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Biobanking as an integral part of the RECETOX research infrastructures

Pavel Piler, Ph.D.

CELSPAC biobank

10. 03. 2023



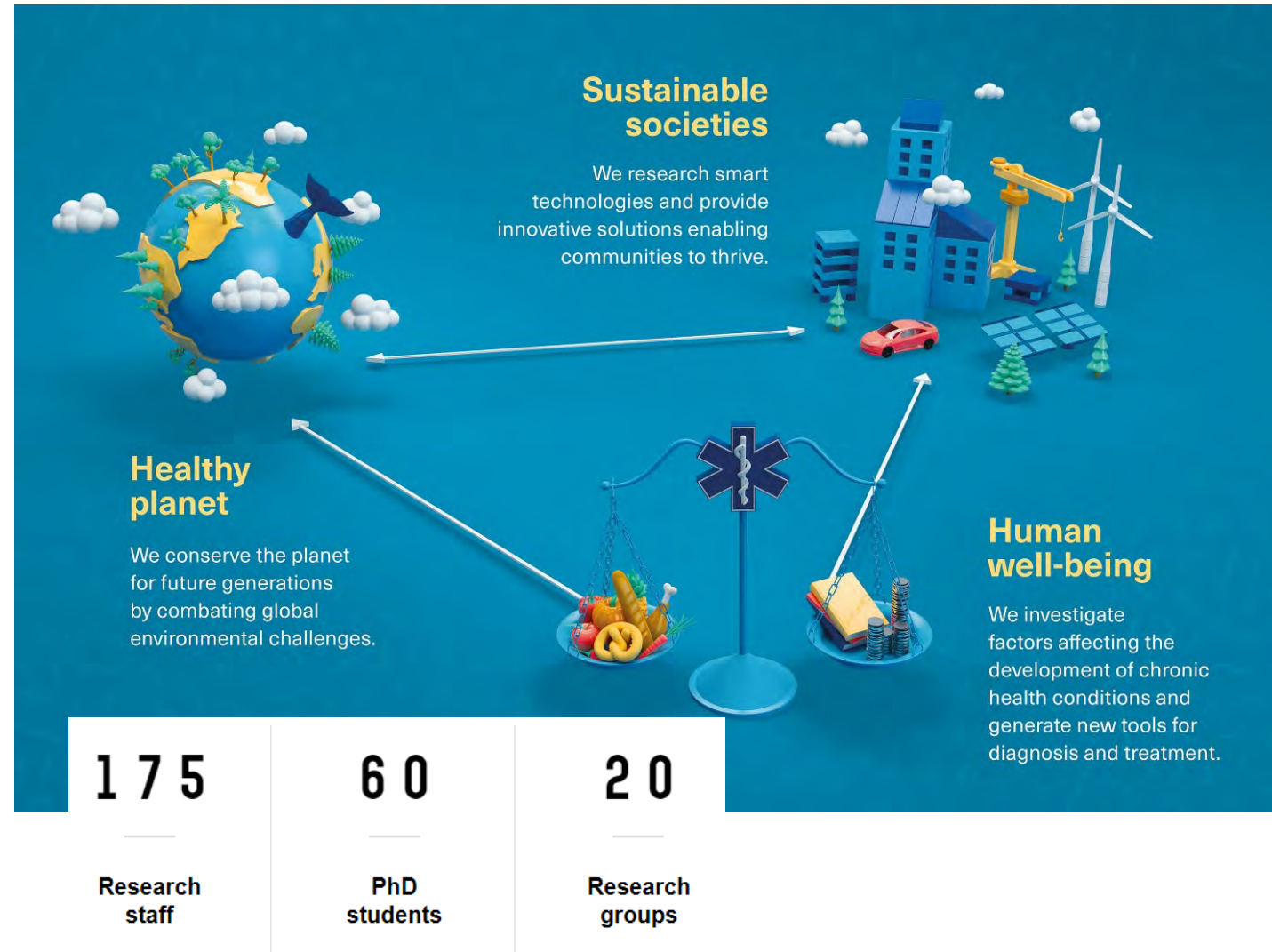
WHO WE ARE

Masaryk University (1919)

Faculty of Science (1920)

RECETOX (1983)

