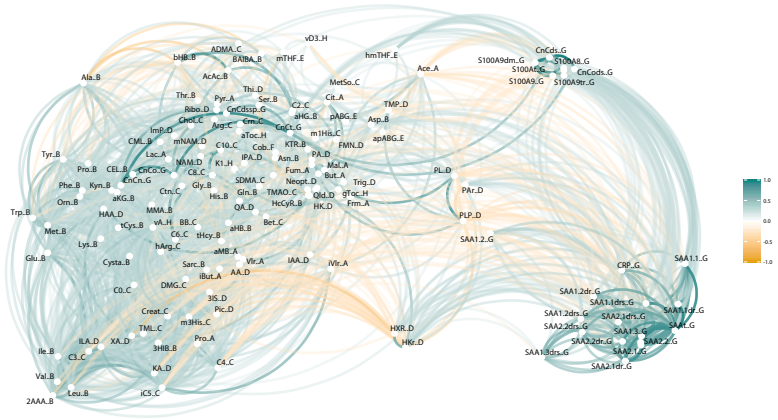
BEVITAL

Assessment of Disease Risk by Targeted Metabolomics



High precision data

BEVITAL's methods have been developed by our scientists and technicians, and have been published in leading scientific journals within the fields of analytical technology. BEVITAL's analytical repertoire covers high to low abundance biomarkers which are quantified by targeted metabolomics. Our methods use authentic isotope-labelled internal standards which deliver highly precise biomarker quantification with superior CVs in comparison to methods based on non authentic standards.

Disease related biomarkers and comprehensive coverage of whole pathways

The analytical repertoire of BEVITAL covers defined, cross-talking pathways, cofactors involved, and biomarkers reflecting key lifestyle factors, nutritional status, kidney and endothelial function, and inflammation. Biomarkers are allocated to complementary platforms characterized by multiplexing, high capacity, large dynamic range, and low volume consumption to save precious biobank material. More than 130 biomarkers are measured in less than 500 µL.

Scientific support from analysis planning to data interpretation

Most scientists at BEVITAL have for decades been involved in scientific projects and can provide academic support, including collaboration and contributions to writing of funding applications and scientific articles. If requested, we also offer support in statistical data analysis using sophisticated methods based on R and Shiny apps.

Track record in international, EU-, and NIH-funded projects

BEVITAL was founded in 2003 by members of a research group with more than 25 years experience in bioanalytical technology, including chromatography and mass spectrometry. BEVITAL has been partner in several international projects that involve instrument development, establishment of new technologies, and their application in large epidemiological projects, such as the lung cancer consortium (LC3).

Platform specifications

Technology (n):	GC-MS/MS (2) , LC-MS/MS (5), MALDI-TOF MS (1), Microbiological (1)
Sample type:	Serum and plasma; cerebrospinal fluid, urine, and whole blood for selected biomarkers
Sample volume:	15 - 500µL, depending on number of platforms
Number of biomarkers:	137
Quantification:	Absolute biomarker quantification from pM to mM
Between-run precision (median):	2.7% on GC-MS/MS and 4.4-5.9% on LC-MS/MS

Vitamins & Lifestyle

B vitamins

- Cobalamin
- Folate species and catabolites
- Folate, erythrocyte
- Folate, serum
- Functional B6 marker, HK:XA
- Functional B6 marker, HKr
- HCC index
- mNAM
- RBC-folate as pABG equivalents
- Serum folate as pABG equivalents
- Vitamin B1
- Vitamin B2 (riboflavins)
- Vitamin B3
- Vitamin B6 species

Fat soluble vitamins

- A vitamer
- D vitamers
- E vitamers
- K vitamers

Folate and cobalamin

- Cobalamin
- Folate, erythrocyte
- Folate, serum
- HCC index
- Homocysteine
- Methylmalonic acid
- RBC-folate as pABG equivalents
- Serum folate as pABG equivalents

