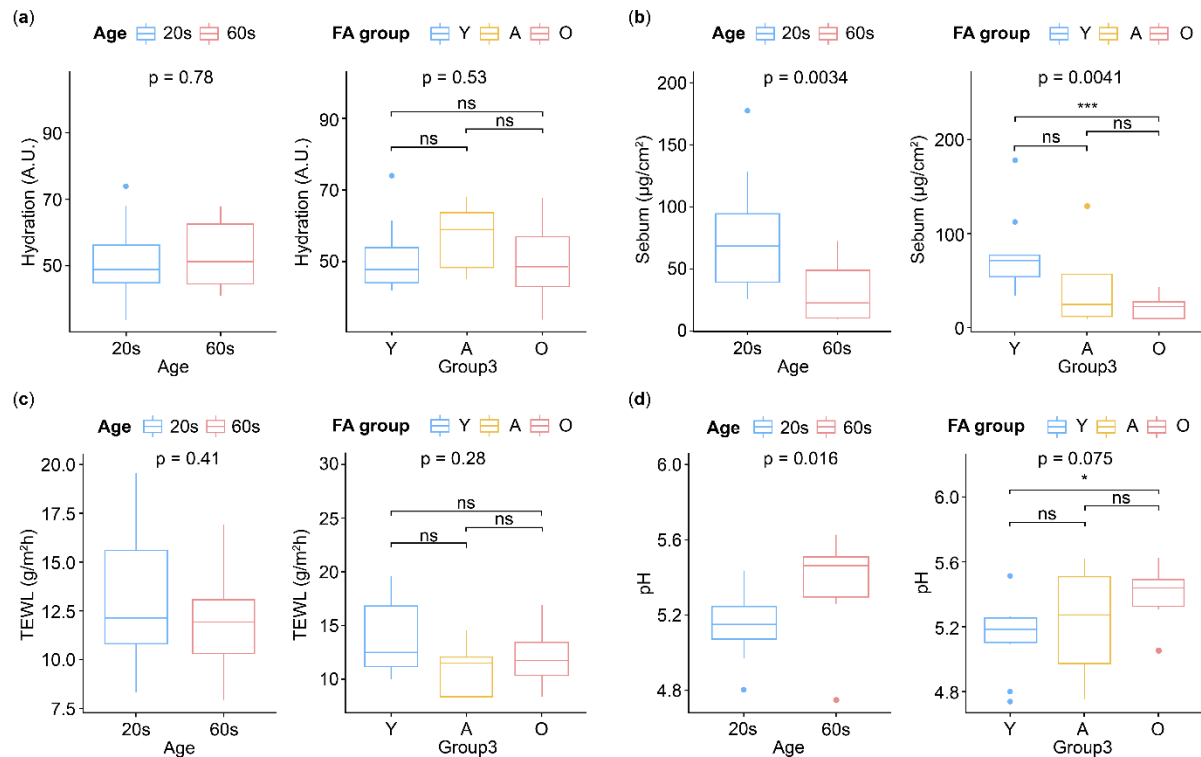


Supplementary Materials

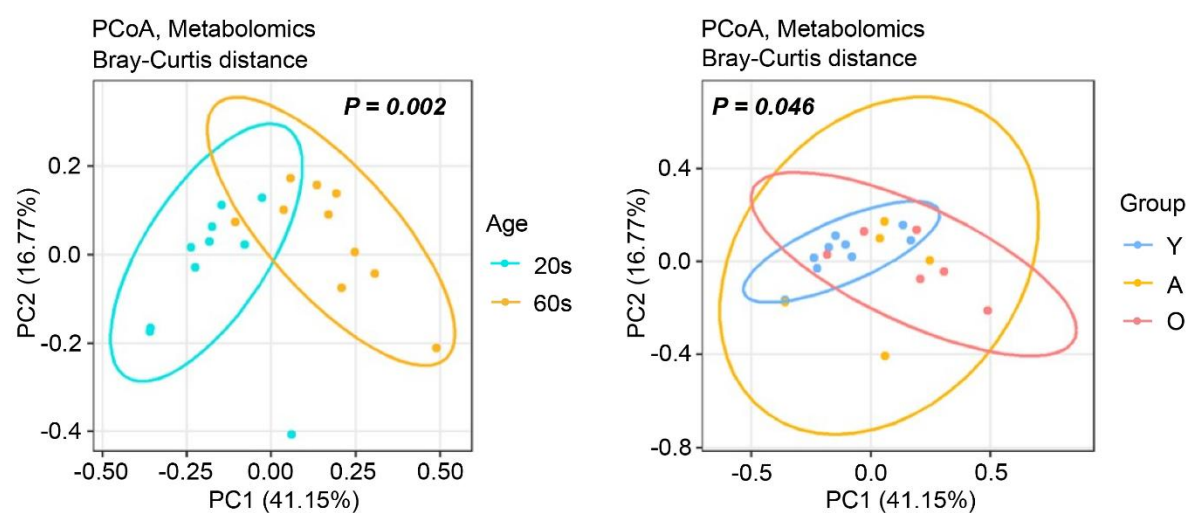


Supplementary Figure S1. Differences in skin properties among different age groups.

