Analysis Report

Bruker IVDr Quantification in URine B.I.Quant-UR b™

Sample ID:	Demo_Urine_02
Measuring Date:	03-Dec-2019 09:29:56
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Quantification Method Version:	Quant-UR B.1.1.0

Disclaimer

RESEARCH USE ONLY: This is no clinical diagnostic analysis report. Must not be used for clinical (medical or IVD) diagnosis or for patient management! Additional concentration range information (95% range) provided numerically or graphically in this report must not be used for clinical diagnostic interpretation.

Application of B.I.Quant-UR B 1.1.0 requires use of Bruker's B.I.Methods SOP for urine.

Summary

The following metabolites were found with concentrations outside the 95% range of Bruker Quant-UR B.1.1.0 urine metabolite concentration database:

Amines and derivatives: Dimethylamine (56 mmol/mol Crea), Trimethylamine (7 mmol/mol Crea),
Amino acids and derivatives: Alanine (76 mmol/mol Crea), Creatine (430 mmol/mol Crea), N,N-Dimethylglycine (19 mmol/mol Crea),
Benzene and substituted derivatives: Benzoic acid (12 mmol/mol Crea),
Carboxylic acids: Acetic acid (100 mmol/mol Crea), Formic acid (81 mmol/mol Crea), Succinic acid (54 mmol/mol Crea),
Keto acids and derivatives: 3-Hydroxybutyric acid (220 mmol/mol Crea), Acetoacetic acid (56 mmol/mol Crea), Acetone (33 mmol/mol Crea),
Sugars and derivatives: D-Glucose (220 mmol/mol Crea), D-Lactose (99 mmol/mol Crea).

Further detailed information is provided on the following pages.

Contents

1 Creatinine

Compound	Conc. mmol/L	LOD mmol/L	r mmol/L	ρ %	Δ mmol/L	95% Range(*) mmol/L
Creatinine	4.6	0.3	4.553	100 ●	0.235	1 - 19

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

2 Amines and derivatives

Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
Dimethylamine	0.26	56	31	0.256	100 ●	0.016	$\leq$ 54
Trimethylamine	0.03	7	2	0.030	99 ●	0.002	$\leq$ 3

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

3 Amino acids and derivatives

Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
1-Methylhistidine	< 0.07	< 15	15	0.000	0 ○	0.171	$\leq$ 15
2-Furoylglycine	< 0.18	< 39	39	0.000	0 ○	0.078	$\leq$ 40
4-Aminobutyric acid	< 0.09	< 20	20	0.000	0 ○	0.688	$\leq$ 20
Alanine	0.35	76	10	0.348	99 ●	0.043	11 - 72
Arginine	< 3.4	< 750	750	0.000	0 ○	4.164	$\leq$ 750
Betaine	0.33	73	7	0.330	100 ●	0.019	9 - 78
Creatine	2.0	430	50	1.952	100 ●	0.235	$\leq$ 280
Glycine	1.4	300	34	1.379	100 ●	0.090	38 - 440
Guanidinoacetic acid	0.51	110	100	0.513	13 ○	0.480	$\leq$ 140
Methionine	< 0.08	< 18	18	0.000	0 ○	0.437	$\leq$ 18
N,N-Dimethylglycine	0.09	19	5	0.086	94 ●	0.019	$\leq$ 15
Sarcosine	0.01	3	2	0.015	39 ○	0.014	$\leq$ 7
Taurine	0.79	170	140	0.786	90 ●	0.419	$\leq$ 170
Valine	0.02	4	2	0.018	80 ○	0.021	$\leq$ 7

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

4 Benzene and substituted derivatives

Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
Benzoic acid	0.06	12	10	0.056	69 ○	0.030	≤ 10
D-Mandelic acid	< 0.01	< 2	2	0.000	0 ○	0.298	2 - 17
Hippuric acid	1.3	280	170	1.263	100 ●	0.066	≤ 660