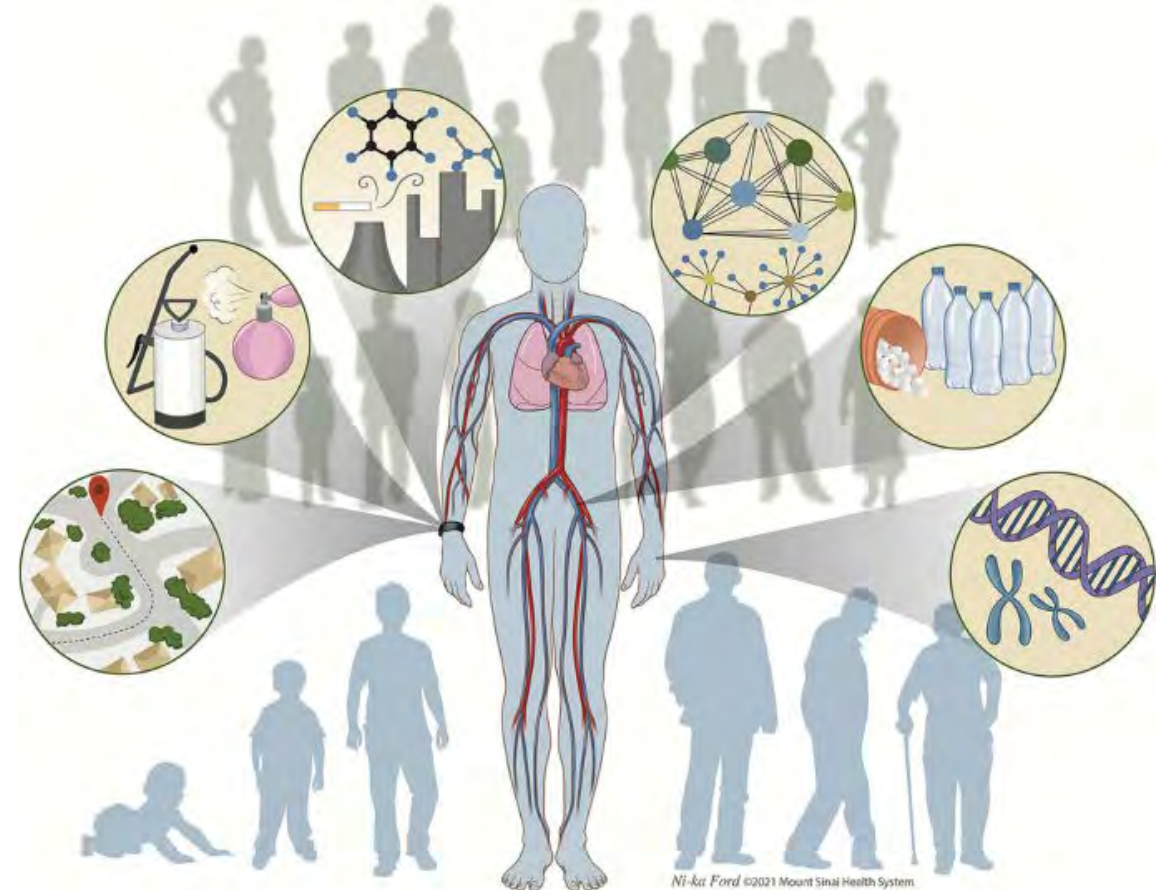
CELSPAC Core Facility (2013)



FACTORS AFFECTING HEALTH DURING LIFE

The Exposome: Understanding the Effect of the Environment on Our Health

ISGlobal



Culmulative Exposure

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CELSPAC POPULATION STUDIES



since 2013 < 36 000 active participants

different age groups

multidisciplinary research

Longitudinal vs. Cross-sectional

Prospective vs. Retrospective

Observational vs. Intervention

Causal relationship vs. Association

CELSPAC POPULATION STUDIES



- Birth cohort from 1991 – 1992
- Brno and Znojmo
- 7 589 mother-child pairs
- Followed for 20 years through the questionnaires
- Children re-examined as 30 years old = Young Adults cohort
- Re-examination of parents is planned = Ageing cohort



CELSPAC TNG

- The Next Generation – birth cohort
- 3000 mother-child pairs from 2018
- Exposome cohort
- Biobanking / Omics methods
- Online validated questionnaires / Health Records



Cohort Profile

Cohort Profile: The European Longitudinal Study of Pregnancy and Childhood (ELSPAC) in the Czech Republic