Physiological properties, including hydration (a), sebum (b), TEWL (c), and pH (d), were compared depending on chronological age (*left panel*) or functional age groups (*right panel*).

The hydration, TEWL, and pH were measured on the right cheek, and sebum was measured on the forehead. For statistical analyses, the Wilcoxon rank-sum or Kruskal–Wallis tests were performed to compare differences between two or three groups, respectively. The asterisks indicate significant differences between two groups from the pairwise Wilcoxon rank-sum test.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; ns, not significant.



Supplementary Figure S2. β -diversity analyses of skin metabolites in different ages. The Bray–Curtis dissimilarity distances were calculated based on metabolite profiles. Significant differences among groups were calculated using permutational multivariate analysis of variance. Left panel, chronological age group; right panel, functional age group.

Supplementary Table S1. Subject information.

Subject	Real age	Age group	FA group	CE-MS analysis
A01	25	20s	Y	O
A02	20	20s	Y	O
A03	22	20s	Y	O
A04	24	20s	Y	O
A05	23	20s	A	O
A06	25	20s	Y	O
A07	24	20s	O	O
A08	25	20s	A	O
A09	23	20s	Y	-
A10	24	20s	Y	O
A11	27	20s	O	O
B01	61	60s	Y	O
B02	63	60s	O	O
B03	60	60s	A	O
B04	64	60s	O	-
B05	61	60s	A	O
B06	63	60s	Y	O
B07	61	60s	O	-
B08	66	60s	A	O
B09	62	60s	O	O
B10	63	60s	Y	O
B11	66	60s	O	O
B12	60	60s	O	O

Y, young group; O, older group; FA, functional age; CE-MS, capillary electrophoresis mass spectrometry.

Supplementary Table S2. Taxonomic analysis on skin microbiome

Genus (top 10)	Age						Functional age group			
	20s		60s		Y		A		O	
	<i>RA</i>	<i>SD</i>	<i>RA</i>	<i>SD</i>	<i>RA</i>	<i>SD</i>	<i>RA</i>	<i>SD</i>	<i>RA</i>	<i>SD</i>
<i>Cutibacterium</i>	88.13	22.60	65.61	21.97	94.37	6.25	87.16	8.96	47.16	16.94
<i>Corynebacterium</i>	2.24	5.42	2.50	1.97	1.40	2.23	1.28	1.21	4.29	5.88
<i>Staphylococcus</i>	1.34	2.06	7.43	6.60	1.82	2.34	3.35	4.38	8.62	7.51
<i>Xenophilus</i>	1.23	3.15	1.25	4.21	1.50	4.61	0.00	0.00	1.69	3.65
<i>Micrococcus</i>	0.25	0.67	2.80	6.93	0.16	0.27	0.02	0.04	4.34	8.25
<i>Ralstonia</i>	0.23	0.68	2.40	5.14	0.20	0.33	0.31	0.35	3.47	6.16
<i>Streptococcus</i>	0.06	0.17	2.55	5.15	0.01	0.02	2.00	3.03	2.65	6.06
<i>Xanthomonas</i>	0.03	0.07	1.83	3.27	0.05	0.15	0.05	0.11	2.68	3.78
<i>Paraburkholderia</i>	0.01	0.01	1.98	5.16	0.10	0.19	0.34	0.36	2.65	6.36
<i>Pseudomonas</i>	3.22	10.67	0	0	0.00	0.00	0.00	0.00	4.42	12.51
Others	3.27	7.90	11.64	10.28	0.39	0.49	5.48	5.51	18.04	9.66

RA, relative abundance; SD, standard deviation; Y, young group; O, older group; A, aged group.

Supplementary Table S3. Significantly enriched pathways.

