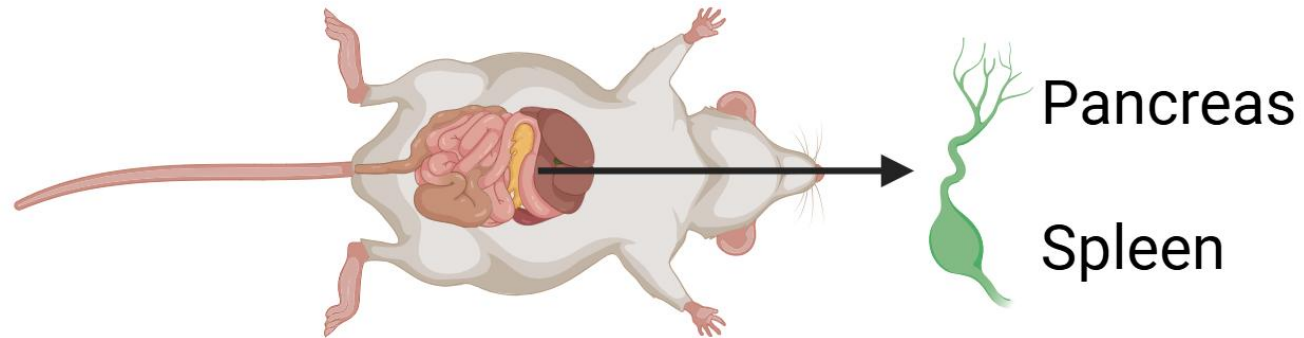
T1D development assessment: Insulitis scoring

14
weeks



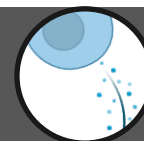
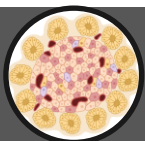
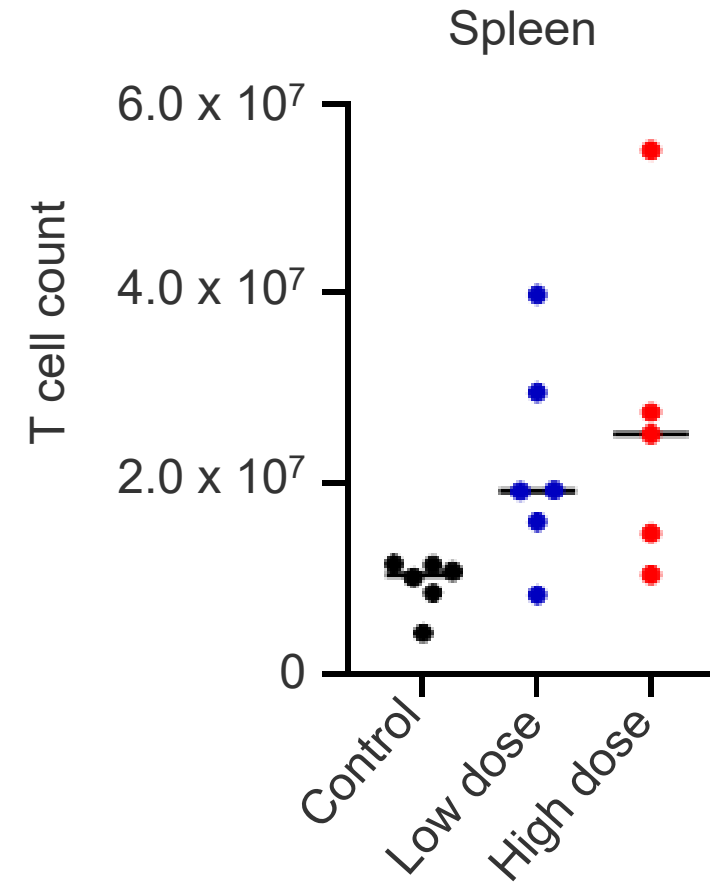
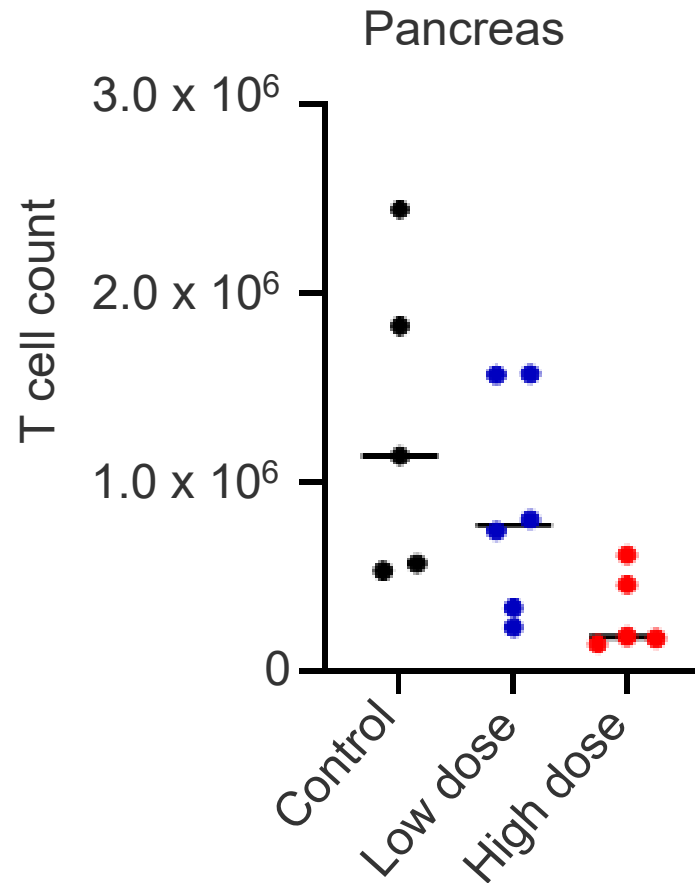
T1D development assessment: T cell distribution

