Analysis Report

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

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

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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 E 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 E.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), Methylmalonic acid (38 mmol/mol Crea), Succinic acid (54 mmol/mol Crea),
Cosmetics, vitamines, drugs and drug metabolites: Pantothenic acid (22 mmol/mol Crea),
Fatty acids and derivatives: 3-Hydroxyvaleric acid (3 mmol/mol Crea), Butyric acid (65 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),
Purine, Pyridine and Pyrimidine derivatives: Dihydrothymine (160 mmol/mol Crea),
Sugars and derivatives: D-Glucose (220 mmol/mol Crea), D-Lactose (99 mmol/mol Crea), L-Fucose (840 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 Alcohols and derivatives

Compound	Conc. mmol/L	Conc. $\frac{mmol}{mol\ Crea}$	LOD $\frac{mmol}{mol\ Crea}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{mmol}{mol\ Crea}$
Ethanol	< 0.32	< 70	70	0.000	0 ○	1.744	≤ 98
Isopropanol	< 0.01	< 3	3	0.000	0 ○	0.246	≤ 3
Methanol	0.26	56	48	0.257	99 ●	0.023	≤ 230
Propylene glycol	0.19	42	39	0.190	96 ●	0.058	≤ 50

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

3 Amines and derivatives

Compound	Conc. mmol/L	Conc. $\frac{mmol}{mol\ Crea}$	LOD $\frac{mmol}{mol\ Crea}$	r mmol/L	ρ %	Δ mmol/L	95% Range(*) $\frac{mmol}{mol\ Crea}$
1-Methylguanidine	0.32	70	64	0.320	98 ●	0.152	≤ 72
Dimethylamine	0.26	56	31	0.256	100 ●	0.016	≤ 54
Trimethylamine	0.03	7	2	0.030	99 ●	0.002	≤ 3
Tyramine	< 0.36	< 80	80	0.000	0 ○	0.865	≤ 80

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

4 Amino acids and derivatives

Compound	Conc. mmol/L	Conc. mmol / mol Crea	LOD mmol / mol Crea	r mmol/L	ρ %	Δ mmol/L	95% Range(*) mmol / mol Crea
1-Methylhistidine	< 0.07	< 15	15	0.000	0 ○	0.171	≤ 15
2-Furoylglycine	< 0.18	< 39	39	0.000	0 ○	0.078	≤ 40
3-Aminoisobutyric acid	< 0.39	< 85	85	0.000	0 ○	1.958	≤ 85
3-Methylcrotonylglycine	< 0.04	< 8	8	0.000	0 ○	0.013	≤ 8
4-Aminobutyric acid	< 0.09	< 20	20	0.000	0 ○	0.688	≤ 20
5-Aminopentanoic acid	< 0.43	< 94	94	0.000	0 ○	1.787	≤ 94
Alanine	0.35	76	10	0.348	99 ●	0.043	11 - 72
Arginine	< 3.4	< 750	750	0.000	0 ○	4.164	≤ 750
Argininosuccinic acid	< 0.13	< 29	29	0.000	0 ○	0.645	≤ 29
Betaine	0.33	73	7	0.330	100 ●	0.019	9 - 78
Citrulline	< 3.1	< 690	690	0.000	0 ○	7.616	≤ 690
Creatine	2.0	430	50	1.952	100 ●	0.235	≤ 280
Cystine	< 2.2	< 490	490	0.000	0 ○	5.458	≤ 490
DL-Alloisoleucine	< 0.22	< 48	48	0.000	0 ○	0.284	≤ 48
DL-Tyrosine	< 0.20	< 44	44	0.000	0 ○	0.227	≤ 44
Glutamic acid	< 2.1	< 460	460	0.000	0 ○	3.237	≤ 460
Glutamine	< 2.0	< 440	440	0.000	0 ○	16.16	≤ 440
Glycine	1.4	300	34	1.379	100 ●	0.090	38 - 440
Guanidinoacetic acid	0.51	110	100	0.513	13 ○	0.480	≤ 140
Isobutyrylglycine	< 0.03	< 7	7	0.000	0 ○	0.255	≤ 7
L-Carnosine	< 0.59	< 130	130	0.000	0 ○	0.255	≤ 130
L-Homocystine	< 4.2	< 910	910	0.000	0 ○	0.308	≤ 910
L-Isoleucine	< 0.07	< 16	16	0.029	93 ●	0.026	≤ 16
L-Pyroglutamic acid	< 0.15	< 32	32	0.000	0 ○	1.330	≤ 67
L-Tryptophan	< 0.44	< 97	97	0.093	19 ○	0.139	≤ 97
Leucine	< 0.10	< 22	22	0.035	75 ○	0.016	≤ 22
Methionine	< 0.08	< 18	18	0.000	0 ○	0.437	≤ 18
N,N-Dimethylglycine	0.09	19	5	0.086	94 ●	0.019	≤ 15
N-Acetylaspartic acid	< 0.45	< 99	99	0.115	9 ○	0.363	≤ 99
N-Acetylglutamate	< 0.19	< 42	42	0.000	0 ○	0.783	≤ 42
N-Acetylphenylalanine	< 0.61	< 130	130	0.000	0 ○	0.478	≤ 130
N-Acetyltyrosine	< 1.7	< 380	380	0.000	0 ○	2.122	≤ 380
N-Isovaleroylglycine	< 0.01	< 2	2	0.000	0 ○	0.108	≤ 5
Phenylalanine	< 0.91	< 200	200	0.000	0 ○	0.361	≤ 200
Proline betaine	0.29	64	25	0.293	83 ○	0.086	≤ 280
Propionylglycine	< 0.06	< 12	12	0.000	0 ○	0.277	≤ 12
Sarcosine	0.01	3	2	0.015	39 ○	0.014	≤ 7
Taurine	0.79	170	140	0.786	90 ●	0.419	≤ 170
Tiglylglycine	< 0.09	< 19	19	0.000	0 ○	0.109	≤ 19
Valine	0.02	4	2	0.018	80 ○	0.021	≤ 7