Path	Feature	Enriched Group	LDA score (log₁₀)	P-value
ko00860	Porphyrin and chlorophyll metabolism	Y	3.843	7.21E-05
ko00051	Fructose and mannose metabolism	Y	3.772	1.31E-04
ko00520	Amino sugar and nucleotide sugar metabolism	Y	3.596	2.35E-04
ko00052	Galactose metabolism	Y	3.551	3.18E-04
ko00020	Citrate cycle (TCA cycle)	Y	3.492	2.54E-04
ko00010	Glycolysis/Gluconeogenesis	Y	3.453	2.49E-03
ko00240	Pyrimidine metabolism	Y	3.445	2.92E-04
ko00030	Pentose phosphate pathway	Y	3.382	1.53E-04
ko00040	Pentose and glucuronate interconversions	Y	3.313	5.23E-04
ko00780	Biotin metabolism	Y	3.146	9.85E-05
ko00472	D-Arginine and D-ornithine metabolism	Y	3.105	8.45E-05
ko00564	Glycerophospholipid metabolism	Y	3.094	2.73E-04
ko00430	Taurine and hypotaurine metabolism	Y	3.046	1.50E-04
ko00900	Terpenoid backbone biosynthesis	Y	3.014	2.73E-04
ko00500	Starch and sucrose metabolism	A	3.702	2.29E-03
ko00910	Nitrogen metabolism	A	3.478	1.51E-03
ko00250	Alanine, aspartate and glutamate metabolism	A	3.442	1.09E-03
ko02020	Two-component system	O	3.866	1.39E-03
ko00071	Fatty acid degradation	O	3.592	2.56E-04
ko02024	Quorum sensing	O	3.540	7.99E-03
ko00270	Cysteine and methionine metabolism	O	3.477	2.56E-04
ko00920	Sulfur metabolism	O	3.474	1.14E-04

ko02025 Biofilm formation - <i>Pseudomonas aeruginosa</i>	O	3.441	4.49E-04
ko00362 Benzoate degradation	O	3.316	3.18E-04
ko00360 Phenylalanine metabolism	O	3.303	9.85E-03
ko00450 Selenocompound metabolism	O	3.293	3.19E-04
ko00380 Tryptophan metabolism	O	3.287	1.20E-03
ko00650 Butanoate metabolism	O	3.251	1.43E-03
ko00630 Glyoxylate and dicarboxylate metabolism	O	3.244	8.81E-03
ko00310 Lysine degradation	O	3.181	7.93E-04
ko00350 Tyrosine metabolism	O	3.171	3.00E-03
ko00540 Lipopolysaccharide biosynthesis	O	3.155	5.42E-04
ko00280 Valine, leucine and isoleucine degradation	O	3.146	7.96E-03
ko00330 Arginine and proline metabolism	O	3.101	1.21E-03
ko02026 Biofilm formation - <i>Escherichia coli</i>	O	3.080	2.23E-03
ko01501 beta-Lactam resistance	O	3.076	4.37E-04
ko00640 Propanoate metabolism	O	3.059	7.02E-04

Y, young group; O, older group; A, aged group; LDA, linear discriminant analysis.

Supplementary Table S4. Significantly enriched metabolites in the 20s and 60s groups.

Metabolite	20s		60s		P-value
	Relative intensity (arbitrary unit)				
	Mean	S.D.	Mean	S.D.	
1-Methyl-4-imidazoleacetic acid	5.2E-01	2.9E-01	9.5E-01	4.3E-01	0.017
1-Methyladenosine	7.1E-04	1.8E-04	1.3E-03	6.3E-04	0.022
1-Methylnicotinamide	6.4E-04	6.9E-04	3.0E-03	2.7E-03	0.029
2-Aminoadipic acid	8.0E-04	4.1E-04	1.7E-03	7.6E-04	0.006
O-Acetylhomoserine					
Glutamic acid g-methyl ester					
2-Furoic acid	7.3E-04	8.2E-05	1.2E-03	4.5E-04	0.032
3-Furoic acid					
2-Hydroxyoctanoic acid	3.1E-04	1.8E-04	6.2E-04	2.1E-04	0.008
8-Hydroxyoctanoic acid					
3-Hydroxyoctanoic acid					
2-Hydroxyoctanoic acid	6.7E-04	3.3E-04	1.0E-03	3.2E-04	0.040
8-Hydroxyoctanoic acid					
3-Hydroxyoctanoic acid					
3-Phenylpropionic acid	1.5E-02	1.3E-02	3.0E-02	1.7E-02	0.046
4-Hydroxyphenylacetaldehyde	7.1E-04	7.2E-04	1.6E-03	6.3E-04	0.023
4-Methyl-5-thiazoleethanol	9.4E-05	2.9E-05	1.9E-04	8.6E-05	0.044
4-Oxopyrrolidine-2-carboxylic acid	6.4E-02	2.3E-02	1.6E-01	9.2E-02	0.011
Dimethylbenzimidazole	5.5E-04	2.6E-04	9.7E-04	4.4E-04	0.021