Pavel Piler,¹ Vít Kandrnal,¹ Lubomír Kukla,¹ Lenka Andryšková,¹ Jan Svancara,^{1,2} Jiří Jarkovský,^{1,2} Ladislav Dusek,^{1,2} Hynek Pikhart,^{1,3} Martin Bobák^{1,3} and Jana Klánová^{1*}



Original Investigation | Public Health

Association of Maternal Depression During Pregnancy and Recent Stress With Brain Age Among Adult Offspring

Klara Mareckova, PhD; Radek Mareček, PhD; Martin Jani, PhD; Lenka Zackova, MSc; Lenka Andryšková, PhD; Milan Brazdil, MD, PhD; Yuliya S. Nikolova, PhD

PLOS ONE

OPEN ACCESS | PEER-REVIEWED

RESEARCH ARTICLE

Socioeconomic characteristics, family structure and trajectories of children's psychosocial problems in a period of social transition

Daniela Kuruczova, Jana Klanova, Jiri Jarkovsky, Hynek Pikhart, Julie Bienertova-Vasku

Published: June 5, 2020 • <https://doi.org/10.1371/journal.pone.0234074>

Article | Open Access | Published: 10 April 2020

Association between Stress Urinary Incontinence and Depressive Symptoms after Birth: the Czech ELSPAC Study

Milúše Juráškova, Pavel Piler, Lubomír Kukla, Jan Svancara, Petra Daňšová, Lukáš Hruban, Vít Kandrnal & Hynek Pikhart

Scientific Reports 10: Article number: 6233 (2020) | Cite this article

> Sci Rep. 2021 May 13;11(1):10222. doi: 10.1038/s41598-021-89384-0.

Simultaneous quantitative profiling of clinically relevant immune markers in neonatal stool swabs to reveal inflammation

Veronika Vidova¹, Eliska Benesova¹, Jana Klanova¹, Vojtech Thon¹, Zdenek Spacil²

CELSPAC POPULATION STUDIES

PROSECO

- Prospective seroprevalence coronavirus study (2020-2022)
- 30 000 participants from the Czech Republic
- Antibodies against SARS-CoV-2
- Three six-month-long periods (pandemic, vaccination, post-vaccination period)
- Rest of the samples in the biobank for further research

HAPIEE

- Czech Republic, Poland, Lithuania and Russia
- 30 000 participants aged 45-69 years
- Enrolled from 2002 to 2005; 3 waves of follow-up
- Association between rapid social and economic transition and population health
- Czech samples are stored in the CELSPAC biobank

communications medicine

ARTICLE

[Check for updates](#)

<https://doi.org/10.1038/s43856-022-00080-0> **OPEN**

Nationwide increases in anti-SARS-CoV-2 IgG antibodies between October 2020 and March 2021 in the unvaccinated Czech population

Pavel Piler^{1,8}, Vojtěch Thon^{1,8,23}, Lenka Andrášková¹, Kamil Doležel², David Kostka³, Tomáš Pavlík^{4,5}, Ladislav Dušek^{4,5}, Hynek Píkhart^{1,6}, Martin Bobák^{1,6}, Srdan Matic⁷ & Jana Klánová¹

Open access

Original research

BMJ Open Investigation of SARS-CoV-2 seroprevalence in relation to natural infection and vaccination between October 2020 and September 2021 in the Czech Republic: a prospective national cohort study

Vojtěch Thon,¹ Pavel Piler,¹ Tomáš Pavlík,² Lenka Andrášková,¹ Kamil Doležel,³ David Kostka,⁴ Hynek Píkhart,^{1,5} Martin Bobák,^{1,5} Jana Klánová¹

Study protocol | [Open Access](#) | [Published: 18 October 2026](#)

Determinants of cardiovascular disease and other non-communicable diseases in Central and Eastern Europe: Rationale and design of the HAPIEE study

Anne Peasey[✉], Martin Bobak, Ruzena Kubinova, Sofia Malyutina, Andrzej Pajak, Abdonas Tamosiunas, Hynek Píkhart, Amanda Nicholson & Michael Marmot

BMC Public Health 6, Article number: 255 (2006) | [Cite this article](#)

J Clin Endocrinol Metab, 2008 Mar; 93(3): 750–757.