Meat and fish

- 1-Methylhistidine
- 3-Methylhistidine
- Trimethylamine-N-oxide
- β-Alanine

Tobacco and coffee

- 3-Hydroxycotinine
- Cotinine
- Trigonelline

Pathology & Physiology

Diabetes

- 2-Aminoadipic acid
- 2-Hydroxybutyrate
- 3-Hydroxybutyrate
- 3-Hydroxyisobutyrate
- Acetoacetate
- Branched-chain amino acids
- HbA1c
- Imidazole propionate

Endothelial function

- Arginine
- Asymmetric dimethylarginine
- Homoarginine
- Symmetric dimethylarginine

Inflammation

- C-reactive protein
- Calprotectin and variants
- Kynurenine/tryptophan ratio
- Neopterin
- PAr index
- Serum amyloid A and variants

Keton bodies

- 3-Hydroxybutyrate
- Acetoacetate

Liver pathology

- Amino acid ratios

Neuroactive

- 3-Hydroxykynurenine
- Kynurenic acid
- Picolinic acid
- Quinolinic acid

Oncometabolites

- Fumarate
- α-Hydroxyglutaric acid
- Lactate
- Succinate

Renal function

- Creatinine
- Cystatin C and variants
- Symmetric dimethylarginine

Uremic toxin

- 3-Indoxyl sulfate

AGEs

- Carboxyethyllysine
- Carboxymethyllysine

Amino acids and metabolites

- 1-Methylhistidine
- 2-Aminoadipic acid
- 3-Hydroxyisobutyrate
- 3-Methylhistidine
- Arginine
- Citrulline
- Cysteine
- Glycine
- Histidine
- Imidazole propionate
- Methionine
- Methionine sulfoxide
- Ornithine
- Other amino acids
  Aspartic acid (Asp), glutamic acid (Glu), lysine (Lys), alanine acid (Ala), phenylalanine (Phe), isoleucine (Ile), leucine (Leu), proline (Pro), valine (Val), asparagine (Asn), glutamine (Gln), threonine (Thr), and tyrosine (Tyr).
- Serine
- Tryptophan
- β-Aminoisobutyrate

Acylcarnitines

- Carnitine
- Carnitine, total
- Short-, medium-, and long-chain acylcarnitines

Metabolites & Pathways

Choline oxidation pathway

- Betaine
- Choline, free
- Choline, total
- Dimethylglycine
- Glycine
- Sarcosine
- Serine
- Trimethylamine-N-oxide

Citric acid cycle

- Citrate
- Fumarate
- Isocitrate
- Lactate
- Malate
- Pyruvate
- Succinate
- α-Hydroxyglutarate
- α-Ketoglutarate

Microbiota-derived

- 3-Indoxyl sulfate
- Imidazole propionate
- Indole-3-acetamide
- Indole-3-acetate
- Indole-3-aldehyde
- Indole-3-lactate
- Indole-3-propionate
- Short-chain fatty acids
  Trimethylamine-N-oxide

One carbon metabolism

- Betaine
- Choline, free
- Cobalamin
- Dimethylglycine
- Folate, erythrocyte
- Folate, serum
- Formate
- Glycine
- HCC index
- Homocysteine
- Methionine
- Methylmalonic acid
- RBC-folate as pABG equivalents
- Sarcosine
- Serine
- Serum folate as pABG equivalents

Transsulfuration

- Cystathionine
- Cysteine

Tryptophan metabolites

- 3-Indoxyl sulfate
- Indole-3-acetamide
- Indole-3-acetate
- Indole-3-aldehyde
- Indole-3-lactate
- Indole-3-propionate
- Kynurenine
- Kynurenines
- Tryptophan

Urea cycle

- Arginine
- Aspartate
- Citrulline
- Ornithine

Others

- Creatine
- Trimethyllysine

Platform A — GC-MS/MS

Short-chain fatty acids.

Sample vol.: 50 µL

Concentrations in µmol/L

- Acetate
- Butyrate
- Formate
- Isobutyrate
- Isovalerate
- Propionate
- Valerate
- α-Methylbutyrate

Platform B — GC-MS/MS

TCA metabolites and intermediates. Amino and carboxylic acids.

