

Supplementary Table S1. Patient demographics of RSV Study 2018–2019 (N=30).

	(n)	%	mean	median	st.dev.
Weight (kg)					
Controls	10		6.81	7.32	1.76
RSV	20		4.61	4.25*	1.65
Ethnicity					
Controls	10				
Caucasian/European	9	90.0			
Black or Hispanic	1	10.0			
RSV	20				
Caucasian/European	17	85.0			
Black or Hispanic	3	15.0			
Premature (< 36 weeks)	3				
Controls	0	0.0			
RSV	3	15.0			

*Mann-Whitney Rank test control vs. RSV at time of enrollment p-value ≤ 0.005 .

Supplementary Table S2. Diagnosis of RSV positive patients (N=20).

	(n)	mean	median	st.dev.
Diagnosis*				
Acute bronchiolitis	20			
RSV	20			
Acute respiratory failure	20			
Pneumonia ^a	15			
Viral	10			
Bacterial	11			
Anemia, unspecified	2			
Atelectasis	2			
Other ^b	12			
Severity of Illness Scores				
PELOD Comprehensive	19	10.70	11.00	3.28
Day 0 ^c	19	8.63	11.00	4.21
Severe	15	8.87	11.00	4.09
Moderate	4	7.75	10.00	5.19
Day 3 ^d	19	6.78	11.00	5.45
Severe	15	7.93	11.00	5.05
Moderate	4	2.75	0.00	5.50
PIM2	20	-5.13	-5.03	0.92
Severe	15	-5.004	-4.9	0.94
Moderate	5	-5.51	-5.92	0.83
PRISM III	20	2.15	1.5	1.95
Severe	15	2.13	1.0	2.03
Moderate	5	2.2	2.0	1.92

*Patients may have more than one diagnosis code listed. ^aIncludes: Pneumonia due to other specified bacteria; Pneumonia, unspecified organism. ^bIncludes: Failure to thrive (child). ^c14/19 patients scored 1 for PELOD Pulmonary score. ^d11/19 patients scored a 1 for PELOD Pulmonary score.

Supplementary Table S3. PLS coefficients of plasma metabolites in RSV model.

Metabolite	Coefficient vs RSV severity
Xanthosine	0.0536
Phosphoserine	0.0527
Nacetylneuraminate	0.0501
NAD	0.0413
CoA	0.0411
GAP.DHAP	0.0384
2.hydroxyglutarate	0.0372
Serine	0.0323
Allantoate_and_Carbamoyl_aspartate	0.0318
GDP	0.0312
Proline	0.0306
FBP	0.0293
Glycine	0.0291
GMP	0.0290
dCMP	0.0267
Uracil	0.0243
Glutathione_reduced	0.0229
UDP.D.glucuronate	0.0217
GDP.fucose	0.0199
Glutamine	0.0198
GDP.mannose	0.0189
ADP	0.0177
Threonine	0.0165
Hexose.phosphate	0.0158
Glutathione_disulfide_oxidized	0.0150
Acetyl.CoA	0.0150
AMP	0.0139
ADP.ribose	0.0131
UMP	0.0120
UDP.D.glucose	0.0102
Citrulline	0.0100
Ribose.5.phosphate	0.0097
Valine	0.0080
xylulose.5.phosphate	0.0077
Histidine	0.0075
Asparagine	0.0069
Alanine	0.0068
Lysine	0.0036
Glutamic.acid	0.0024
Methionine	0.0018

IMP	0.0016
Leucine	0.0006
Bisphosphoglycerate	-0.0013
Ribulose.5.phosphate	-0.0022
Phenylalanine	-0.0029
Ornithine	-0.0030
Aspartic.acid	-0.0051
Isoleucine	-0.0053
ATP	-0.0056
Succinate	-0.0082
Phosphoenolpyruvate	-0.0084
Phosphogluconic_acid	-0.0096
Arginine	-0.0100
Tryptophan	-0.0104
CMP	-0.0116
Malate	-0.0117
Fumarate	-0.0250
UDP.N.acetylglucosamine	-0.0277
Tyrosine	-0.0301
Citrate.isocitrate	-0.0326
CMP.N.acetylneuraminate	-0.0392
Ketoglutarate	-0.0408
Glycerol_3.phosphate	-0.0500
N.acetylglucosamine.1.phosphate	-0.0727

Supplementary Table S4. PLS coefficients of urinary metabolites in RSV model.