PMCID: PMC2266962

Published online 2007 Dec 11. doi: [10.1210/jc.2007-0737](https://doi.org/10.1210/jc.2007-0737)

PMID: 18073316

The Relationship between Alcohol Consumption and Cortisol Secretion in an Aging Cohort

Elena Badrick, Martin Bobak, Annie Britton, Clemens Kirschbaum, Michael Marmot, and Meena Kumari

[Author information](#) [Article notes](#) [Copyright and License information](#) [Disclaimer](#)

J Clin Endocrinol Metab

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UPDATE 2019

Roadmap of Large Research Infrastructures of the Czech Republic for the years 2016-2022

Ministry of Education, Youth and Sports

1.6.3 Multi-domainal system

RECETOX Research Infrastructure



Acronym:

RECETOX RI

Hosting institution:
Masaryk University

Phase: constitutive

Character: single-site

Responsible person:
Prof. Jitka Klánová, Ph.D.

klanova@chem.muni.cz

Website:
rd.recetox.muni.cz/infra-en.php

Year of inclusion on the Czech Roadmap: 2010

Ministry:

Science in a healthy future

► 30

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Research Infrastructure

Characteristics

RECETOX RI enables research on both environmental and human health risks related to environmental contamination, and supports the safe management of chemicals. The existing and newly built capacities of the RECETOX RI core facilities offer a wide range of expertise needed for making environmental impact assessments for a variety of uses. They provide access to analytical, chemical, biological, and toxicological laboratories, the environmental monitoring networks [MONE](#) (Monitoring Networks), population studies [CERCA](#) (Central European Longitudinal Study of Parents and Children), and related data sources. They allow for the presentation of external data through the [Globe of Environmental Assessment and Information System](#) information databases. The capacities for data analysis, interpretation and modelling are available together with advanced bioinformatics and bioinformatics offering a portfolio of services to users from both the academic and private sectors in the Czech Republic and abroad. The comprehensive interdisciplinary approach taken by RECETOX RI is unique in the European context. RECETOX RI offers capacities for the assessment of environmental impacts on human health, a platform for the development of innovative methods, know-how and technology transfer, teaching and consulting. The education and training activities of RECETOX RI at all levels of higher education improve the quality and professional readiness of its graduates. The training courses, workshops, and the international summer schools are also organized for attendees from universities, research institutes, health facilities, industrial enterprises, regional and state authorities, ministries, governments and international organizations. RECETOX RI is associated with the Czech nodes of the AC TRIS (Aerol, Chem and Trace Gases Research Infrastructure), [ELIAS](#) (European Life Science Infrastructure for Biological Information), and [BIOBANK](#) (Biobanks and Biomolecular Resources Infrastructure) European research infrastructures. It coordinates the EREN (European Environmental Exposure Assessment Network) project for the updated [ESRN](#) Roadmap, and the [Globe of Environmental Assessment](#) initiative [Globe of Environmental Assessment System for Persistent Organic Pollutants](#). It also contributes to the implementation and management of joint European programmes such as [HBM4EU](#) (Human Biomonitoring for Europe) and [EUNITE](#) (European Network for Observing our Changing Planet).

Socio-economic benefits

RECETOX RI develops new approaches to assess the causal links between human exposure to toxic substances and the development of chronic diseases, and improves our understanding of the mechanisms of such interactions. It identifies toxic mixtures in the environmental samples, consumer products and human tissues, as well as sources of such chemical mixtures, their health effects and most vulnerable populations. It explores the links between these environmental exposures and individual genomic factors that affect the human health and allows for the prioritization and better targeting of the relevant legislation. It contributes to the better management of toxic chemicals, the safe production of food and consumer products, and safe waste processing. It enhances the protection of human health, the development of preventive measures, and sustainability of healthcare. It collaborates with [CERCA](#) (Central European Longitudinal Study of Parents and Children) and [MONE](#) (Monitoring Networks), and supports the implementation of the concepts of a circular economy and healthy smart cities. It also provides university education and builds international capacities for assessing environmental exposures.

