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OF BIALYSTOK

Medical University of Bialystok Metabolomics

Michał Ciborowski

Medical University of Bialystok

Clinical Research Centre

Clinical
Research
Centre

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Where are we?

University Clinical Hospital

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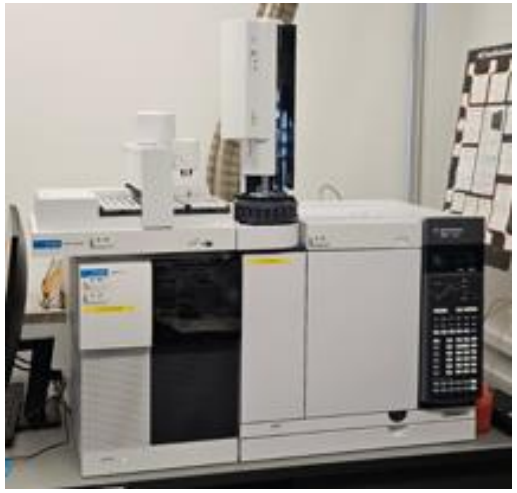
Mass Spectrometry-based metabolomics



GC-QQQ-MS (7000D, Agilent)

LC-Qtrap-MS (6500+, Sciex)

LC-QQQ-MS
(6495, Agilent)

LC-QTOF-MS
(6546, Agilent)

LC-QTOF-MS
(6545, Agilent)

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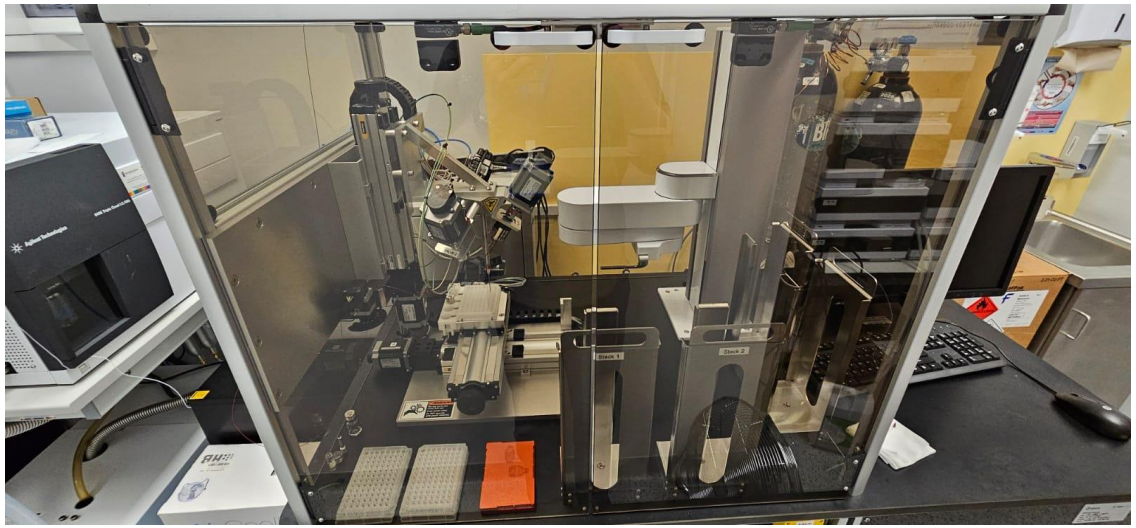
Sample treatment automation

RapidFire (400, Agilent)



Sample Prep Workbench (7696A, Agilent)

Hudson Solo SOL9 Automated Liquid Handler System

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Metabolomics Group

Sandra Chmielewska, MSc

Adrian Godlewski, MSc

Joanna Godzień, PhD

Wioleta Gosk, MSc

Dariusz Kiejza, MSc

Patrycja Mojsak, PhD

Karolina Pietrowska, PhD

Julia Siemińska, MSc

Krzysztof Sołowiej, MSc

"People acting together as a group can accomplish things which no individual acting alone could ever hope to bring about"