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

5 Carboxylic acids

Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
Acetic acid	0.47	100	5	0.468	99 ●	0.044	≤ 51
Citric acid	1.9	420	40	1.897	100 ●	0.299	≤ 700
Formic acid	0.37	81	10	0.371	99 ●	0.041	≤ 43
Fumaric acid	0.01	3	2	0.013	100 ●	0.000	≤ 3
Imidazole	< 0.22	< 48	48	0.000	0 ○	0.214	≤ 48
Lactic acid	0.31	69	49	0.314	99 ●	0.229	≤ 110
Proline betaine	0.29	64	25	0.293	83 ○	0.086	≤ 280
Succinic acid	0.25	54	5	0.246	99 ●	0.026	≤ 39
Tartaric acid	0.07	16	5	0.071	98 ●	0.015	≤ 110
Trigonelline	< 0.16	< 35	35	0.038	99 ●	0.003	≤ 67

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

6 Fatty acids and derivatives

Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
2-Methylsuccinic acid	< 0.22	< 48	48	0.000	0 ○	0.339	≤ 48

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

7 Keto acids and derivatives

Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
2-Oxoglutaric acid	< 0.42	< 92	92	0.114	18 ○	0.251	≤ 92
3-Hydroxybutyric acid	1.00	220	100	1.008	98 ●	0.311	≤ 100
Acetoacetic acid	0.25	56	14	0.254	100 ●	0.011	≤ 30
Acetone	0.15	33	2	0.150	97 ●	0.027	≤ 7
Oxaloacetic acid	0.26	57	17	0.262	92 ●	0.148	≤ 66
Pyruvic acid	< 0.04	< 9	9	0.036	97 ●	0.008	≤ 13

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

8 Purine, Pyridine and Pyrimidine derivatives

Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
1-Methyladenosine	< 0.02	< 5	5	0.000	0 ○	0.185	≤ 5
1-Methylnicotinamide	< 0.14	< 32	32	0.102	99 ●	0.009	≤ 32
Adenosine	< 1.8	< 390	390	0.000	0 ○	1.823	≤ 390
Allantoin	0.10	22	17	0.098	100 ●	0.003	≤ 47
Allopurinol	0.05	10	10	0.046	59 ○	0.058	≤ 11
Caffeine	< 0.21	< 45	45	0.189	71 ○	0.241	≤ 61
Inosine	< 0.09	< 19	19	0.018	70 ○	0.067	≤ 19

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

9 Sugars and derivatives

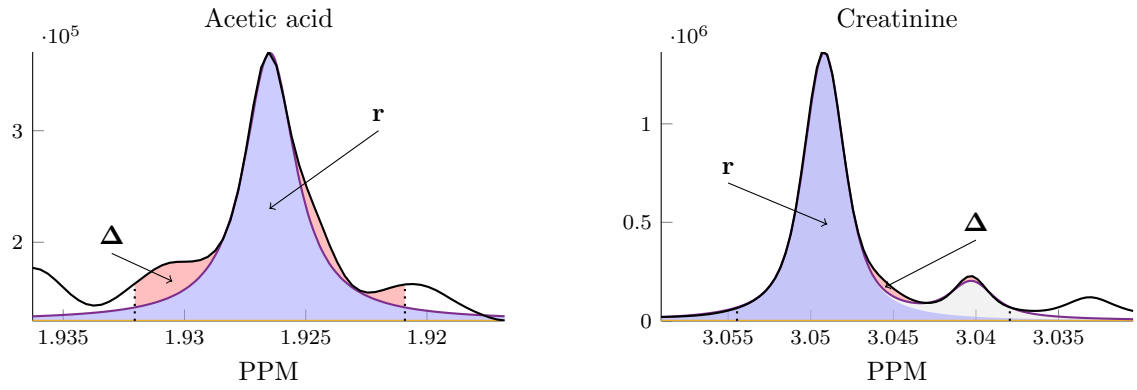
Compound	Conc. mmol/L	Conc. $\frac{\text{mmol}}{\text{mol Crea}}$	LOD $\frac{\text{mmol}}{\text{mol Crea}}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{\text{mmol}}{\text{mol Crea}}$
D-Galactose	< 0.20	< 43	43	0.175	99 ●	0.004	≤ 44
D-Glucose	1.00	220	34	0.998	97 ●	0.138	≤ 140
D-Lactose	0.45	99	96	0.450	91 ●	0.152	≤ 96
D-Mannitol	< 0.83	< 180	180	0.739	46 ○	0.961	≤ 180
D-Mannose	< 0.03	< 6	6	0.021	89 ●	0.003	≤ 8
Myo-Inositol	< 20	< 4400	4400	0.000	0 ○	6.014	≤ 4400