14
weeks

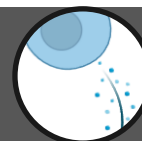
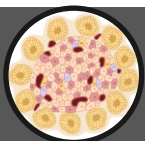
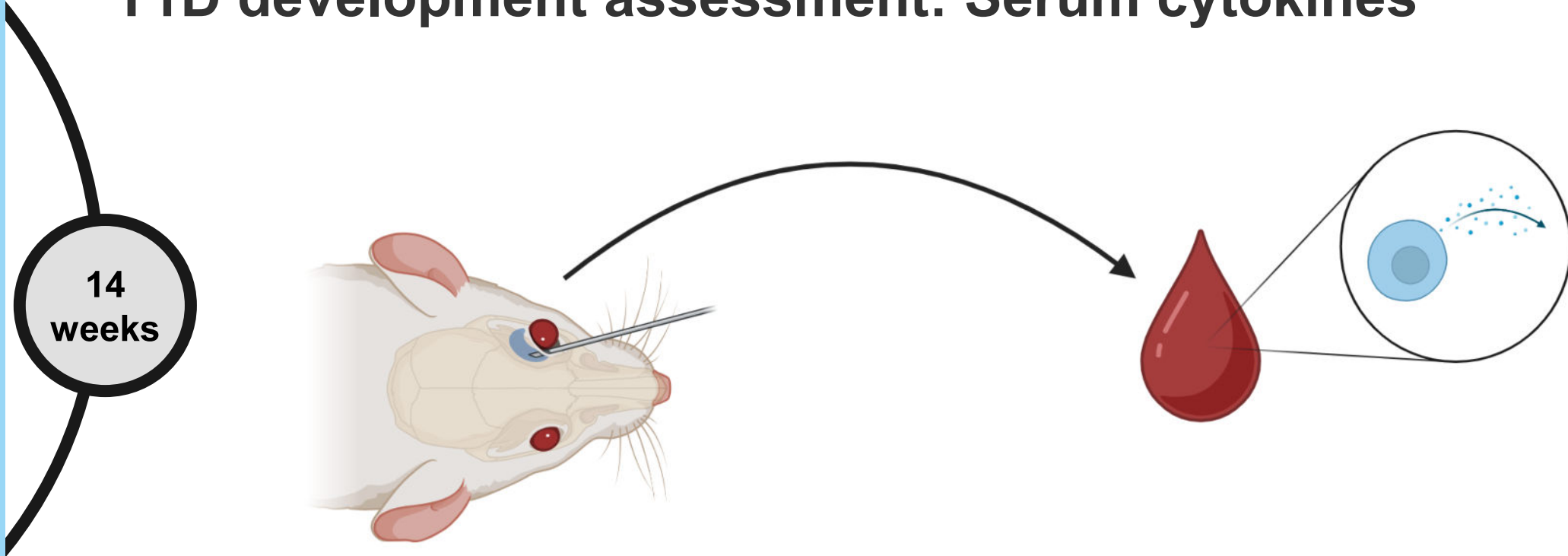