Franklin D. Roosvelt

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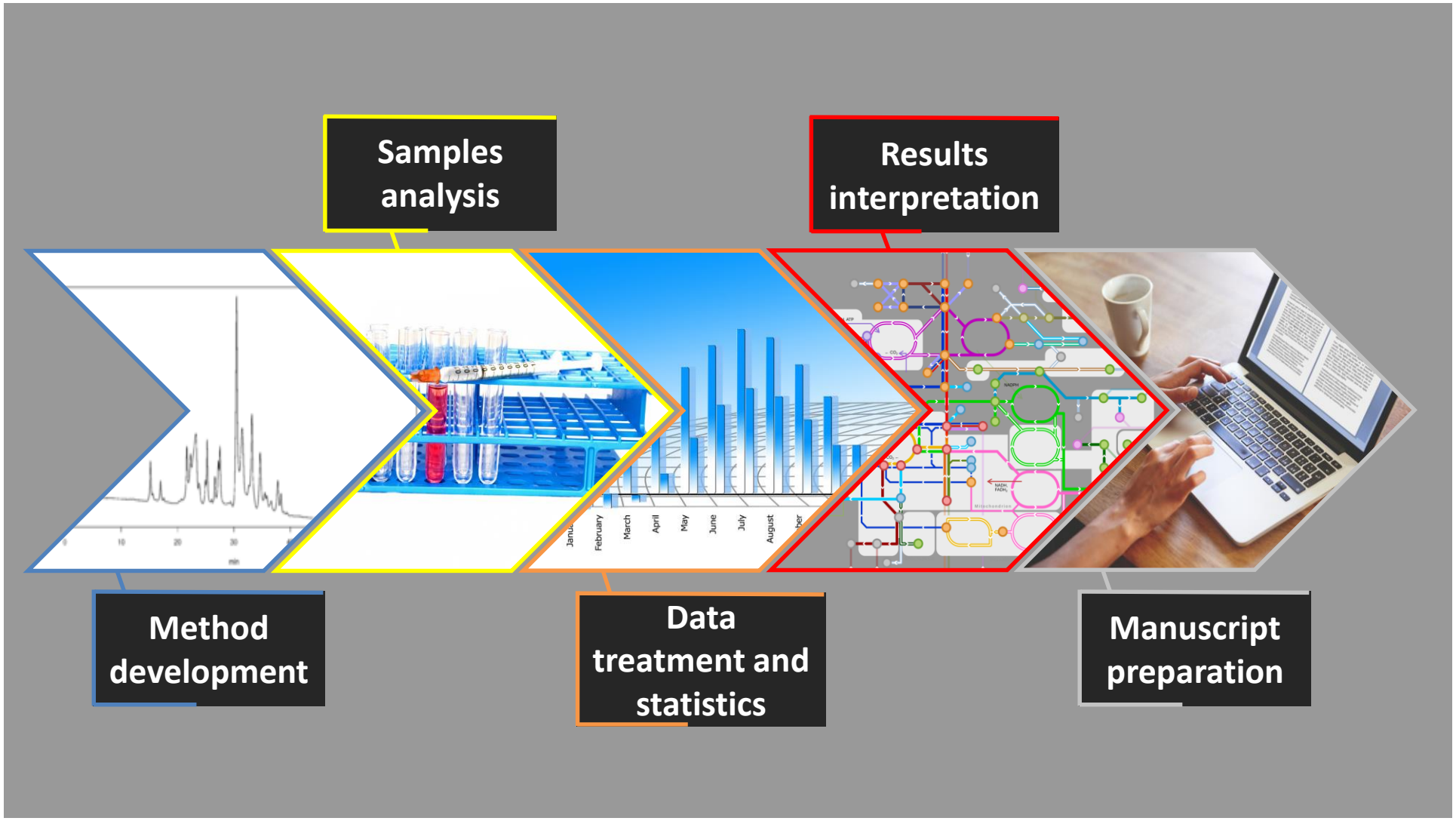
What do we do? – in general ☺



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LC-MS – untargeted metabolomics

Agilent 6545 LC-QTOF
Agilent 6546 LC-QTOF

LC-QTOF-MS

Metabolic fingerprinting – untargeted metabolomics

- Plasma/urine fingerprinting
- Cells fingerprinting
- Tissue fingerprinting
- Aqueous/vitreous Humor fingerprinting