5-Amino-3,4-dihydro-2H-pyrrole-2-carboxylic acid	1.9E-03 7.9E-04	3.6E-03 2.2E-03	0.041
5-Oxohexanoic acid	2.2E-03 1.8E-03	4.6E-03 2.1E-03	0.016
5-Oxoproline	7.2E-01 3.1E-01	1.9E+00 1.3E+00	0.020
Agmatine	9.6E-05 6.8E-05	2.2E-04 9.6E-05	0.013
Ala	9.8E-01 3.3E-01	2.6E+00 1.6E+00	0.008
Ala-Ala	6.8E-03 3.0E-03	1.3E-02 4.2E-03	0.001
Arg	3.9E+00 2.2E+00	8.4E+00 4.7E+00	0.017
Arg-Glu	6.5E-03 3.6E-03	1.7E-02 9.5E-03	0.006
Asn	4.0E-01 1.2E-01	1.0E+00 7.6E-01	0.028
Asp	1.9E+00 7.0E-01	3.9E+00 2.5E+00	0.030
Butyrylcarnitine	7.5E-04 2.5E-04	1.7E-03 6.0E-04	0.027
Cysteinesulfinic acid	1.5E-04 9.4E-05	2.8E-04 1.3E-04	0.021
Cystine	7.5E-03 3.6E-03	1.9E-02 1.3E-02	0.025
Diethanolamine	5.5E-02 2.2E-02	1.2E-01 7.8E-02	0.027
Ferulic acid	3.9E-04 1.4E-04	6.5E-04 2.0E-04	0.004
Gln	6.8E-01 3.8E-01	1.8E+00 1.3E+00	0.024
Glu	1.6E+00 5.6E-01	3.9E+00 2.2E+00	0.010
Glu-Glu	4.1E-03 1.9E-03	1.1E-02 5.6E-03	0.005
Glucuronic acid	3.6E-05 1.9E-05	1.0E-04 2.0E-05	0.007
Galacturonic acid			
Gly	5.6E-01 1.9E-01	1.5E+00 8.7E-01	0.010
Gly-Asp	5.8E-03 2.3E-03	1.4E-02 7.2E-03	0.004
Gly-Gly	1.2E-02 5.6E-03	2.9E-02 1.3E-02	0.002

Gly-Leu	1.5E-02 5.5E-03	3.5E-02 2.0E-02	0.016
Glyceric acid	3.4E-03 1.4E-03	6.3E-03 3.0E-03	0.014
Glycolic acid	6.6E-03 2.8E-03	1.2E-02 4.4E-03	0.010
His	3.0E+00 1.2E+00	7.6E+00 4.7E+00	0.013
His-Glu	7.9E-03 4.1E-03	2.0E-02 1.1E-02	0.007
Ile	1.5E+00 3.9E-01	3.6E+00 2.3E+00	0.017
Iminodiacetic acid	9.4E-04 4.0E-04	1.7E-03 9.0E-04	0.028
Leu	2.0E+00 5.5E-01	4.7E+00 3.1E+00	0.023
Leupeptin	6.0E-05 2.9E-05	1.4E-04 4.2E-05	0.004
Lys	9.0E-01 2.0E-01	2.0E+00 1.3E+00	0.022
Methionine sulfoxide	9.6E-02 7.8E-02	1.9E-01 8.4E-02	0.022
Morpholine	2.2E-03 1.2E-03	3.9E-03 1.7E-03	0.049
Myoinositol 2-phosphate	1.2E-04 6.8E-05	2.0E-04 8.7E-05	0.048
<i>N</i> -Acetyl-b-alanine	2.4E-03 7.8E-04	4.9E-03 2.4E-03	0.008
<i>N</i> -Acetylalanine			
<i>N</i> -Acetyllysine	3.1E-02 1.3E-02	7.0E-02 3.8E-02	0.010
<i>N</i> -Acetylorithine	1.6E-02 5.3E-03	3.4E-02 2.1E-02	0.028
<i>N</i> -Acetylphenylalanine	3.8E-05 5.6E-06	6.5E-05 1.7E-05	0.046
Phenylpropionylglycine			
<i>N</i> -Acetylserine	2.3E-02 6.2E-03	4.4E-02 2.7E-02	0.037
<i>N</i> -Acetylthreonine	2.3E-03 1.0E-03	5.7E-03 3.1E-03	0.007
<i>N</i> -Methylaspartic acid	4.9E-03 1.8E-03	8.4E-03 3.7E-03	0.031
<i>N</i> -Methylglutamic acid	9.7E-04 2.3E-04	1.6E-03 6.9E-04	0.033
p-Sulfobenzoic acid	3.4E-04 3.0E-04	8.4E-04 6.0E-04	0.044