Metabolite	Coefficient vs RSV severity
AMP	0.0528
UMP	0.0503
xylulose.5.phosphate	0.0432
IMP	0.0426
UDP.N.acetylglucosamine	0.0298
CMP	0.0294
Ornithine	0.0290
GDP.fucose	0.0264
UDP.D.glucose	0.0253
Glutathione_reduced	0.0245
GDP.mannose	0.0229
Hexose.phosphate_1	0.0197
Citrulline	0.0193
Nacetylneuraminate	0.0192
UTP	0.0180
GMP	0.0177
ADP.ribose	0.0169
Glycine	0.0163
NAD	0.0156
Lysine	0.0146
Proline	0.0140
Asparagine	0.0133
Tyrosine	0.0102
Hexose.phosphate_2	0.0088
NADH	0.0084
Arginine	0.0078
Acetyl.CoA	0.0075
NADPH	0.0068
Threonine	0.0057
Leucine	0.0042
CTP	0.0036
dCMP	-0.0005
Aspartic.acid	-0.0006
NADP	-0.0016
Serine	-0.0018
Glutamic.acid	-0.0023
Glutathione_disulfide_oxidized	-0.0024
GAP.DHAP	-0.0026
Glutamine	-0.0041
FAD	-0.0053

Valine	-0.0054
Alanine	-0.0054
UDP.D.glucuronate	-0.0055
Xanthosine	-0.0058
UDP	-0.0060
Histidine	-0.0060
Methionine	-0.0080
Phenylalanine	-0.0083
Uracil	-0.0110
Malate	-0.0122
FBP	-0.0124
Isoleucine	-0.0175
Hexose.phosphate_3	-0.0197
Ribose.5.phosphate	-0.0197
Glycerol_3.phosphate	-0.0209
Tryptophan	-0.0216
ADP	-0.0225
2.3.phosphoglycerate	-0.0247
2.hydroxyglutarate	-0.0247
Flavin_mononucleotide	-0.0249
Phosphoserine	-0.0282
Succinate	-0.0328
Ribulose.5.phosphate	-0.0341
CMP.N.acetylneuraminate	-0.0380
Bisphosphoglycerate	-0.0382
N.acetylglucosamine.1.phosphate	-0.0412
Phosphogluconic_acid	-0.0420
CDP	-0.0551
GDP	-0.0602
Citrate.Isocitrate	-0.0675

Supplementary Table S5. PCA loadings in the covariate model.

	PC1	PC2
Weight	-0.350	0.232
PL.protein	-0.337	0.082
Age_wks	-0.272	0.049
Birth_weight	-0.165	0.385
Race	-0.062	-0.229
Diet	0.008	-0.213
UR.protein	0.105	0.162
Gender	0.113	-0.207
Lymph	0.120	0.034
Timepoint	0.130	-0.034
Eosinophils	0.133	-0.286
Prematurity	0.164	-0.371
WBC	0.164	0.282
Neu	0.167	0.335
ENT_problems	0.198	0.401
Classified_As_asthmatic	0.239	0.189
Pathology	0.336	0.038
Length_of_stay	0.372	0.097
Length_of_vent	0.396	0.010

Supplementary Table S6. PLS coefficients of metabolites in asthma prediction model.

Metabolite	Coefficient vs asthma
UR.Lysine	0.0664
PL.Uracil	0.0634
UR.Ornithine	0.0590
UR.UMP	0.0581
UR.IMP	0.0579
UR.GDP.mannose	0.0557
PL.Asparagine	0.0511
UR.CTP	0.0477
PL.Serine	0.0470
PL.Arginine	0.0453
PL.Citrulline	0.0432
UR.Asparagine	0.0421
PL.Threonine	0.0414
PL.UDP.D.glucuronate	0.0406
PL.Methionine	0.0397
UR.AMP	0.0347
UR.GDP.fucose	0.0335
UR.NADPH	0.0323
PL.Lysine	0.0321
UR.Hexose.phosphate_2	0.0303
PL.CMP	0.0300
PL.Glutamine	0.0291
PL.Glycine	0.0284
PL.Isoleucine	0.0284
PL.Fumarate	0.0281
PL.GDP.mannose	0.0275
PL.Nacetylneuraminate	0.0268
UR.Malate	0.0250
UR.Glycine	0.0248
PL.Phosphogluconic_acid	0.0233
UR.Acetyl.CoA	0.0233
UR.Proline	0.0230
UR.Succinate	0.0228
PL.GDP.fucose	0.0225
UR.ADP.ribose	0.0206
PL.UDP.D.glucose	0.0186
UR.Arginine	0.0166
PL.Phosphoserine	0.0165
PL.Tyrosine	0.0152
PL.Hexose.phosphate	0.0145