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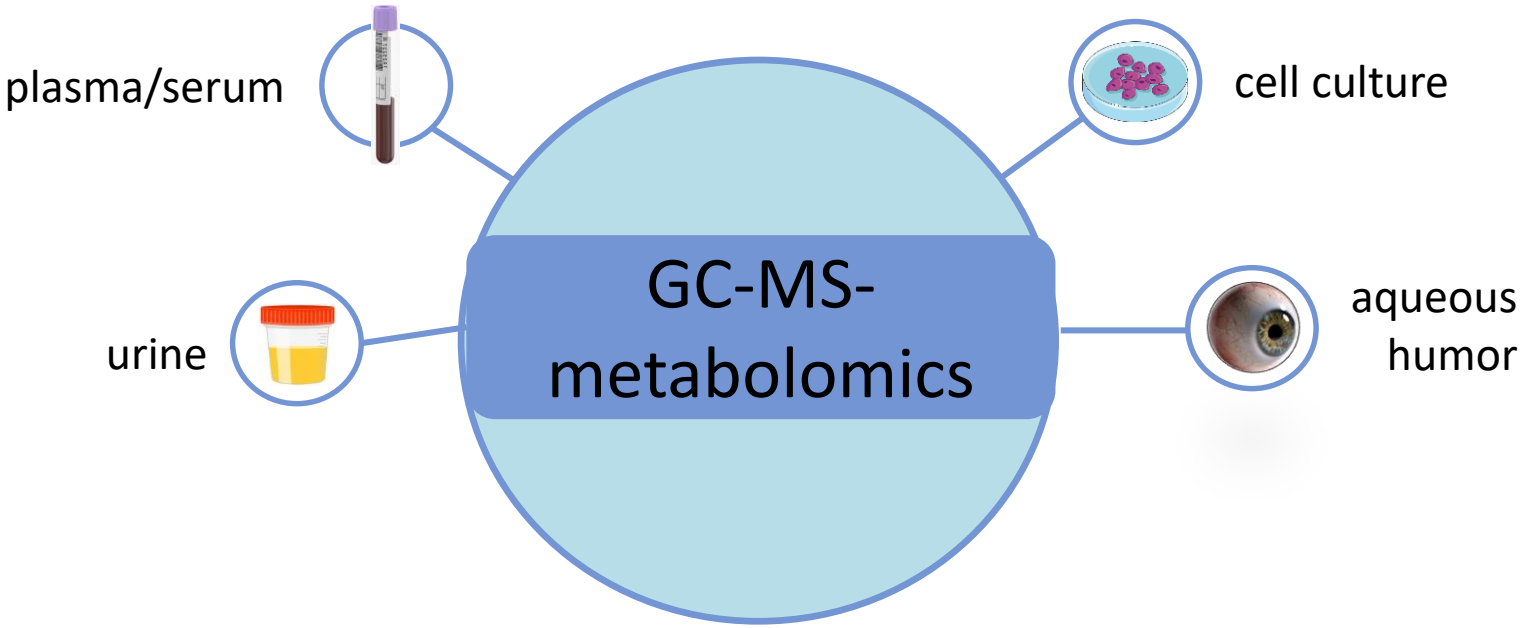
GC-MS – targeted and untargeted metabolomics

Agilent GC-QQQ,
GC-7830B, MS-7000



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LC-MS – targeted metabolomics

LC-QQQ-MS (Agilent 6495)

Targeted metabolomics – quantitative measurement of metabolites

- Atorvastatin and its metabolites
- Metformin
- Endocannabinoids

- Semaglutide
- Arachidonic acid and its metabolites

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Targeted metabolomics – commercial kits

LC-QTrap 6500+
Targeted metabolomics – Biocrates

	Sample analysis	Data treatment	Identification
Standard metabolomics	Few days	Few months	
Biocrates	2-3 days	1-2 days	

2020 → 2023

First analyses using **AbsoluteIDQ® p180** kit

First analyses using **MxP® Quant 500** and **MxP® Quant 500XL** kits

biocrates
The future of research and health

MxP®Quant 500 XL kit	1 019 metabolites
MxP® Quant 500 kit	630 metabolites
AbsoluteIDQ® p180 kit	188 metabolites