RECETOX RI

Servis for excellent research

CELSPAC core facility
Accredited mass spectrometry labs
IT core facility



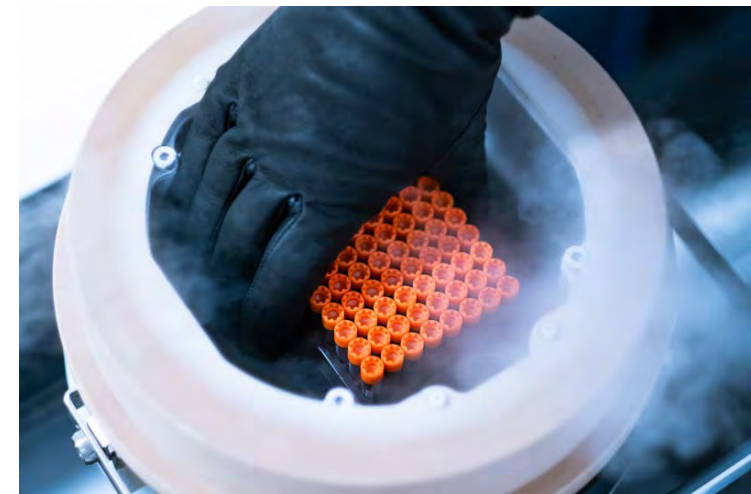
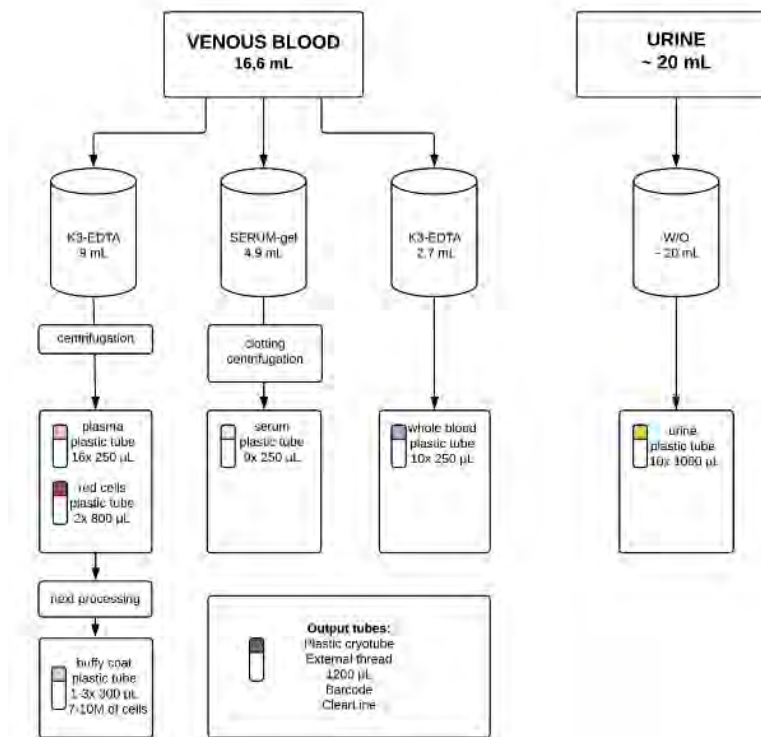
<https://www.vyzkumne-infrastruktury.cz/en/2019/11/update-of-roadmap-of-large-research-infrastructures-of-the-czech-republic/>

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CELSPAC BIOBANK

blood, urine, buccal swab, faeces, breast milk

- Collection, manual and automatic processing and long-term storage of various types of biological material according to validated SOPs in QA/QC mode
- Basic biochemical and immunological characterization of the sample
- Long-term archiving under monitored conditions

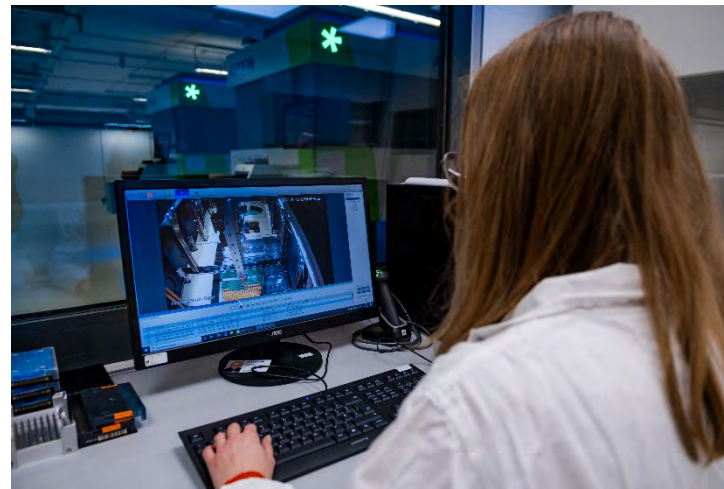


CELSPAC BIOBANK

automatic processing and storing

High-quality samples for future research

- Reduced human errors (barcodes, QR codes)
- SBS format for next automatic (pre-)analysis
- Reduced cryotube size = saves storing space
- Uniforming vs. fluctuated sample temperature
- High-throughput processing of samples