UR.UDP.N.acetylglucosamine	0.0138
PL.Aspartic.acid	0.0133
PL.Allantoate_and_Carbamoyl_aspartate	0.0131
PL.Proline	0.0129
PL.Glutamic.acid	0.0129
PL.FBP	0.0109
UR.GAP.DHAP	0.0105
UR.Threonine	0.0100
PL.Bisphosphoglycerate	0.0099
PL.CMP.N.acetylneuraminate	0.0098
PL.Alanine	0.0094
PL.Glutathione_disulfide_oxidized	0.0092
PL.Phosphoenolpyruvate	0.0088
PL.Tryptophan	0.0087
PL.ATP	0.0084
UR.Phosphogluconic_acid	0.0082
UR.UDP.D.glucose	0.0081
PL.Acetyl.CoA	0.0067
PL.Ribose.5.phosphate	0.0063
PL.UDP.N.acetylglucosamine	0.0062
UR.Phosphoserine	0.0055
UR.UTP	0.0049
PL.Ribulose.5.phosphate	0.0049
PL.Leucine	0.0045
UR.Flavin_mononucleotide	0.0042
UR.Ribulose.5.phosphate	0.0037
PL.xylulose.5.phosphate	0.0029
UR.NAD	0.0026
UR.Glutathione_disulfide_oxidized	0.0025
PL.UMP	0.0020
PL.NAD	0.0016
UR.Uracil	0.0015
UR.Ribose.5.phosphate	0.0010
PL.AMP	0.0009
UR.Histidine	0.0007
UR.Leucine	0.0006
PL.GDP	0.0001
PL.ADP.ribose	-0.0012
PL.Ornithine	-0.0015
PL.dCMP	-0.0024
UR.Glutamine	-0.0029
UR.Serine	-0.0030
PL.Glutathione_reduced	-0.0030

UR.Tyrosine	-0.0040
UR.FAD	-0.0040
PL.ADP	-0.0047
PL.Xanthosine	-0.0048
UR.Aspartic.acid	-0.0057
UR.UDP	-0.0058
UR.Alanine	-0.0075
UR.Citrate.Isocitrate	-0.0083
UR.NADP	-0.0103
UR.CMP	-0.0107
UR.xylulose.5.phosphate	-0.0118
UR.GMP	-0.0119
PL.Ketoglutarate	-0.0122
UR.Phenylalanine	-0.0124
UR.Glutathione_reduced	-0.0128
UR.Isoleucine	-0.0139
PL.Valine	-0.0152
PL.GMP	-0.0153
UR.CDP	-0.0153
UR.Glycerol_3.phosphate	-0.0165
UR.2.hydroxyglutarate	-0.0166
UR.N.acetylglucosamine.1.phosphate	-0.0174
PL.2.hydroxyglutarate	-0.0174
UR.Glutamic.acid	-0.0182
UR.Tryptophan	-0.0183
UR.2.3.phosphoglycerate	-0.0183
UR.Methionine	-0.0189
PL.CoA	-0.0189
PL.Phenylalanine	-0.0197
UR.ADP	-0.0212
PL.Histidine	-0.0220
UR.Valine	-0.0227
PL.IMP	-0.0235
PL.N.acetylglucosamine.1.phosphate	-0.0246
UR.Citrulline	-0.0259
UR.Nacetylneuraminate	-0.0266
PL.Malate	-0.0298
UR.NADH	-0.0299
UR.FBP	-0.0299
UR.GDP	-0.0301
UR.UDP.D.glucuronate	-0.0301
UR.CMP.N.acetylneuraminate	-0.0349
PL.GAP.DHAP	-0.0382

UR.Hexose.phosphate_3	-0.0392
UR.dCMP	-0.0394
UR.Hexose.phosphate_1	-0.0396
PL.Succinate	-0.0443
PL.Glycerol_3.phosphate	-0.0474
UR.Bisphosphoglycerate	-0.0488
PL.Citrate.isocitrate	-0.0608
UR.Xanthosine	-0.0655

Supplementary Table S7. MRM transitions for target metabolites.

