

Targeted Small Molecules Analysis at ARC-BIO center

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Contact us: <https://www.research.colostate.edu/pmf/team/>

- **Phytohormones** in leaf, rachis, root, bud, grain
trans-zeatin (tZ), trans-zeatin riboside (tZR), indole-3-acetamide (IAM), indole-3-acetyl-alanine (IAA-ala), indole-3-carboxylic acid (ICA), indole-3-acetic acid (ICA), indole-3-acrylic acid (IAcRA), indole-3-butyric acid (IBA), indole-3-acetonitrile (IAN), jasmonic acid (JA), dihydrophaseic acid (DPA), gibberellic acid GA3 (GA3), phaseic acid (PA), salicylic acid (SA), abscisic acid (ABA), gibberellic acid GA4 (GA4), 12-oxo-phytodienoic acid (OPDA), indole-3-acetic acid (IAA)
Note: The compounds on the phytohormone panel change with the availability of commercial standards.
- **Uremic toxins** in serum
trimethylamine N-oxide (TMAO), indoxyl sulfate, p-cresol sulfate
- **Cannabinoids**
 - In plasma/serum: cannabidiol (CBD), cannabidiolic acid (CBDA), delta-9-tetrahydrocannabinol (delta-9-THC)
 - In plant tissues: cannabichromeorcin (CBCO), cannabichromevarin (CBCV), cannabidivarin (CBDV), tetrahydrocannabivarin (THCV), cannabinol (CBN), cannabichromene (CBC), cannabidiol (CBD), cannabicyclol (CBL), delta-8-tetrahydrocannabinol (delta-8-THC), delta-9-tetrahydrocannabinol (delta-9-THC), cannabigerol (CBG), cannabidivarinic acid (CBDVA), cannabinolic acid (CBNA), cannabichromenic acid (CBCA), cannabidiolic acid (CBDA), cannabicyclic acid (CBLA), delta-9-tetrahydrocannabinolic acid (delta-9-THCA), cannabigerolic acid (CBGA)
Note: method development in progress
- **Drugs/antibiotics** in whole blood/plasma
cefepime, flucloxacillin, vancomycin
- **Circadian rhythm related neurotransmitter and hormones** in plasma/serum
melatonin, serotonin, cortisol
- **Sex hormones** in plasma/serum
estradiol, progesterone, testosterone, dihydrotestosterone (DHT), dehydroepiandrosterone sulfate (DHEA-S)
Note: method development in progress
- **Tryptophan metabolites**
 - In feces: 5-hydroxyindole-3-acetic acid (5-HIAA), melatonin, Serotonin, anthranilic acid, indole-3-propionic acid (IPA), 3-methylindole, tryptophan, kynurenic acid, kynurenine, tryptamine, indole-3-acetic acid (IAA)

- In plant root: tryptophan, indole-3-acetic acid (IAA), indole-3-pyruvic acid (IPyA)
- **Bile acids in feces**
 serotonin, tryptamine, taurocholic acid (TCA), taurodeoxycholic acid (TDCA), β -muricholic Acid ((5 β)-3 α ,6 β ,7 β -trihydroxy-cholan-24-oic acid), glycocholic acid (GCA), 3-oxocholic acid (OCA), ursodeoxycholic acid (UDCA), hyodeoxycholic acid (HDCA), nutriacholic acid (NCA), glycodeoxycholic acid (GDCA), glycochenodeoxycholic acid (GCDCA), cholic acid (CA), 7 α -hydroxy-3-oxo-5 β -cholanoic acid (OCDCA), cholonic acid (3 β -hydroxy-5-cholenoic acid), chenodeoxycholic acid (CDCA), deoxycholic acid (DCA), lithocholic acid (LCA)
- **Thyroid hormones in meat ingredients**
 Triiodothyronine (T3), thyroxine (T4)
- **Amino acids in plant tissues, biofluids, cell extracts**
- **Short chain fatty acids**
 - In plasma/serum: acetate, propionate, butyrate
 - In feces: acetate, propionate, butyrate, isobutyrate, valerate, isovalerate
- **Fatty acids**
 - Standard/common fatty acids: palmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1*cis*), linoleic acid (C18:2), linolenic acid (C18:3), arachidic acid (C20:0)
Note: We can add most of the non-conjugated saturated/unsaturated fatty acids from C12:0 to C24:0 including EPA (C20:5 ω 3) and DHA (C22:6 ω 3) to the standard panel.
 - Conjugated linoleic acids (CLA)
- **Mono- and disaccharides**
 In root exudates: arabinose, xylose, glucose, mannose, galactose, sucrose, maltose, trehalose
- **Photorespiration metabolites in leaf tissues**
 Glyceric acid, glycolic acid, glycine, phosphoglycolic acid, glyoxylic acid, hydroxypyruvic acid, glutathione (by LC-MS/MS)
- **Ethyl carbamate (urethane) in plasma and ethanol distillers' grain co-products**
- **Organic acids in plant tissues, root exudate, biofluids**
- **Nutrition biomarkers in plasma, urine, stool**
 Pipecolic acid, methyl pipecolate, S-methyl-L-cysteine, S-methyl cysteine sulfoxide, trigonelline, pyridoxal, xanthurenic acid, apigenin, salicylic acid, myo-inositol, salicyluric acid

- **Central carbon metabolism** (See Table 1)

Note: Profiling of all the compounds involved in central carbon metabolism is semi-quantitative or nontargeted (i.e., peak intensities are reported). Absolute quantification (i.e., ng/mL) is available for custom subsets if internal standards are available.

Table 1. Central carbon metabolism or other small polar molecules assays

Amino acids and related	Alanine, Arginine, Asparagine, Aspartic acid, Cysteine, Glutamate, Glutamine, Glycine, Hydroxyproline, Isoleucine, Leucine, Lysine, Methionine, Ornithine, Phenylalanine, Proline, Serine, Taurine, Threonine, Tryptophan, Tyrosine, Valine, beta-alanine, Betaine, Carnitine, Carnosine, Citrulline, Creatine, Cystathionine, Cysteine-glutathione disulfide-CySSG, Cystine, Glutathione, Kynurenine, Oxiglutatione-GSSG, S-adenosylmethionine
Organic acids and related	2-methylglutarate, 2-phosphoglycerate, 3-hydroxymethylglutarate, 6-phosphogluconate, cis-aconitate, Citrate, Fumarate, Glucuronate, Glycerate, Isocitrate, Kynurenate, Lactate, Malate, Methylmalonate, Orotate, Phosphoenolpyruvate, Pipecolate, Pyruvate, Succinate, trans-aconitate, Allantoate, alpha-ketoglutarate, Aminoadipate, Arginosuccinate, Dihydroorotate
Nucleotides and related	NADH, NADP, NADPH, Adenine, Adenosine, ADP, AMP, ATP, CMP, CTP, Cytosine, Deoxycytidine, Deoxyguanosine, Deoxyuridine, GDP, GTP, Inosine, Inosine monophosphate, Uridine, 5-methyluridine, 7-methylguanosine, cyclic AMP, cyclic GMP, Cytidine, FAD, Flavin mononucleotide, Hypoxanthine, UDP-glucose, UMP, Uracil, Xanthine
Sugar phosphates	Pentose monophosphate, Hexose monophosphate
Others	Acetyl-CoA, allantoin, Choline, Glycerol-3-P, Glycerophosphocholine, Phosphocholine, Trigonelline, Tryptamine, Gln-6-P, Myo-inositol, Urea, Acetylcholine