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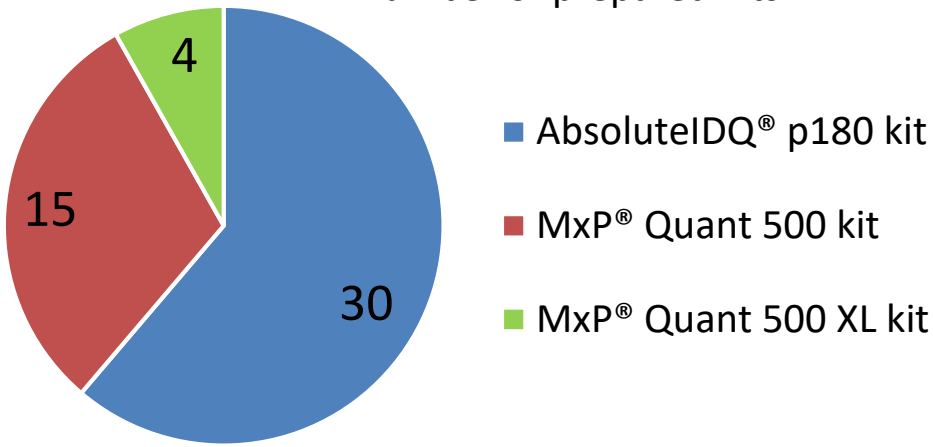
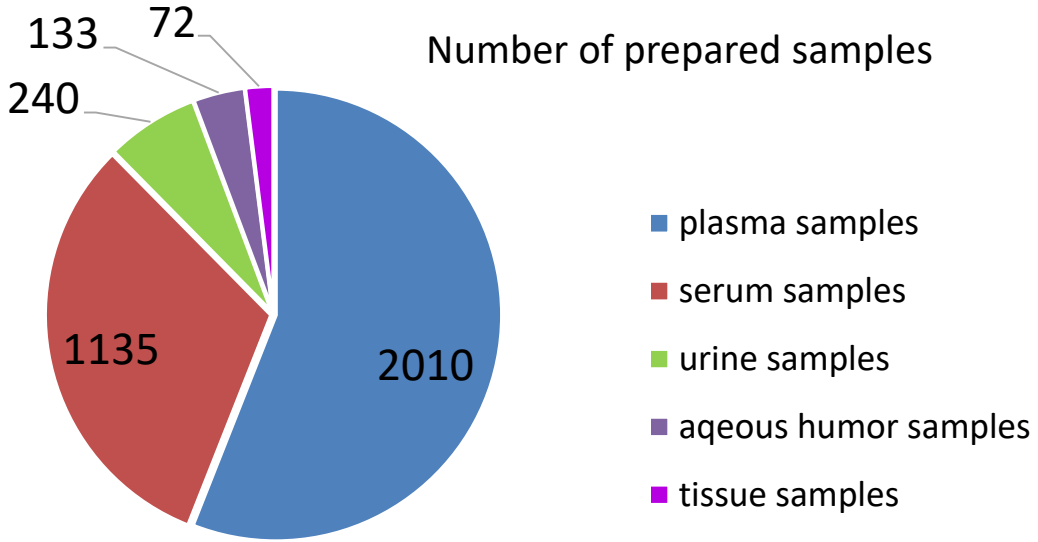
Since February 2024 - Certified laboratory of Biocrates

biocrates
The future of research and health

Number of prepared kits



Number of prepared samples



Certificate

biocrates life sciences ag
recognizes that

Metabolomics Laboratory
Clinical Research Centre
Medical University of Bialystok
M. Skłodowskiej-Curie 24a
15-276 Bialystok, Poland

has passed the certification criteria for partner laboratories through a comprehensive evaluation and can title itself as a

Certified laboratory of biocrates

for

- MxP® Quant 500 XL kit
- MxP® Quant 500 kit
- AbsoluteIDQ® p180 kit

Scope

- Quantitative analysis of biological samples with biocrates kits
- Standardized laboratory and kit workflow procedures
- Continuous instrumental performance evaluation
- Validated metabolite quantification and quality assessment
- Results reported in accordance with biocrates quality standards

Certified on 2024-02-05
Valid until 2025-02-05

biocrates CEO

biocrates support specialist

biocrates life sciences ag | Eduard-Bodem Gasse 8 | A-6020 Innsbruck | biocrates.com

