ISRCTN14636038 https://doi.org/10.1186/ISRCTN14636038

Exploring the role of the gut-kidney axis in type 1 diabetes

Submission date
05/01/2026

Recruitment status
Recruiting

Registration date
16/02/2026

Overall study status
Ongoing

Last Edited
16/02/2026

Condition category
Nutritional, Metabolic, Endocrine

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
Type 1 diabetes is a long-term autoimmune disease that leads to high blood sugar levels and can cause serious complications over time. One of the most important complications is diabetic kidney disease, which can progress to kidney failure and increase the risk of heart disease and early death. Many people with type 1 diabetes also experience digestive problems, such as abdominal pain, bloating, diarrhoea or constipation, but the causes of these symptoms are not fully understood.
Recent research suggests that changes in the gut, including increased intestinal permeability ("leaky gut"), inflammation, and changes in gut bacteria, may contribute to kidney disease progression. This study aims to better understand how changes in the gut may be linked to kidney damage in people with type 1 diabetes.

Who can participate?
Patients aged 18 years and over with type 1 diabetes who have had the disease for at least 8 years, have mild to moderate kidney disease, and have clinical indications for gastrointestinal endoscopic examination can participate. A control group of adults without diabetes, matched for age and sex and with indications for gastrointestinal endoscopy, will also be included.

What does the study involve?
Participants will attend a screening visit, complete a questionnaire about gastrointestinal symptoms, and provide blood, urine, and stool samples. If clinically indicated, they will undergo a sigmoidoscopy or colonoscopy, during which small tissue samples (biopsies) from the intestine will be taken. These samples will be analysed to assess intestinal inflammation, immune activity, and gut barrier integrity. Blood and urine samples will be used to measure markers of kidney damage and inflammation.

What are the possible benefits and risks of participating?
Participants may benefit from detailed medical assessments of their gut and kidney health, which may provide useful clinical information. Risks include temporary discomfort related to blood sampling and endoscopic procedures. All procedures will be performed by experienced specialists following standard safety guidelines.

Where is the study run from?
The study is conducted at the University of Latvia and Pauls Stradiņš Clinical University Hospital in Riga (Latvia).

When is the study starting and how long is it expected to run for?
The study is expected to start after ethical approval and will run for 36 months (3 years).

Who is funding the study?
The study is funded by the Latvian Council of Science under the Fundamental and Applied Research Projects Programme (FLPP, LZP).

Who is the main contact?
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Additional identifiers

FLPP, Latvia
lzp-2025/1-0280

Study information

Scientific Title
In individuals with type 1 diabetes, how modulation of the gut–kidney axis compared with usual gut–kidney axis function affects kidney function and the development of diabetic kidney disease

Acronym
GUTKIDNEY-T1D

Study objectives

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 05/12/2025, Central Medical Ethics Committee of the Republic of Latvia (Brīvības iela 72 k-1, Riga, LV1011, Latvia; +371 (0)67876182; pasts@vm.gov.lv), ref: Nr. 01-29.1.2/5494

Primary study design
Observational

Secondary study design
Cohort study

Study type(s)

Health condition(s) or problem(s) studied
Type 1 diabetes mellitus and diabetic nephropathy

Interventions
Population-based cross-sectional case-control study based on the longitudinal LatDiane cohort (Latvian Diabetic Nephropathy Study, initiated 2013).

Participants:
Adults with type 1 diabetes mellitus (n = 50), subdivided into those with progressive diabetic nephropathy and stable kidney disease.
Control group (n = 20) of age-, gender-, and race-matched individuals with normal glucose metabolism.

Inclusion/exclusion criteria ensure participants are suitable for gastrointestinal investigation and have no confounding conditions (e.g., inflammatory bowel disease, eGFR<45 ml/min/1.73m²).

Recruitment and screening:
Eligible participants are identified from LatDiane and the PSCUH outpatient clinic based on clinical and laboratory records.
Screening includes a gastrointestinal symptom questionnaire, medical history review, and lab tests.
Endoscopic evaluation (colonoscopy) is performed in participants with gastrointestinal indications.

Data and sample collection:
Biological samples: blood (serum), urine, stool; processed and stored at -80°C for biomarker analysis.
Laboratory analyses: fecal markers (calprotectin, IgA, albumin, elastase), intestinal permeability markers in serum (LPS activity, zonulin, I-FABP, EndoCAb, LPB, KIM-1, NGAL, indoxyl sulfate, p-Cresyl sulfate) measured by ELISA or validated assays.
Colon biopsies: collected during endoscopy, analyzed morphologically and immunohistochemically for immune cell markers (CD4, CD20) and intestinal integrity markers (zonula occludens 1, claudin-1, claudin-2, occludin).

Statistical analysis:
Descriptive statistics for baseline characteristics.
Non-parametric tests (Kruskal-Wallis) for group comparisons.
Multiple linear and logistic regression to assess associations between gut markers and kidney outcomes.
Odds ratios, relative risks, 95% confidence intervals reported.
Study powered at 80% to detect significant differences in I-FABP between progressive and stable DKD.

Data management:
FAIR principles will guide data handling.
Analysis documentation stored in a DataverseLV repository for reproducibility.

Study setting:
Recruitment and sample collection at University of Latvia, Faculty of Medicine and Pauls Stradins University Hospital, Riga, Latvia.

Intervention Type
Other

Primary outcome(s)
1. Kidney function and progression of diabetic nephropathy measured using estimated glomerular filtration rate (eGFR) using the CKD-EPI 2021 equation and urine albumin-to-creatinine ratio, with progressive nephropathy defined as eGFR decline ≥3 ml/min/year and/or worsening albuminuria status; at the time of study enrollment using retrospective data from the last 3 or more years of kidney function (eGFR and albuminuria) for assessment of progression

Key secondary outcome(s)

Completion date
31/12/2028

Eligibility

Key inclusion criteria
1. Type 1 diabetes mellitus with a duration of least 8 years
2. Available data on DKD progression in the last 3 years or more
3. Indications for colonoscopy

Healthy volunteers allowed
Yes

Age group
Mixed

Lower age limit
18 Years

Upper age limit
99 Years

Sex
All

Total final enrolment
70

Key exclusion criteria
1. eGFR <45 ml/min/1.73m2
2. Nephrotic range proteinuria (more than 3.0 g/day)
3. Hematuria in more than two consecutive urine samples
4. Histologically proven other type of glomerular disease
5. Inflammatory bowel disease
6. Coeliac disease
7. Pregnancy
8. Intestinal infection within 1 month of planned endoscopy and faecal collection
9. Gastrointestinal “alarm symptoms”: bleeding, severe weight loss, fever, abrupt onset of symptoms, anemia

Date of first enrolment
01/01/2026

Date of final enrolment
31/12/2028

Locations

Countries of recruitment
Latvia

Study participating centre
University of Latvia
Latvia

Study participating centre
Pauls Stradins University Hospital
Latvia

Sponsor information

Organisation
University of Latvia

ROR
https://ror.org/05g3mes96

Organisation
Pauls Stradiņš Clinical University Hospital

ROR
https://ror.org/00h1aq868

Funder(s)

Funder type

Funder Name
Latvijas Zinātnes Padome

Alternative Name(s)
Latvian Council of Science

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
Latvia

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available