	Retention time (min)	Cone voltage (V)	Precursor m/z	Collision energy (V)	Product m/z
TQ-S:					
2+3-phosphoglycerate	6.56	22	184.8	16	96.66
2-hydroxyglutarate	6.29	35	146.94	15	84.814
Acetyl-CoA	8.29	40	808	37	408.01
ADP	7.14	34	426.12	21	158.62
ADP-ribose	6.92	50	558.1	21	345.78
Allantoate_and_Carbamoyl_aspartate	5.73	28	175	12	132
AMP	4.2	40	346.11	29	78.6
ATP	7.9	16	505.87	28	158.64
Bisphosphoglycerate	7.89	16	265	13	166.73
CDP	6.69	28	401.83	22	158.65
Citrate/Isocitrate	7.96	22	191	13	110.6
CMP	2.37	34	322.1	29	78.68
CMP-N-acetylneuraminate	6.37	40	613	20	322
CoA	8.18	40	766	40	408
CTP	7.78	10	481.8	22	158.67
dCMP	2.88	50	305.89	22	78.57
FAD	7.82	50	784.2	29	436.92
FBP	6.86	28	339	28	97
Flavin_mononucleotide	7.47	22	455	19	213
Fumarate	5.62	22	115	5	70.9
GAP+DHAP	2.56	16	169.05	13	97
GDP	6.9	28	441.8	16	343.78
GDP-fucose	6.8	40	587.937	25	441.728
GDP-mannose	6.54	10	603.908	30	423.691
Glutathione_disulfide_oxidized	6.04	46	611	21	306.01
Glutathione_reduced	2.15	40	305.89	16	142.72
Glycerol_3-phosphate	1.65	46	170.79	16	78.67
GMP	3.49	34	362.1	21	78.65
Hexose-phosphate	1.51	10	258.83	16	96.63
IMP	3.48	34	347.2	21	78.68
Ketoglutarate	6.27	22	145	5	100.77
Malate	5.61	16	132.77	16	70.69
N-acetylglucosamine-1-phosphate	1.77	22	299.9	22	78.78
Nacetylneuraminate	1.25	40	308	15	87
NAD	3.19	22	662.1	22	540.05
NADH	7.16	46	664.18	28	407.81
NADP	6.91	22	742	13	619.6
NADPH	7.91	34	744.07	34	407.83

Phosphoenolpyruvate	6.96	16	167	13	78.77
Phosphogluconic_acid	6.44	22	274.84	16	96.65
Phosphoserine	2.23	40	183.82	10	96.68
Ribose-5-phosphate	1.56	28	229	21	96.64
Ribulose-5-phosphate	1.92	28	229	21	96.64
Succinate	4.79	28	116.76	10	72.71
UDP	6.86	10	402.76	22	158.43
UDP-D-glucose	6.53	22	565	22	323
UDP-D-glucuronate	7.8	22	579	22	403
UDP-N-acetylglucosamine	6.57	30	606	25	385
UMP	3.19	46	322.9	28	78.55
Uracil	1.69	40	110.76	10	41.7
UTP	7.83	28	482.83	34	158.65
Xanthosine	1.55	28	283	22	151
xylulose-5-phosphate	2.27	28	229	21	96.64
Quattro Micro:					
Alanine	3.87	17	90.1	8	44
Arginine	7.5	24	175.1	18	70
Asparagine	2.04	19	133.1	14	74
Aspartic acid	1.68	19	134.1	10	74
Citrulline	4.83	16	176	28	70
Glutamic acid	2.37	19	148.1	14	84
Glutamine	2.47	16	147.1	14	84
Glycine	2.36	17	76	8	30
Histidine	7.39	20	156.1	12	110
Isoleucine	6.59	19	132.1	9	86
Leucine	6.59	19	132.1	9	86
Lysine	7.38	19	147.1	14	84
Methionine	5.96	19	150.1	9	104
Ornithine	7.33	16	133	16	70
Phenylalanine	6.66	20	166.1	10	120
Proline	5.35	21	116	10	70
Serine	2.02	19	106.1	10	60
Threonine	2.79	19	120.1	8	74
Tryptophan	6.72	19	205.1	14	146
Tyrosine	5.75	20	182.1	12	136.1
Valine	6.04	17	118.1	9	72