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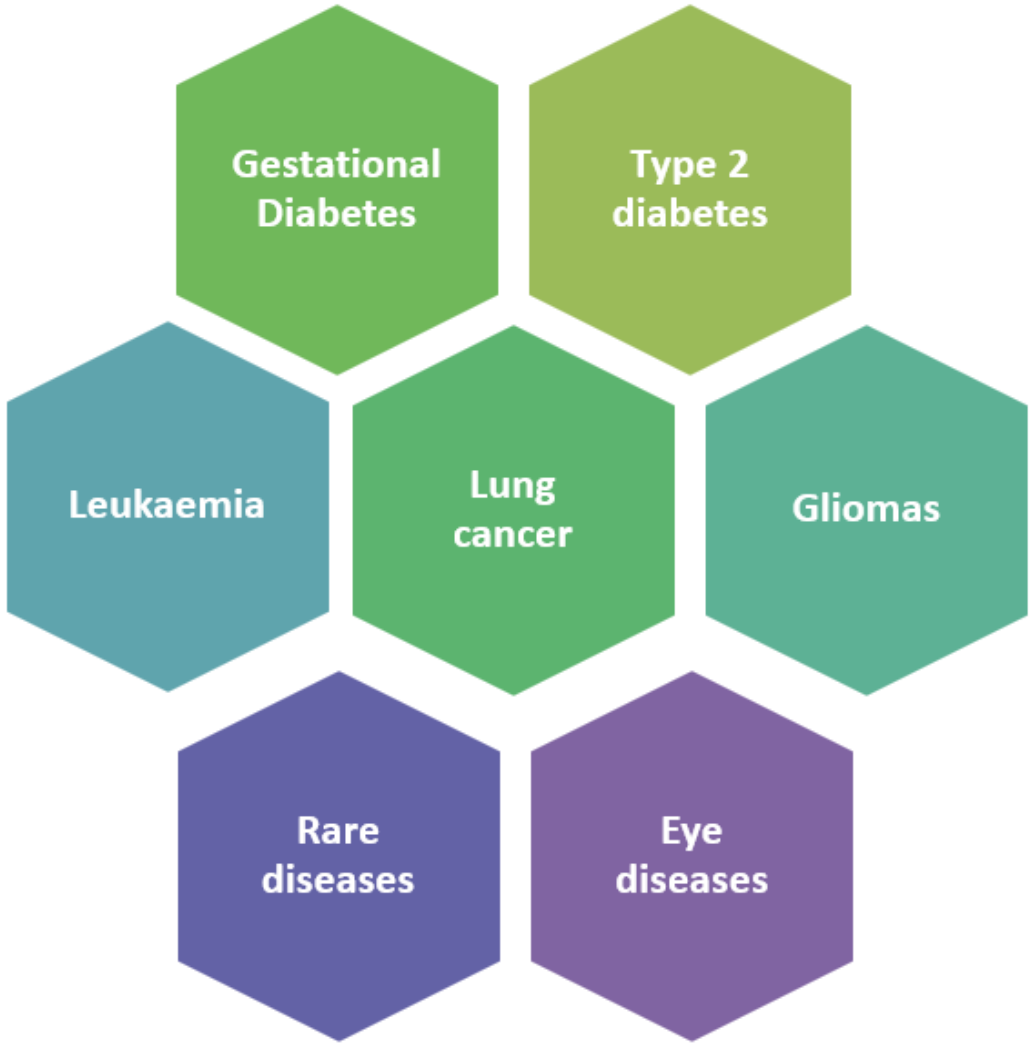
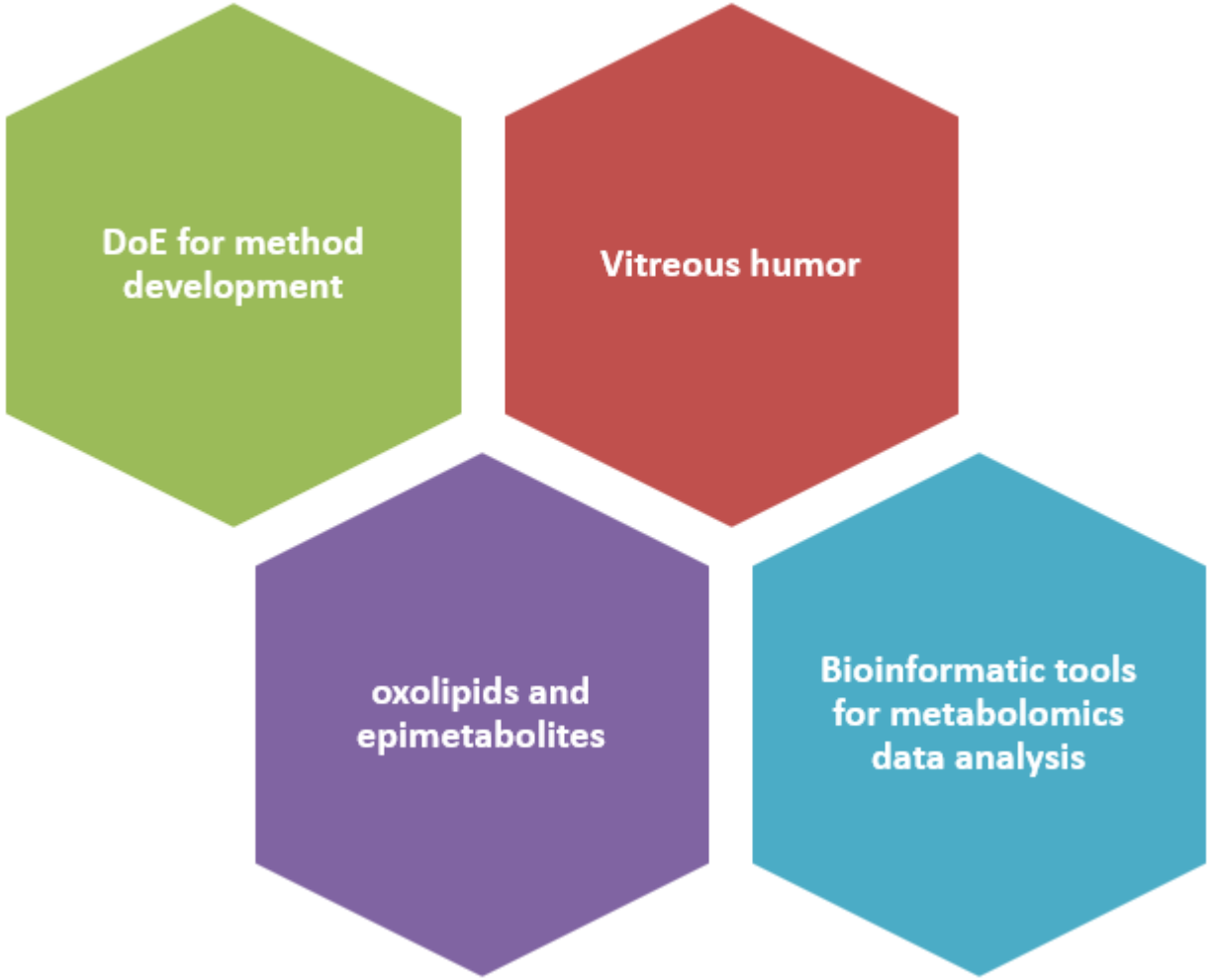
Current research areas