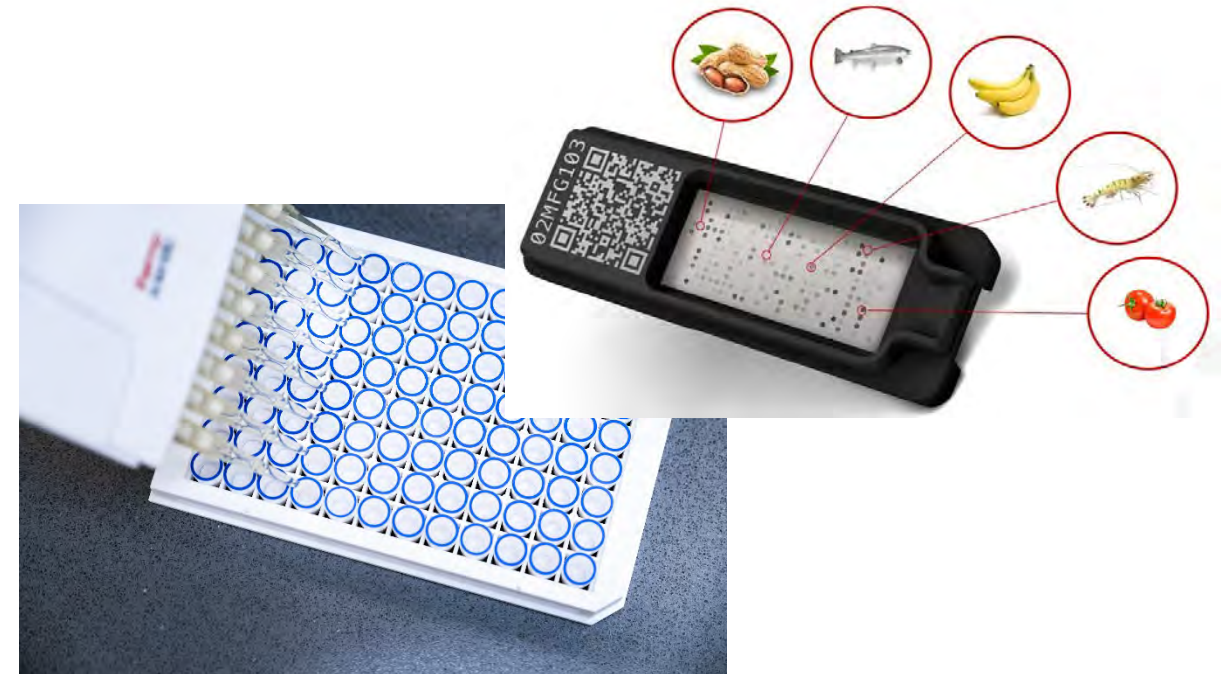
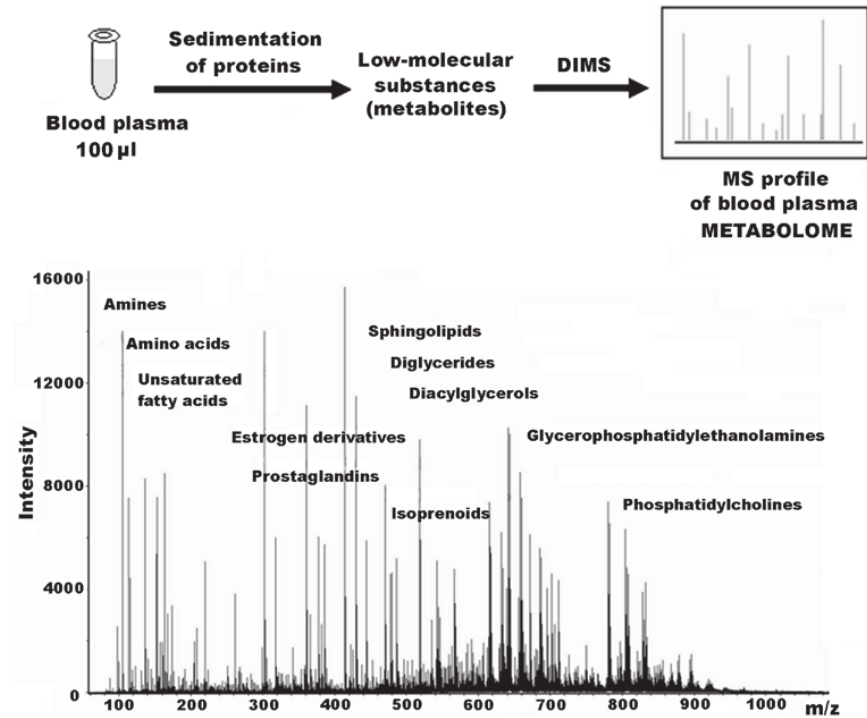
BIOMARKER ANALYTICAL LABORATORY