Pantothenic acid	4.0E-04 1.5E-04	6.7E-04 3.2E-04	0.033
Pantothenol	3.2E-01 3.0E-01	1.4E+00 1.5E+00	0.049
Penicillamine	6.8E-03 5.6E-03	1.3E-02 5.0E-03	0.025
Phe	1.3E+00 3.6E-01	2.8E+00 1.8E+00	0.021
Phenylethanolamine	5.0E-04 2.0E-04	1.0E-03 2.4E-04	0.005
Phthalic acid	4.0E-03 2.5E-03	6.5E-03 2.4E-03	0.033
Piperidine	5.6E-04 1.9E-04	7.6E-04 2.1E-04	0.041
Pro	9.8E-01 3.0E-01	2.1E+00 1.3E+00	0.018
Pyroglutamine	2.8E-03 2.5E-03	5.3E-03 2.8E-03	0.046
<i>S</i> -Methylcysteine	1.0E-04 6.1E-05	2.6E-04 1.4E-04	0.013
<i>S</i> -Sulfocysteine	8.3E-05 4.5E-05	2.2E-04 1.4E-04	0.011
Ser	3.6E+00 1.2E+00	9.0E+00 4.8E+00	0.006
Ser-Glu	1.6E-02 6.8E-03	4.0E-02 1.7E-02	0.001
Serotonin	3.7E-03 1.6E-03	7.0E-03 4.1E-03	0.036
Thiamine	1.1E-04 6.4E-05	2.2E-04 1.1E-04	0.023
Thr	1.7E+00 5.0E-01	4.1E+00 2.4E+00	0.013
Thr-Asp	3.9E-03 1.5E-03	7.6E-03 4.1E-03	0.023
threo- β -Methylaspartic acid	5.8E-03 5.5E-03	2.0E-02 1.3E-02	0.045
Trp	5.2E-01 1.7E-01	1.2E+00 7.5E-01	0.019
Tyr-Arg	1.8E-03 1.1E-03	4.0E-03 2.6E-03	0.025
Tyr-Glu	2.7E-03 1.7E-03	5.5E-03 2.4E-03	0.008
Urea	1.5E+00 9.8E-01	2.4E+00 9.8E-01	0.041
Uric acid	2.6E-02 1.3E-02	4.6E-02 2.4E-02	0.033
Urocanic acid	1.8E+00 9.5E-01	3.7E+00 1.9E+00	0.015

Val	1.5E+00 3.9E-01	3.4E+00 1.9E+00	0.008
b-Ala-Lys	2.9E-03 1.5E-03	5.8E-03 2.8E-03	0.013
b-Hydroxyisovaleric acid	1.3E-03 1.0E-03	2.9E-03 1.4E-03	0.012
g-Glu-Ala	5.8E-03 3.6E-03	2.2E-02 1.4E-02	0.004
g-Glu-Arg	5.3E-02 3.0E-02	1.5E-01 7.8E-02	0.004
g-Glu-Asn	7.3E-03 4.0E-03	1.8E-02 1.0E-02	0.012
g-Glu-Asp	2.5E-02 1.3E-02	4.8E-02 2.4E-02	0.016
g-Glu-Citrulline	1.2E-02 9.0E-03	2.7E-02 1.6E-02	0.030
g-Glu-Gln	6.4E-03 3.7E-03	2.0E-02 1.2E-02	0.005
g-Glu-Glu	1.7E-02 1.1E-02	4.4E-02 1.7E-02	8.4E-04
g-Glu-Gly	6.8E-02 3.9E-02	2.0E-01 1.1E-01	0.006
g-Glu-His	1.7E-01 8.1E-02	4.5E-01 2.6E-01	0.008
g-Glu-Ile	4.7E-02 2.0E-02	1.4E-01 9.8E-02	0.016
g-Glu-Leu			
g-Glu-Lys	1.6E-02 7.1E-03	3.6E-02 2.5E-02	0.032
g-Glu-Ornithine	4.9E-04 3.1E-04	1.2E-03 7.8E-04	0.022
H-Asp(Lys-OH)-OH			
g-Glu-Ornithine	6.2E-03 1.9E-03	1.8E-02 1.1E-02	0.009
H-Asp(Lys-OH)-OH			
g-Glu-Phe	1.6E-02 7.2E-03	4.6E-02 3.8E-02	0.036
g-Glu-Ser	1.1E-01 5.7E-02	2.9E-01 1.7E-01	0.008
g-Glu-Thr	5.6E-02 2.6E-02	1.3E-01 7.1E-02	0.009
g-Glu-Trp	3.6E-03 1.4E-03	9.8E-03 7.4E-03	0.026
g-Glu-Tyr	1.7E-02 6.2E-03	3.9E-02 2.6E-02	0.025