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

5 Benzene and substituted derivatives

Compound	Conc. mmol/L	Conc. mmol/mol Crea	LOD mmol/mol Crea	r mmol/L	ρ %	Δ mmol/L	95% Range(*) mmol/mol Crea
2-Hydroxyphenylacetic acid	< 0.05	< 10	10	0.000	0 ○	0.417	≤ 10
3-Phenyllactic acid	< 0.40	< 89	89	0.160	0 ○	0.404	≤ 89
4-Aminohippuric acid	< 1.2	< 270	270	0.000	0 ○	0.556	≤ 270
4-Ethylphenol	< 0.06	< 13	13	0.000	0 ○	0.570	≤ 13
4-Hydroxyhippuric acid	< 0.12	< 26	26	0.000	0 ○	0.315	≤ 30
4-Hydroxyphenylacetic acid	< 0.08	< 18	18	0.000	0 ○	1.116	≤ 28
4-Hydroxyphenyllactic acid	< 0.19	< 43	43	0.000	0 ○	1.060	≤ 43
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
Phenylacetic acid	< 0.33	< 72	72	0.008	95 ●	0.076	≤ 72
Phenylpyruvic acid	< 0.45	< 98	98	0.133	78 ○	0.073	≤ 98
Pyrocatechol	< 0.80	< 170	170	0.000	0 ○	0.603	≤ 170
Syringic acid	< 0.17	< 38	38	0.110	97 ●	0.161	≤ 38

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

6 Carboxylic acids

Compound	Conc. mmol/L	Conc. mmol/mol Crea	LOD mmol/mol Crea	r mmol/L	ρ %	Δ mmol/L	95% Range(*) mmol/mol Crea
5-Aminolevulinic acid	< 0.01	< 2	2	0.000	0 ○	0.144	≤ 2
Acetic acid	0.47	100	5	0.468	99 ●	0.044	≤ 51
Citric acid	1.9	420	40	1.897	100 ●	0.299	≤ 700
E-Glutaconic acid	< 0.17	< 38	38	0.000	0 ○	0.068	≤ 38
Ethylmalonic acid	< 0.16	< 35	35	0.107	85 ●	0.460	≤ 35
Formic acid	0.37	81	10	0.371	99 ●	0.041	≤ 43
Fumaric acid	0.01	3	2	0.013	100 ●	0.000	≤ 3
Glutaric acid	< 0.78	< 170	170	0.000	0 ○	0.558	≤ 170
Imidazole	< 0.22	< 48	48	0.000	0 ○	0.214	≤ 48
Lactic acid	0.31	69	49	0.314	99 ●	0.229	≤ 110
Maleic acid	< 0.02	< 4	4	0.007	67 ○	0.006	≤ 8
Methylmalonic acid	0.17	38	17	0.173	92 ●	0.182	≤ 31
Propionic acid	< 0.23	< 51	51	0.053	12 ○	0.243	≤ 51
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
Xanthurenic acid	< 0.08	< 18	18	0.000	0 ○	0.234	≤ 18