High-throughput quantitative assays for clinically relevant effect biomarkers.

MICROBIOME – METABOLOMICS – PROTEOMICS

LC-MS/MS, GC-MS/MS
Mass spectrometry labs

ELISA based multiplex
CELSPAC core facility



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ACCREDITED MASS SPECTROMETRY LABS

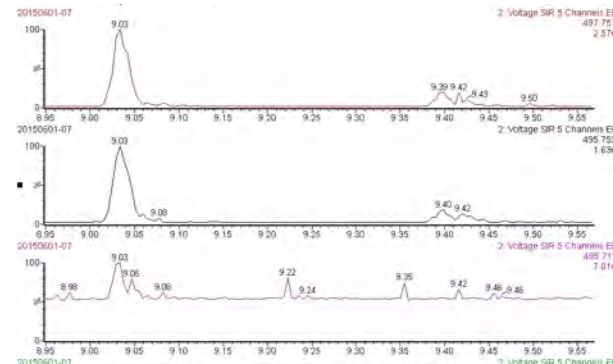
Organic pollutants:

- Polychlorinated dibenzo-*p*-dioxins/furans (PCDDs/Fs)
- Brominated and organophosphorus flame retardants
- Organochlorine, cyclodiene, and polar pesticides
- Polycyclic aromatic hydrocarbons (PAHs), NO_x-, and oxy-PAHs
- Perfluorinated compounds (PFAS)
- Pharmaceuticals and cosmetic products
- Bisphenols
- Thyroid hormones

Metabolites:

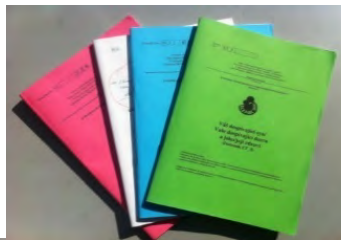
- OH-PAHs
- Phthalates metabolites + DINCH
- Pesticides metabolites

Trace elements, heavy metals, and species



DATA COLLECTION AND EXAMINATIONS

- Data management
 - Validated questionnaires
 - Health records
- Participant Management
 - PR activity
- Examinations
- IT Infrastructure



IMUNOLOGICKÉ OBTÍŽE

BYLO VÁM NĚKDY LÉKÁŘEM DIAGNOSOVÁNO:

Astma
 Ano Ne Nevím

Alergie - pyl, prach, roztoči
 Ano Ne Nevím

V kolika letech vám bylo onemocnění poprvé diagnostikováno:
 Ne Nevím

Bylo diagnostikováno toto onemocnění některým z následujících lékařů:
 Ano, užívání léčiv předepsaných lékařem Ano, h proved zákrok Ne Nevím

Léčila jste se v posledním roce pro toto onemocnění:
 Ano, užívání léčiv předepsaných lékařem Ano, h proved zákrok Ne Nevím