Medical



non-Medical



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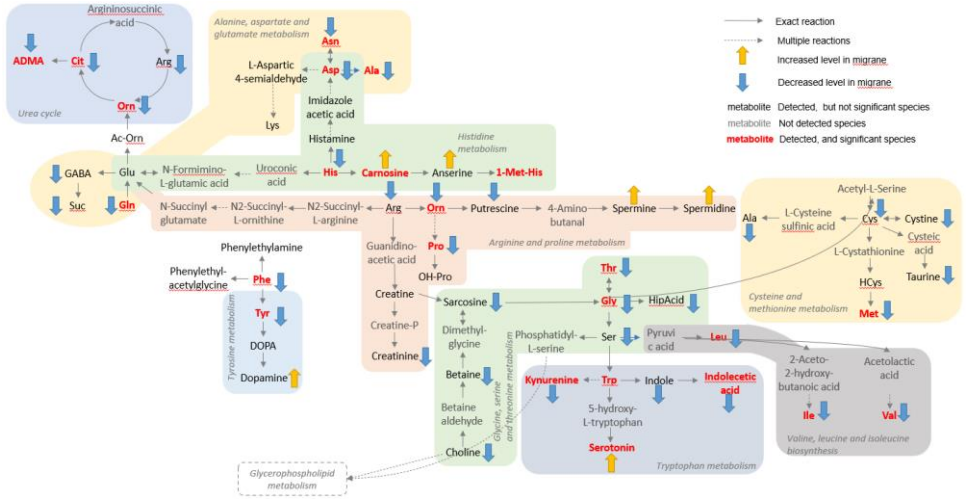
Bioinformatics