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

7 Cosmetics, vitamines, drugs and drug metabolites

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(*) $\frac{\text{mmol}}{\text{mol Crea}}$
Choline	< 0.21	< 46	46	0.000	0 ○	0.282	≤ 46
D-Panthenol	< 0.08	< 17	17	0.000	0 ○	1.008	≤ 17
L-Ascorbic acid	< 0.73	< 160	160	0.000	0 ○	0.574	≤ 160
Pantothenic acid	0.10	22	16	0.102	93 ●	0.150	≤ 19
Paracetamol	< 0.23	< 50	50	0.000	0 ○	0.234	≤ 50
Paracetamol-glucuronide	< 0.11	< 24	24	0.000	0 ○	1.181	≤ 53

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

8 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-Hydroxy-4-methylvaleric acid	< 0.03	< 7	7	0.000	0 ○	0.083	≤ 7
2-Hydroxyisovaleric acid	< 0.02	< 4	4	0.004	0 ○	0.030	≤ 4
2-Methylsuccinic acid	< 0.22	< 48	48	0.000	0 ○	0.339	≤ 48
3-Hydroxy-3-methylglutaric acid	< 0.09	< 19	19	0.000	0 ○	1.988	≤ 19
3-Hydroxyisovaleric acid	< 0.16	< 36	36	0.069	100 ●	0.010	≤ 36
3-Hydroxyvaleric acid	0.01	3	2	0.015	32 ○	0.077	≤ 2
3-Methylglutaconic acid	< 0.07	< 16	16	0.031	76 ○	0.020	≤ 16
Butyric acid	0.30	65	15	0.295	88 ●	0.600	≤ 15
Citraconic acid	< 0.17	< 37	37	0.000	0 ○	1.033	≤ 37
L-Citramalic acid	< 0.47	< 100	100	0.367	65 ○	2.046	≤ 100
Pimelic acid	< 0.14	< 31	31	0.000	0 ○	0.676	≤ 31
Thymol	< 0.20	< 44	44	0.000	0 ○	1.246	≤ 44

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

9 Hydroxy 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(*) $\frac{\text{mmol}}{\text{mol Crea}}$
3-Hydroxyglutaric acid	< 0.22	< 49	49	0.026	0 ○	0.247	≤ 49
3-Hydroxypropionic acid	< 0.16	< 35	35	0.000	0 ○	0.586	≤ 35
D-Galactonic acid	< 0.26	< 57	57	0.000	0 ○	0.171	≤ 57
D-Gluconic acid	< 0.45	< 99	99	0.000	0 ○	2.668	≤ 99
Glycolic acid	< 0.83	< 180	180	0.685	98 ●	0.218	≤ 180
Malic acid	< 0.44	< 97	97	0.000	0 ○	5.172	≤ 97

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

10 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-Ketobutyric acid	< 0.31	< 68	68	0.000	0 ○	0.519	≤ 68
2-Oxoglutaric acid	< 0.42	< 92	92	0.114	18 ○	0.251	≤ 92
2-Oxoisocaproic acid	< 0.02	< 5	5	0.000	0 ○	0.128	≤ 5
2-Oxoisovaleric acid	< 0.04	< 9	9	0.000	0 ○	0.236	≤ 9
3-Hydroxybutyric acid	1.00	220	100	1.008	98 ●	0.311	≤ 100
3-Methyl-2-oxovaleric acid	< 0.13	< 29	29	0.000	0 ○	0.850	≤ 29
4-Hydroxyphenylpyruvic acid	< 0.23	< 50	50	0.000	0 ○	0.411	≤ 50
Acetoacetic acid	0.25	56	14	0.254	100 ●	0.011	≤ 30
Acetoine	< 0.07	< 14	14	0.000	0 ○	0.200	≤ 14
Acetone	0.15	33	2	0.150	97 ●	0.027	≤ 7
DL-Kynurenin	< 3.6	< 790	790	0.000	0 ○	1.045	≤ 790
Oxaloacetic acid	0.26	57	17	0.262	92 ●	0.148	≤ 66
Pyruvic acid	< 0.04	< 9	9	0.036	97 ●	0.008	≤ 13
Succinylacetone	< 0.60	< 130	130	0.000	0 ○	0.628	≤ 130