T1D development assessment: T cell distribution

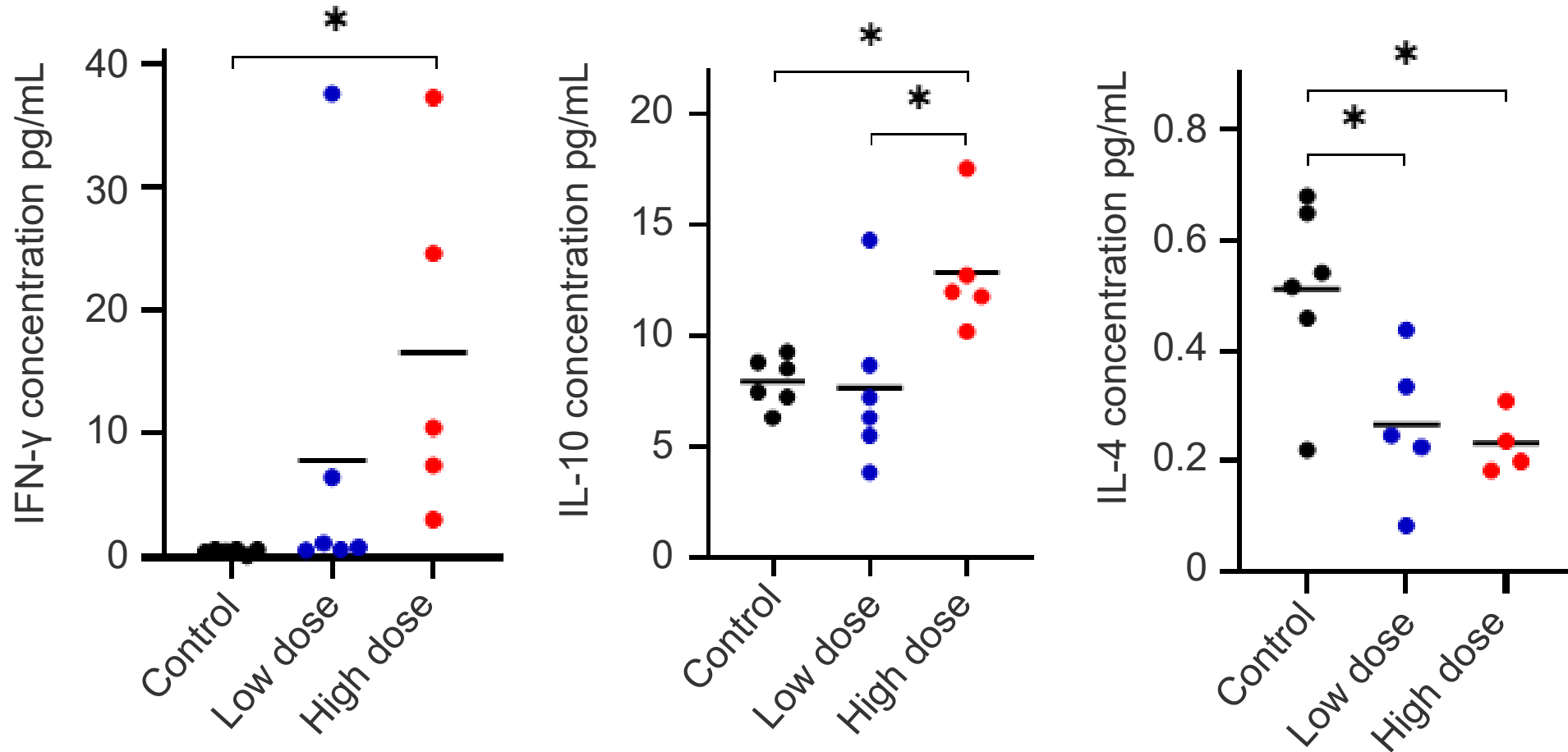
14 weeks



T1D development assessment: Serum cytokines



**14
weeks**



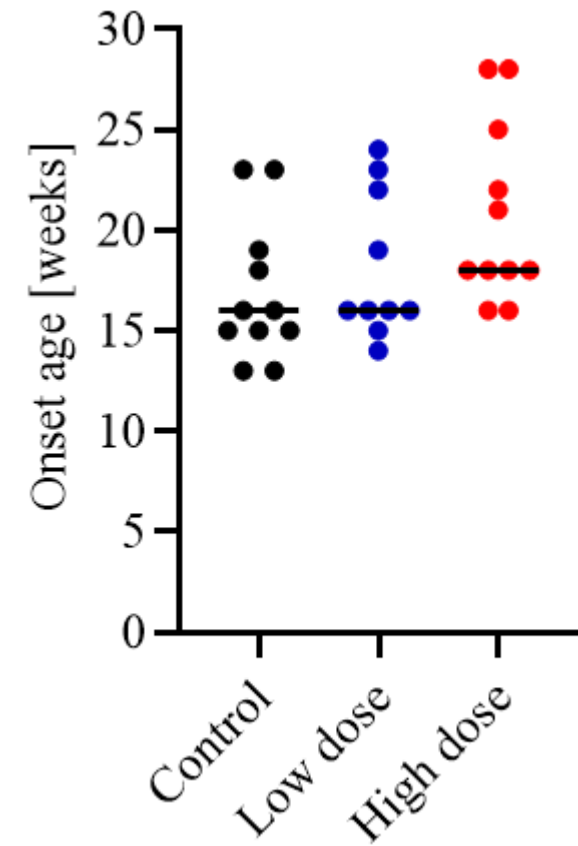
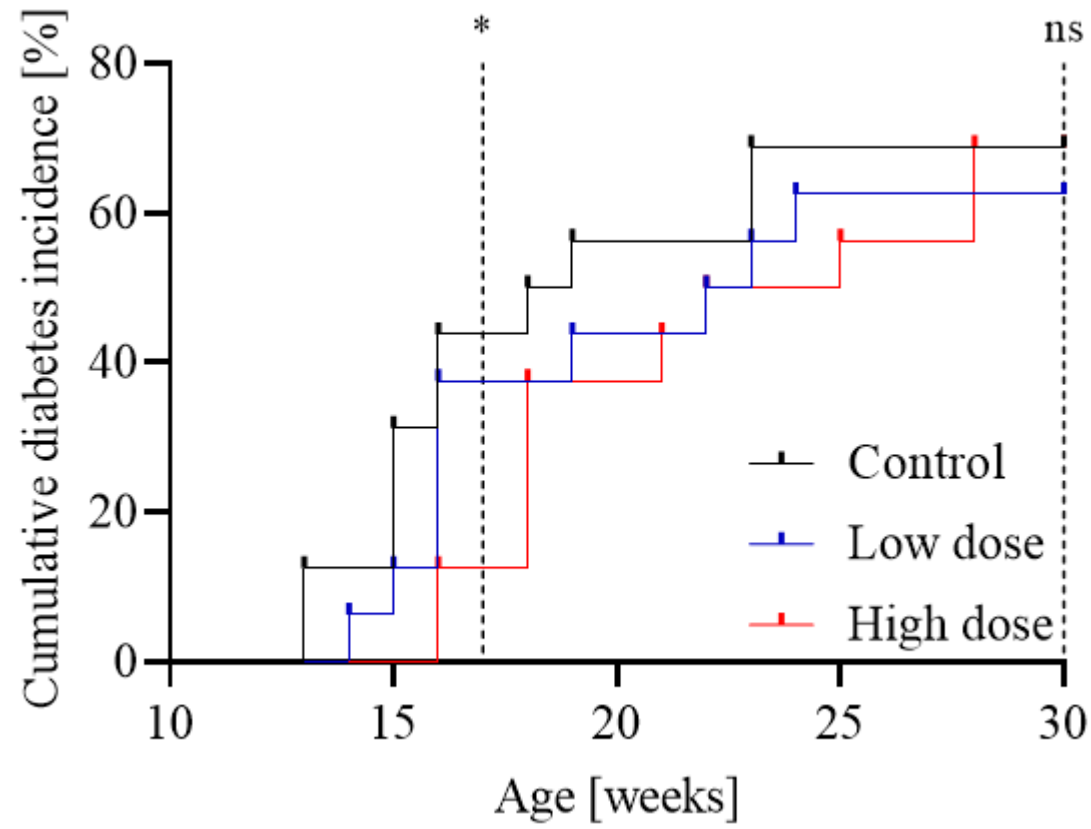
T1D incidence

30
weeks



T1D incidence

30
weeks



Conclusions

- Propolis seemingly slow down T1D development
- Propolis affects immune infiltrations of islets of Langerhans
- Propolis affects T cell distribution
- Propolis affects serum cytokine levels
- Propolis also affected gut microbiota (14 weeks)
- Can propolis be used to slow down T1D development clinically?