Sample vol.: 50 µL

Concentrations in µmol/L

- 2-Aminoadipic acid
- 2-Hydroxybutyrate
- 3-Hydroxybutyrate
- 3-Hydroxyisobutyrate
- Acetoacetate
- Carboxyethyllysine
- Carboxymethyllysine
- Citrate
- Cystathionine
- Fumarate
- Glycine
- Histidine
- Isocitrate
- Kynurenines
- Lactate
- Malate
- Methionine
- Methylmalonic acid
- Ornithine
- Other amino acids: Aspartic acid (Asp), glutamic acid (Glu), lysine (Lys), alanine acid (Ala), phenylalanine (Phe), isoleucine (Ile), leucine (Leu), proline (Pro), valine (Val), asparagine (Asn), glutamine (Gln), threonine (Thr), and tyrosine (Tyr).
- Pyruvate
- Sarcosine
- Serine
- Total cysteine
- Total homocysteine
- Tryptophan
- α-Hydroxyglutaric acid
- α-Ketoglutarate
- β-Alanine
- β-Aminoisobutyrate

Platform I — LC (HILIC)-MS/MS

Short-, medium-, and long-chain acylcarnitines.

New platform under development

Platform C — LC-MS/MS

Choline derivates. Charged, methylated or sulfur amino acids. Short- and medium-chain acylcarnitines.

Sample vol.: 35 µL

Concentrations in µmol/L

- 1-Methylhistidine
- 3-Methylhistidine
- Arginine
- Asymmetric dimethylarginine
- Betaine
- Carnitine
- Carnitine, total
- Choline
- Choline, total
- Citrulline
- Creatine
- Creatinine
- Dimethylglycine
- Histidine
- Homoarginine
- Methionine
- Methionine sulfoxide
- Short- and medium-chain acylcarnitines
- Symmetric dimethylarginine
- Total cysteine
- Total homocysteine
- Trimethylamine N-oxide
- Trimethyllysine

Platform D — LC-MS/MS

Kynurenine pathway and B vitamins (B1, B2, B3, B6).

Sample vol.: 60 µL

Concentrations in µmol/L (*) or nmol/L

- 4-Pyridoxic acid
- Cotinine
- Cystathionine*
- Flavin mononucleotide
- Imidazole propionate*
- Kynurenines*
- Microbiota-derived indoles
- N1-methylnicotinamide
- Neopterin
- Nicotinamide
- Nicotinic acid
- Pyridoxal
- Pyridoxal 5-phosphate
- Pyridoxine
- Riboflavin
- Succinate
- Thiamine
- Thiamine monophosphate
- Trans-3-hydroxycotinine
- Trigonelline*
- Trimethylamine N-oxide*
- Tryptophan*
- Derived indexes:
  HK:XA ratio
  HKr
  Kyn/Trp ratio
  PAr

Platform E — LC-MS/MS

Folate species and catabolites.

Sample vol.: 60 µL

Concentrations in nmol/L

- 4-Alfa-hydroxy-5-methyl-THF
- 5-Formyl-tetrahydrofolate
- 5-Methyl-tetrahydrofolate
- Acetamidobenzoylglutamate
- Folic acid
- Para-aminobenzoylglutamate
- RBC-folate as pABG equivalents
- Serum folate as pABG equivalents

Platform F — Microbiological assay

Folate (B9) and cobalamin (B12).

Sample vol.: 15–35 µL

Concentrations in nmol/L or pmol/L (*)

- Erythrocyte folate
- Serum cobalamin*
- Serum folate

Platform G — MALDI-TOF MS

Proteins and proteoforms.

Sample vol.: 30 µL

Concentrations in µmol/L

- C-reactive protein
- Calprotectin and variants
- Cystatin C and variants
- HbA1c
- Serum amyloid A and variants

Platform H — LC-MS/MS

Lipid-soluble vitamins and long-chain acylcarnities.

Sample vol.: 50–100 µL

Concentrations in µmol/L or nmol/L (*)

- 25-hydroxy vitamin D2*
- 25-hydroxy vitamin D3*
- All-trans retinol
- Long-chain acylcarnitines
- Phylloquinone*
- α-tocopherol
- γ-tocopherol