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

11 Purine, Pyridine and Pyrimidine derivatives

Compound	Conc. mmol/L	Conc. mmol / mol Crea	LOD mmol / mol Crea	r mmol/L	ρ %	Δ mmol/L	95% Range(*) mmol / mol Crea
1,3-Dimethyluric acid	< 0.08	< 17	17	0.026	89	0.009	≤ 49
1-Methyladenosine	< 0.02	< 5	5	0.000	0	0.185	≤ 5
1-Methylhydantoin	< 0.19	< 42	42	0.052	0	0.096	≤ 47
1-Methylnicotinamide	< 0.14	< 32	32	0.102	99	0.009	≤ 32
4-Pyridoxic acid	< 0.05	< 11	11	0.025	22	0.028	≤ 30
Adenine	< 0.04	< 10	10	0.006	60	0.011	≤ 10
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
Cytosine	< 0.02	< 5	5	0.000	0	1.244	≤ 12
Dihydrothymine	0.71	160	94	0.709	87	0.403	≤ 110
Dihydrouracil	< 3.2	< 710	710	0.000	0	2.552	≤ 710
Inosine	< 0.09	< 19	19	0.018	70	0.067	≤ 19
Neopterin	< 0.10	< 23	23	0.007	89	0.003	≤ 30
Orotic acid	< 0.02	< 5	5	0.014	99	0.001	≤ 5
Oxypurinol	0.11	23	20	0.106	90	0.100	≤ 36
Quinolinic acid	< 0.31	< 68	68	0.000	0	2.231	≤ 68
Theobromine	< 0.54	< 120	120	0.117	99	0.065	≤ 120
Thymine	< 0.02	< 5	5	0.000	0	0.277	≤ 5
Uracil	0.40	87	50	0.395	24	0.607	≤ 230
Uridine	< 0.09	< 19	19	0.070	3	0.322	≤ 19

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

12 Sugars and derivatives

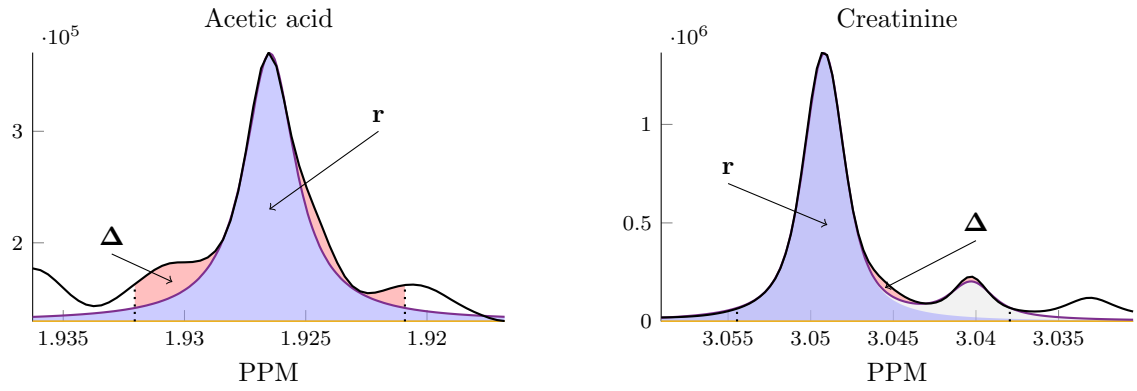
Compound	Conc. mmol/L	Conc. mmol / mol Crea	LOD mmol / mol Crea	r mmol/L	ρ %	Δ mmol/L	95% Range(*) mmol / mol Crea
D-Galactose	< 0.20	< 43	43	0.175	99	0.004	≤ 44
D-Glucose	1.00	220	34	0.998	97	0.138	≤ 140
D-Lactose	0.45	99	96	0.450	91	0.152	≤ 96
D-Mannitol	< 0.83	< 180	180	0.739	46	0.961	≤ 180
D-Mannose	< 0.03	< 6	6	0.021	89	0.003	≤ 8
Galactitol	< 1.7	< 370	370	0.000	0	1.494	≤ 370
Glycerol	< 0.88	< 190	190	0.000	0	5.711	≤ 190
L-Fucose	3.8	840	300	3.803	94	0.497	≤ 300
L-Threonic acid	< 1.5	< 320	320	0.000	0	3.682	≤ 320
Myo-Inositol	< 20	< 4400	4400	0.000	0	6.014	≤ 4400

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

13 Explanations

This section contains the definition of the parameters used above. In the section 13.1 a short manual, how to interpret the results, is presented. The section 13.3 contains the exact definitions of the parameters $\mathbf{r}$, ρ and $\boldsymbol{\Delta}$.

13.1 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)).

13.2 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)).

13.3 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.

$$\rho = \max\left(0, \mathrm{corr}\left(\overline{s}, \overline{f+b}\right)\right),$$

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.

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