g-Glu-Val	3.6E-02	1.5E-02	9.9E-02	6.4E-02	0.013
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Supplementary Table S5. Significantly enriched metabolites in functional age analysis

groups

Metabolite	Y	A		O		
	Relative intensity					
	Mean	SD	Mean	SD	Mean	SD
o-Coumaric acid-1	1.1E-04	3.4E-05	2.4E-05	3.8E-05	1.7E-05	4.1E-05
p-Coumaric acid-1						
3-Phenyllactic acid	3.8E-03	2.0E-03	1.7E-03	5.7E-04	1.6E-03	1.2E-03
p-Methoxyphenylacetic acid						
m-Ethoxybenzoic acid						
Hydroxyphenyllactic acid	1.9E-03	5.2E-04	8.9E-04	2.2E-04	1.2E-03	7.2E-04
Homovanillic acid						
N-Acetylglutamine	8.4E-04	4.6E-04	2.7E-04	9.9E-05	5.2E-04	4.9E-04
FAD_divalent	2.7E-05	2.8E-05	N.D.	-	N.D.	-
Trehalose 6-phosphate	1.3E-04	2.0E-04	N.D.	-	4.2E-06	1.0E-05
ADP	5.6E-04	5.0E-04	1.5E-04	1.4E-04	3.1E-04	1.3E-04
GDP	8.6E-05	1.1E-04	N.D.	-	8.5E-06	2.1E-05
GTP	4.8E-05	6.9E-05	N.D.	-	N.D.	-
1H-Imidazole-4-propionic acid	2.6E-02	2.4E-02	1.3E-02	8.4E-03	6.1E-03	3.1E-03
O-Acetylserine	1.9E-03	1.4E-03	3.0E-04	6.7E-04	6.8E-04	1.1E-03
Carnitine	8.5E-02	7.3E-02	3.3E-02	1.6E-02	3.6E-02	1.2E-02
N6-Acetyllysine	5.6E-02	5.7E-02	1.1E-02	4.7E-03	1.0E-02	1.1E-02
2,6-Diaminopimelic acid	2.3E-03	2.4E-03	5.1E-04	3.4E-04	3.9E-04	3.7E-04
N2-Succinylornithine	6.5E-04	7.1E-04	9.2E-05	6.9E-05	1.3E-04	1.7E-04

S-Adenosylhomocysteine	4.1E-05	5.1E-05	N.D.	-	N.D.	-
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Continued

Metabolite	Y		A		O	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Decanoic acid	1.4E-02	6.0E-03	1.9E-01	3.5E-01	4.8E-02	2.7E-02
Octanoic acid	2.4E-03	1.5E-03	6.3E-02	1.2E-01	7.2E-03	5.3E-03
Paraxanthine	8.7E-03	1.6E-02	2.1E-02	1.2E-02	1.4E-02	8.5E-03
Caffeine	5.6E-03	1.3E-02	1.4E-02	8.4E-03	5.3E-03	2.8E-03
p-Hydroxybenzoic acid	3.4E-04	1.1E-04	5.8E-03	1.2E-02	1.9E-03	2.7E-03
m-Hydroxybenzoic acid						
2-Ethylhexanoic acid	4.9E-04	4.4E-04	5.4E-03	5.7E-03	2.2E-03	2.0E-03
Hexanoic acid	5.8E-04	4.9E-04	4.7E-03	4.7E-03	1.9E-03	1.2E-03
4-Methylpentanoic acid						
Heptanoic acid	2.1E-04	2.7E-04	2.5E-03	2.5E-03	9.1E-04	8.3E-04
N-(1-Deoxy-1-fructosyl)valine	5.0E-03	2.8E-03	2.5E-03	6.1E-04	5.2E-03	2.3E-03
Isocitric acid	3.3E-03	1.7E-03	3.0E-04	6.7E-04	4.6E-03	3.6E-03
Butyric acid	N.D.	-	2.2E-04	3.1E-04	N.D.	-
Isobutyric acid						
Glucuronic acid-3	1.7E-04	2.0E-04	6.6E-05	6.2E-05	3.0E-04	2.2E-04
Galacturonic acid-3						
Homocitric acid	1.7E-04	1.4E-04	4.1E-05	5.7E-05	3.1E-04	2.4E-04