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Jarosław Chilimoniuk, PhD
Krystyna Grzesiak, MSc

Valentin Iglesias, PhD
Dawid Kubkowski, BSc
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https://imputomics.umb.edu.pl/

imputomics: web server and R package for missing values imputation in metabolomics data

Jarosław Chilimoniuk, Krystyna Grzesiak, Jakub Kała, Dominik Nowakowski, Adam Krętowski, Rafał Kolenda, Michał Ciborowski, Michał Burdukiewicz ✉ Author Notes

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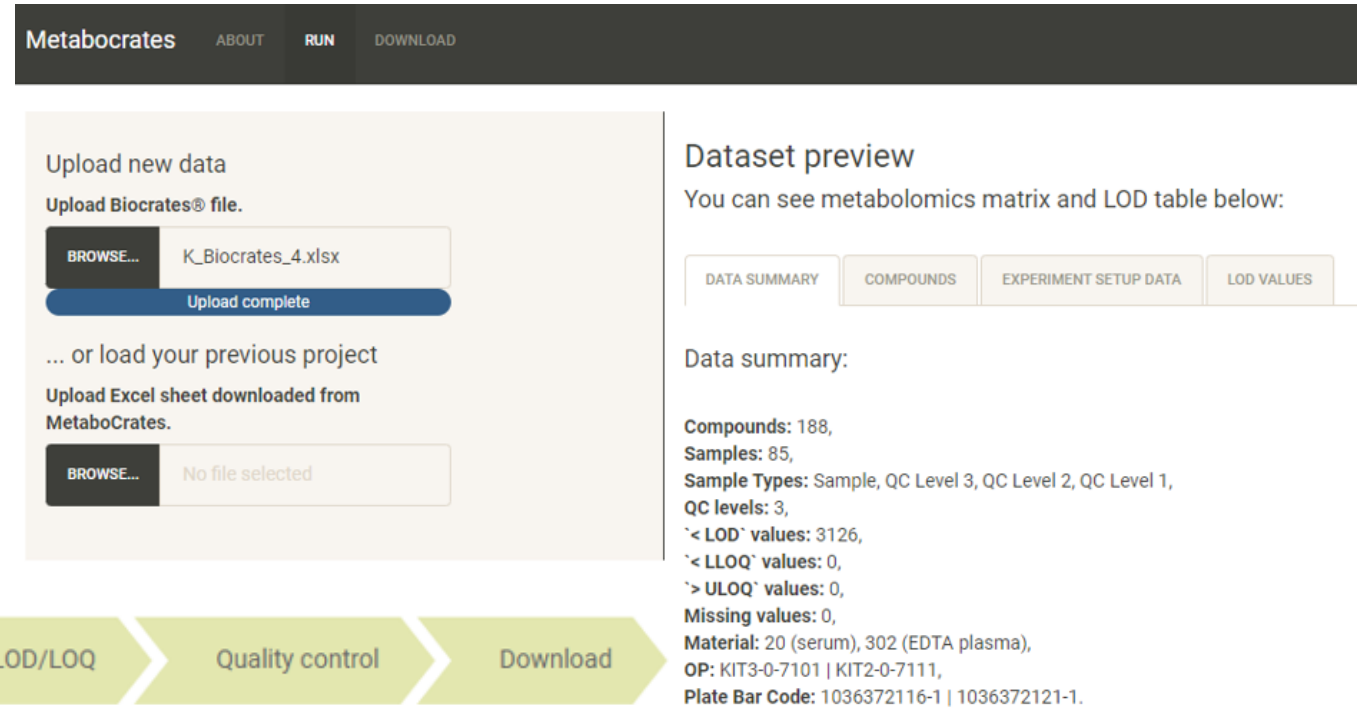