(*) Gray horizontal boxes represent 95% concentration range, black vertical lines represent sample value.

10 Explanations

This section contains the definition of the parameters used above. In the section 10.1 a short manual, how to interpret the results, is presented. The section 10.3 contains the exact definitions of the parameters $\mathbf{r}$, ρ and $\mathbf{\Delta}$.

10.1 How to read the result



(a) Single signal fitting.

(b) Simultaneous fitting of two signals.

Figure 1: Examples of fitting.

In the figure 1(a), the black line, the blue line and the yellow line represent the original spectrum, the calculated signal fit and its baseline, respectively.

The blue area relates to the metabolite concentration to be determined and the red area represents a residue.

In case of the signal overlap a different approach is used: two or more overlapping signals are being fitted simultaneously. The most iconic example of such signals are the ones generated by $\mathrm{CH_3}$ groups of Creatinine and Creatine. In such a case, the blue line and the grey area relate the sum of all fitted signals. The blue area corresponds to the concentration of the metabolite of interest (cf. figure 1(b)).

10.2 Result parameters

a) **Conc.** is the final result concentration of the metabolite,

b) **LOD** is the *limit of detection* of the given metabolite,

c) $\mathbf{r}$ is the *raw concentration* i.e. the concentration equivalent of the resulting signal fit prior to comparing to **LOD** (relates to the blue area, cf. α)),

d) ρ is the correlation of lineshape metabolite signal with calculated fit characterizing the match between metabolite signal and fit (cf. β)). Depending on the value of ρ, the following *flag* is displayed:

- ●, if the correlation is 95%,
- ●, if the correlation is in between 85% and 95%,
- ○, if the correlation is less than 85%,

e) **Δ** is the concentration equivalent of the difference between metabolite signal and calculated fit (residue corresponding to the the red area, cf. γ)).

10.3 Detailed definitions

Let s, f and b denote the functions describing the *raw spectra*, *fitted curve* and *(fitted) baseline* respectively. These functions are chosen such that $s \approx f + b$. Moreover, let I be a relevant PPM interval and P_N be the proton number for given metabolite/signal.

α) $\mathbf{r}$ (*raw concentration*) is defined as

$$\mathbf{r} = \frac{1}{P_N} \int_{\mathbb{R}} f(\xi)\, \mathrm{d}\xi.$$

β) ρ is the *correlation* of the functions s and $f + b$, i.e.

$$\rho = \max\bigl(0, \operatorname{corr}\bigl(\overline{s}, \overline{f+b}\bigr)\bigr)\,,$$

where $\overline{s}$, $\overline{f+b}$ are numerical representations of the functions s and $f+b$ on sufficiently fine mesh of the interval I.

γ) **Δ** is the the area between the raw signal s and the fitted data $f + b$ on the interval I expressed in the terms of the concentration, i.e.

$$\mathbf{\Delta} = \frac{1}{P_N} \int_I |s(\xi) - f(\xi) - b(\xi)|\, \mathrm{d}\xi.$$