Continued

Metabolite	Y		A		O	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Glycolic acid	6.2E-03	2.3E-03	7.9E-03	2.0E-03	1.4E-02	3.9E-03
Oxamic acid	1.9E-05	5.7E-05	5.0E-05	1.1E-04	4.2E-04	6.9E-04
Lactic acid	2.9E+00	1.7E+00	6.0E+00	4.0E+00	9.1E+00	5.9E+00
2-Hydroxyisobutyric acid	3.1E-04	3.6E-04	7.5E-04	9.1E-05	1.3E-03	2.5E-04
2-Hydroxybutyric acid	2.2E-03	1.7E-03	3.5E-03	9.2E-04	6.7E-03	3.1E-03
3-Hydroxybutyric acid	6.2E-04	4.9E-04	1.4E-03	4.1E-04	2.4E-03	2.3E-04
Glyceric acid	3.8E-03	1.7E-03	3.3E-03	6.2E-04	7.6E-03	2.9E-03
Maleic acid	1.9E-03	1.2E-03	1.7E-03	1.2E-03	3.9E-03	8.1E-04
4-Oxovaleric acid	3.2E-03	3.8E-03	6.9E-03	4.7E-03	9.2E-03	3.9E-03
Succinic acid	2.4E-02	7.4E-03	1.9E-02	4.4E-03	3.0E-02	5.3E-03
5-Hydroxypentanoic acid	3.2E-04	2.0E-04	5.0E-04	2.4E-04	6.6E-04	3.5E-04
β-Hydroxyisovaleric acid	1.0E-03	7.2E-04	2.1E-03	6.5E-04	3.7E-03	1.2E-03
Benzoic acid	2.9E-03	2.0E-03	9.2E-03	5.7E-03	2.2E-02	2.8E-02
Citraconic acid	4.7E-03	1.9E-03	4.8E-03	2.3E-03	9.8E-03	2.0E-03
5-Oxohexanoic acid	1.6E-03	1.2E-03	3.9E-03	1.1E-03	5.6E-03	2.0E-03
3-Hydroxyhexanoic acid	1.6E-04	8.4E-05	2.9E-04	8.1E-05	4.3E-04	9.9E-05
Malic acid	6.2E-02	3.3E-02	3.7E-02	1.3E-02	1.4E-01	1.2E-01
Threonic acid	1.2E-02	6.8E-03	8.0E-03	3.8E-03	2.0E-02	7.8E-03
o-Toluic acid-1						
p-Toluic acid-1	8.9E-03	4.5E-03	2.6E-02	1.5E-02	2.2E-02	1.3E-02
m-Toluic acid-1						
o-Hydroxybenzoic acid	4.8E-03	8.7E-03	3.6E-03	2.1E-03	5.3E-03	2.0E-03

trans-Cinnamic acid	7.8E-06	1.4E-05	2.7E-05	2.5E-05	5.9E-05	3.5E-05
Mevalonic acid	3.1E-04	1.6E-04	3.9E-04	1.5E-04	7.0E-04	2.0E-04
Tartaric acid	3.6E-04	2.7E-04	6.5E-04	1.0E-03	1.0E-03	3.9E-04
2-Deoxyribonic acid	2.7E-04	1.2E-04	2.5E-04	7.3E-05	9.6E-04	5.7E-04
3-Phenylpropionic acid	1.0E-02	5.8E-03	2.8E-02	1.1E-02	3.7E-02	1.8E-02
p-Hydroxyphenylacetic acid-2						
Mandelic acid-1						
o-Hydroxyphenylacetic acid-1	3.6E-04	1.4E-04	4.7E-04	1.8E-04	1.4E-03	2.0E-03
p-Anisic acid-1						
3-Hydroxyphenylacetic acid-2						
p-Hydroxyphenylacetic acid-1	2.0E-04	1.3E-04	4.4E-04	2.5E-04	4.1E-04	1.9E-04
3-Hydroxyphenylacetic acid-1						
Mandelic acid-2						
o-Hydroxyphenylacetic acid-2						
p-Anisic acid-2						
Phenoxyacetic acid	4.7E-04	2.8E-04	9.6E-04	1.1E-03	9.6E-04	3.7E-04
2-(Hydroxymethyl)benzoic acid						
3-Hydroxyphenylacetic acid-3						
Pelargonic acid	5.5E-03	2.8E-03	3.4E-02	3.4E-02	2.3E-02	1.5E-02
2-Hydroxyoctanoic acid-3						
8-Hydroxyoctanoic acid-3	4.4E-04	2.3E-04	6.3E-04	1.1E-04	9.3E-04	1.4E-04
3-Hydroxyoctanoic acid-3						