Alergie - potravinová
 Ano Ne Nevím

Alergie - léková
 Ano Ne Nevím

Alergie - kontaktní ekzém
 Ano Ne Nevím

Alergie - bodnutí hmyzem
 Ano Ne Nevím

Atopický ekzém
 Ano Ne Nevím

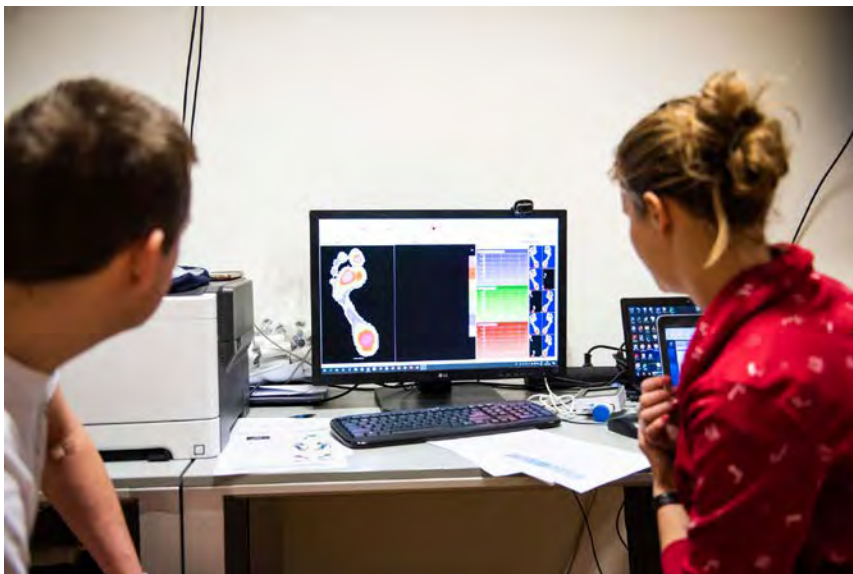
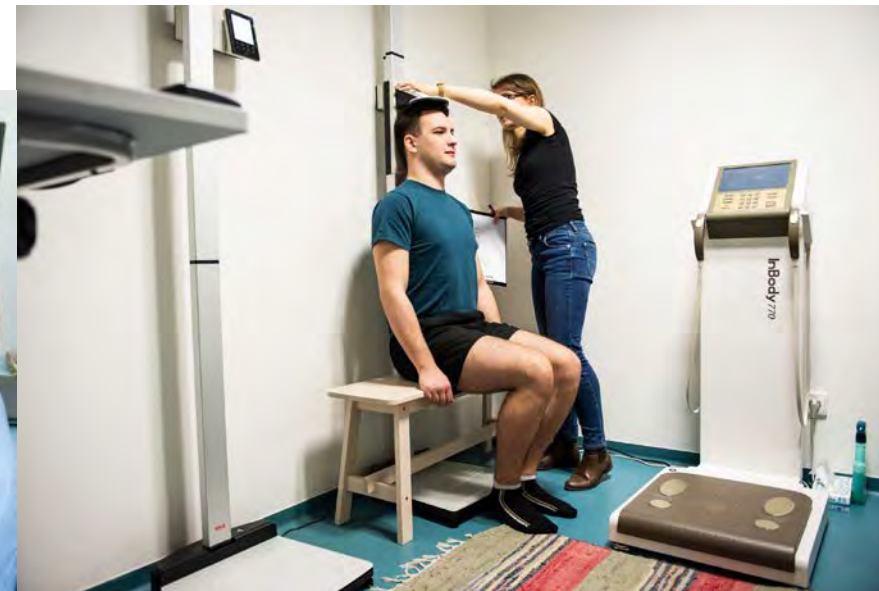
Pro mlsné jazyčky

Sladíte si čaj nebo kávu? Zaznamenejte, kolik lžiček cukru patří do Vašeho hrníčku! A pokud patříte mezi ty, kteří neodolají čokoládě a dalším nečokoládovým cukrovinkám, kam patří například oblíbení gumovi medvídci, neváhejte zaškrtnout pravdivou odpověď! My to na Vás nepovíme :-)

Cukr a sladkosti

Jak často sladíte a jak často jíte sladkosti, zmrzlinu?

	Více než 5x denně	3-4x denně	1-2x denně	5-6x týdně	2-4x týdně	1x týdně	1-3x měsíčně	Méně než 1x měsíčně	Nikdy
Cukr (lžička)									
Čokoláda (1/2 tabulky - 50 g)									
Zmrzlina, nanuky (kus - 50 g)									
Cukrovinky nečokoládové (1/4 balení - 25 g)									
Cukrovinky čokoládové (1/4 balení - 50 g)									



CONCLUSION

- The biobank is an important infrastructure for research on factors affecting human health.
- The automated biobank brings high-quality samples for multi-omics research.
- The biobank is not isolated but integrated entity.

CELSPAC core facilities provide these services:

- Datasets and samples from CELSPAC population studies
- Biobank capacity
- Analyses of environmental pollutants as well as metabolic/proteomic markers

Thank you for your kind attention

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