Thank you!

Funded by

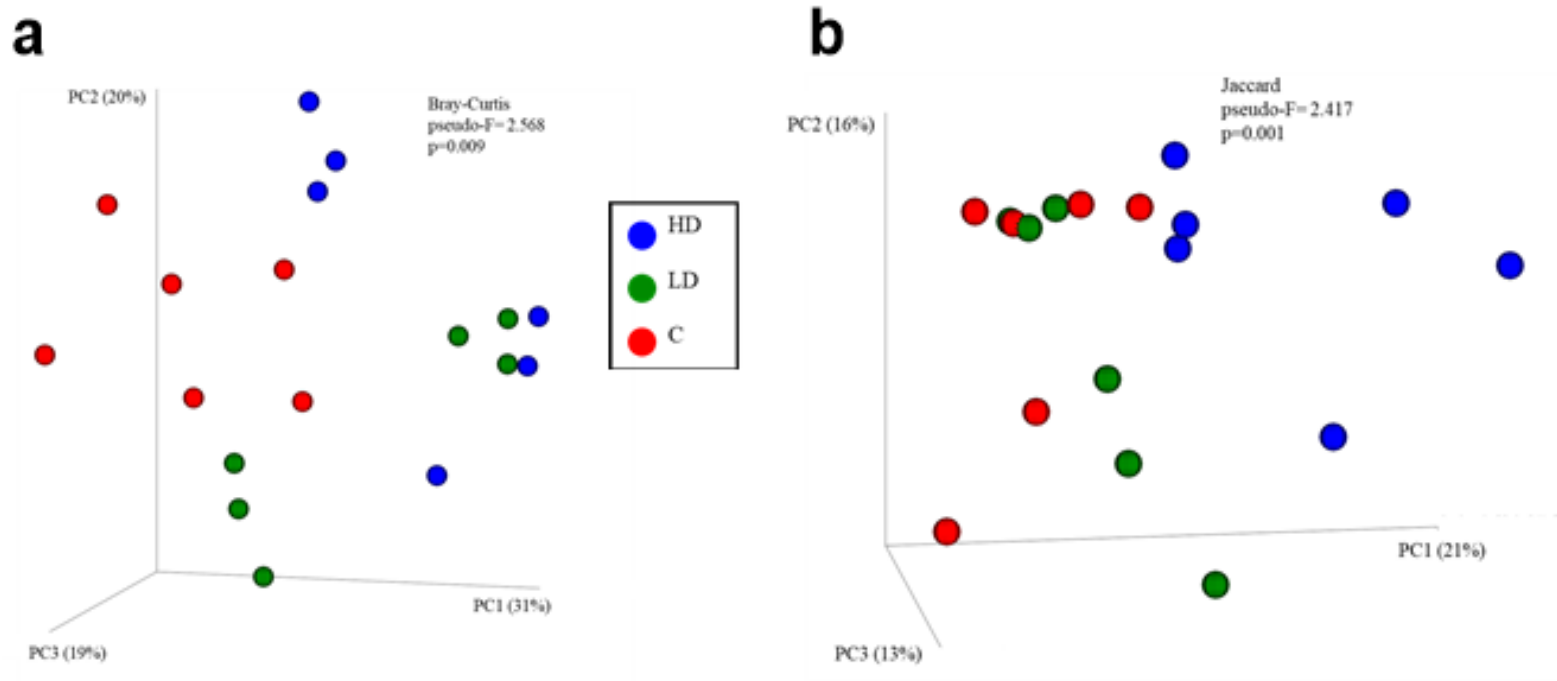


**Ministeriet for Fødevarer,
Landbrug og Fiskeri**
Landbrugsstyrelsen

For more info and contact
information



Extra: T1D development assessment: Microbiota



Increased *G. Akkermansia* in high dose group

Extra: T1D development assessment: Microbiota

c