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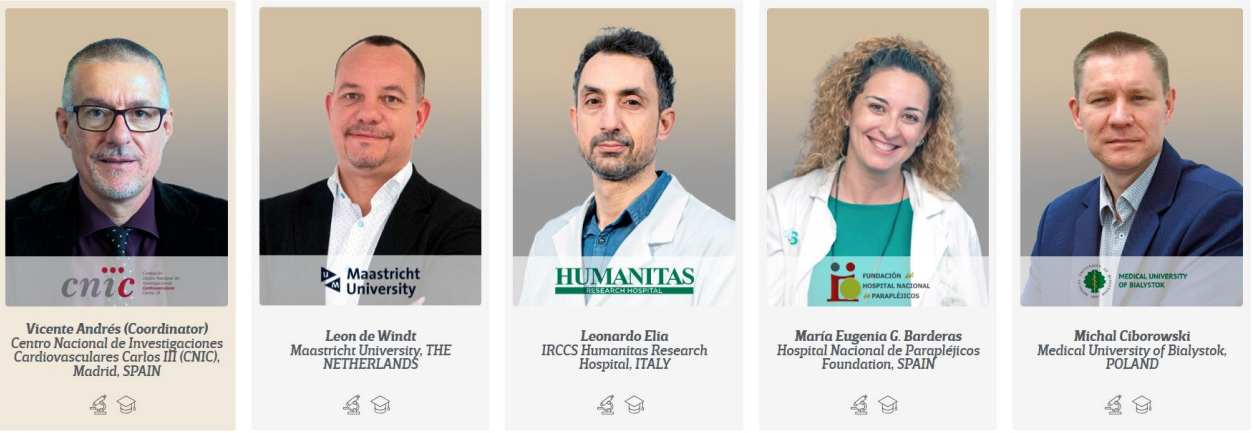
Collaborations

Identification of biomarkers to monitor the progression of Hutchinson-Gilford progeria syndrome

European Joint Progamme Rare Diseases 2022: "Development of new analytic tools and pathways to accelerate diagnosis and facilitate diagnostic monitoring of rare diseases"

EUROPEAN JOINT PROGRAMME RARE DISEASES



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Maastricht University, THE NETHERLANDS

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CEU
Centro de Excelencia en Metabolómica y Bioanálisis CEMBIO
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Coral Barbas

L-Università ta' Malta

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Thank you

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The most relevant papers in the last 5 years

1: Godzien J, et al. Probiotic Lactobacillus plantarum 299v supplementation in patients with major depression in a double-blind, randomized, placebo-controlled trial: A metabolomics study. **J Affect Disord. 2025**; 368:180-190.

2: Burdukiewicz M, et al. ML-based clinical decision support models based on metabolomics data. **TRAC-Trend Anal Chem. 2024**, 178: 117819.

3: Godzien J et al. Metabolic profiling reveals the nutraceutical effect of Gongolaria abies-marina and Rosmarinus officinalis extracts in a type 1 diabetes animal model. **Biomed Pharmacother. 2024**; 175:116731.

4: Drygalski K, et al. Extracellular matrix hyaluronan modulates fat cell differentiation and primary cilia dynamics. **Biochim Biophys Acta Mol Cell Biol Lipids. 2024**; 1869(4):159470.

5: Chilimoniuk J, et al. imputomics: web server and R package for missing values imputation in metabolomics data. **Bioinformatics. 2024**; 40(3):btae098.

6: Sieminska J, et al. A single extraction 96-well method for LC-MS/MS quantification of urinary eicosanoids, steroids and drugs. **Prostaglandins Other Lipid Mediat. 2024**; 170:106789.

7: Pienkowski T, et al. Glioma and post-translational modifications: A complex relationship. **Biochim Biophys Acta Rev Cancer. 2023**; 1878(6):189009.

8: Pietrowska K, et al. Adaptation of the AbsoluteIDQ p180 kit to the analysis of metabolites in the human aqueous humor. **J Chromatogr B Analyt Technol Biomed Life Sci. 2023**; 1229:123880.

9: Godlewski A, et al. A comparison of different machine-learning techniques for the selection of a panel of metabolites allowing early detection of brain tumors. **Sci Rep. 2023**; 13(1):11044.

10: Pienkowski T, et al. Proteomics and metabolomics approach in adult and pediatric glioma diagnostics. **Biochim Biophys Acta Rev Cancer. 2022**; 1877(3):188721.

11: Małachowska B, et al. Elevated level of lysophosphatidic acid among patients with HNF1B mutations and its role in RCAD syndrome: a multiomic study. **Metabolomics. 2022**; 18(3):15.

12: Krupska O, et al. Hippocampal Sector-Specific Metabolic Profiles Reflect Endogenous Strategy for Ischemia-Reperfusion Insult Resistance. **Mol Neurobiol. 2021**; 58(4):1621-1633.