2-Hydroxyoctanoic acid-4						
8-Hydroxyoctanoic acid-4	5.3E-04	2.1E-04	8.9E-04	2.1E-04	1.2E-03	1.5E-04
3-Hydroxyoctanoic acid-4						
p-Coumaric acid-2						
o-Coumaric acid-2	4.7E-04	1.8E-04	7.5E-04	3.0E-04	8.4E-04	2.6E-04
Cumic acid	1.5E-03	6.3E-04	4.9E-03	2.8E-03	1.1E-02	6.8E-03
Terephthalic acid	1.2E-03	4.0E-04	1.8E-03	9.1E-04	4.1E-03	4.0E-03
Perillic acid	7.7E-05	6.4E-05	1.2E-04	8.9E-05	3.9E-04	2.9E-04
Sulfanilic acid						
Metanilic acid	8.2E-05	7.1E-05	8.6E-05	9.7E-05	2.0E-04	9.7E-05
p-Chlorophenoxyacetic acid	1.7E-04	1.2E-04	4.9E-04	2.7E-04	6.2E-04	4.8E-04
Glucuronic acid-2						
Galacturonic acid-2	2.6E-06	7.7E-06	2.8E-05	3.9E-05	6.1E-05	5.9E-05
Ferulic acid	3.8E-04	1.9E-04	5.9E-04	1.4E-04	6.6E-04	2.0E-04
Gluconic acid	1.5E-02	4.1E-03	6.6E-03	2.0E-03	4.6E-02	8.5E-02
Sebacic acid	7.2E-03	2.4E-03	8.0E-03	3.0E-03	1.8E-02	9.2E-03
Cinnamoylglycine	4.7E-05	3.3E-05	1.2E-04	4.2E-05	1.5E-04	8.6E-05
Ibuprofen	4.4E-04	1.7E-04	9.4E-04	2.5E-04	1.4E-03	5.4E-04
Dodecanedioic acid	4.2E-03	1.6E-03	5.3E-03	2.1E-03	8.1E-03	2.7E-03
Abscisic acid	4.2E-04	4.6E-04	5.8E-04	3.3E-04	1.2E-03	8.3E-04
Retinoic acid	6.4E-02	5.7E-02	1.8E-01	5.1E-02	2.8E-01	2.0E-01
Prostaglandin E2	2.4E-03	7.2E-04	3.7E-03	1.3E-03	6.3E-03	3.2E-03
15-Methyl prostaglandin F2 α	3.0E-04	2.3E-04	4.7E-04	1.2E-04	6.3E-04	2.6E-04
Urea	1.5E+00	9.4E-01	1.6E+00	5.0E-01	2.9E+00	1.1E+00

Piperidine	5.5E-04	2.7E-04	7.1E-04	1.0E-04	8.0E-04	1.3E-04
Glycerol	1.6E+00	6.7E-01	2.6E+00	1.2E+00	3.6E+00	7.9E-01
Aniline	1.2E-02	5.3E-03	1.9E-02	4.4E-03	2.1E-02	7.6E-03
Choline	7.0E-02	2.5E-02	6.7E-02	2.0E-02	1.2E-01	6.2E-02
4-Hydroxyphenethyl alcohol - H2O	1.7E-02	7.9E-03	3.0E-02	1.0E-02	3.1E-02	1.1E-02
1-Methyl-4-imidazoleacetic acid	5.2E-01	1.7E-01	6.4E-01	3.1E-01	1.1E+00	5.1E-01
N-Methylantranilic acid	1.1E-03	6.9E-04	1.9E-03	7.4E-04	2.6E-03	1.2E-03
Serotonin	3.7E-03	2.9E-03	5.6E-03	2.8E-03	7.6E-03	4.2E-03
Gluconolactone	8.8E-03	2.3E-03	4.5E-03	1.7E-03	2.9E-02	5.4E-02
Glycerophosphocholine	9.8E-03	4.9E-03	9.1E-03	2.8E-03	4.0E-02	4.2E-02

Y, young group; O, older group; A, aged group; N.D. (Not detected)