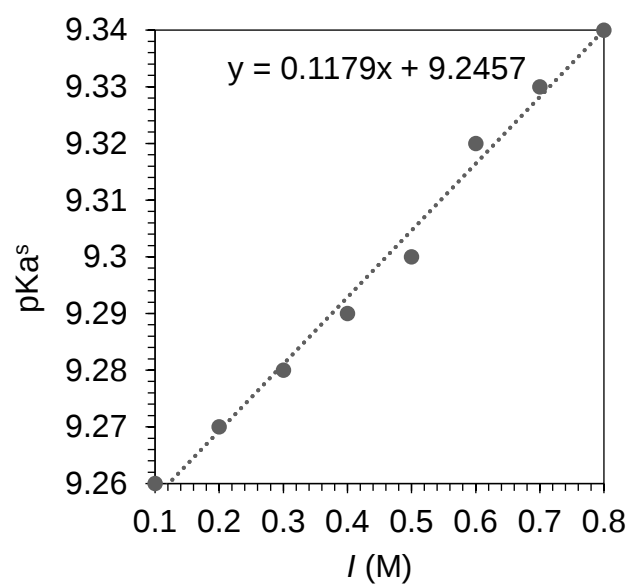
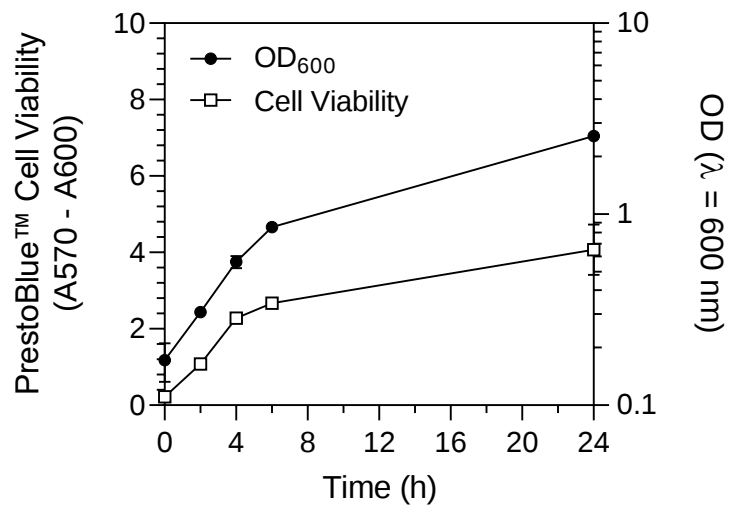


Supplementary Figure 1: pK_a^s of NH_4^+ at given ionic strengths. Scatter plot shows the relationship between the stoichiometric acid hydrolysis constant (pK_a^s) of NH_4^+ at increasing ionic strengths (I). A linear regression (dotted line) was fitted to the data.



Supplementary Figure 2: Cell viability and optical density at 600 nm over 24 h.

Marker and line plot show the PrestoBlue™ cell viability (closed black circles) against optical density at 600 nm (OD_{600}) readings (open white squares). Markers present the mean $\pm$ s.d. (n=3). The s.d. is smaller than the marker if error bar is not visible



Supplementary Table 1: Relative abundance of NH_3 was calculated from equations Eq.1.0, 2.0 and 3.0 depicted in the main text. Table shows parameters and values for salinity (S), temperature (T), ionic strength (I), pK_a^s and % NH_3 calculated. The pK_a^s was calculated from the linear regression provided by Supplementary Figure 1.

Am (M)	Am (mg/L)	S (ppt)	pH	T (K)	I	pK_a^s	NH_3 (mg/L)	% NH_3	% NH_4^+
0.010	170.31	11.688	8.05	301.15	0.236	9.274	11.96	7.0	93.0
0.025	425.78	11.688	8.96	301.15	0.236	9.274	161.97	38.0	62.0
0.050	851.55	11.688	9.38	301.15	0.236	9.274	525.89	61.8	38.2
0.100	1703.1	11.688	9.73	301.15	0.236	9.274	1334.08	78.3	21.7
0.250	4257.75	11.688	10.18	301.15	0.236	9.274	3877.22	91.1	8.9
0.500	8515.5	11.688	10.49	301.15	0.236	9.274	8124.94	95.4	4.6
1.000	17031	11.688	10.78	301.15	0.236	9.274	16621.2	97.6	2.4

Supplementary Table 2: Volcano analysis comparing molecular features in the 0.25 M ammonia dataset against the control dataset (n=3), where metabolites identified in the analysis exhibited a fold change (FC) greater than 2 and a *p*-value < 0.05 (adjusted using FDR correction). Volcano analysis was performed using the web-based software MetabAnalyst 6.0.

Metabolite	FC	log2(FC)	p.adjusted	-log10(p)
CMP-Sialic acid	3.86E+07	25.202	1.20E-07	6.9196
9-OxoODE	1.89E-08	-25.654	2.79E-06	5.5541
N-Acetylserotonin	8.06E-08	-23.565	2.98E-06	5.5258
Glutarylcarntine	1.23E-09	-29.595	1.62E-05	4.7898
Mevalonolactone	4.82E+08	28.845	1.62E-05	4.7898
Linolenic Acid	1.49E-08	-26	1.62E-05	4.7898
2,7-Dimethylnaphthalene	3.45E+07	25.038	1.68E-05	4.7747
Shikimic Acid	3.42E-07	-21.481	1.68E-05	4.7747
Glycerol-3-phosphate	8.34E+07	26.313	2.20E-05	4.6574
Bishomo-gamma-linolenic Acid (20:3)	2.43E-08	-25.293	2.47E-05	4.607
Indole-3-ethanol	1.72E-09	-29.115	5.33E-05	4.2733
Atrazine	4.19E+06	21.997	5.93E-05	4.2268
PA 36:02	5.80E+08	29.113	6.34E-05	4.1982
Sparfloxacin	1.39E+08	27.049	6.47E-05	4.1893
5-Hydroxyindoleacetate	4.53E+08	28.754	0.0002	3.6996
PS 37:04	2.48E+08	27.886	0.000412	3.385
PS 40:01	3.16E-07	-21.592	0.00063	3.2005
PE 38:02	8.20E-08	-23.539	0.002132	2.6712
GVLHAVK (Tryptic Peptide)	2.51E+07	24.582	0.002461	2.6088
D-allo-Isoleucine	3.79E+00	1.9222	0.020352	1.6914
Sorbitol	1.11E-01	-3.1706	0.039119	1.4076
Pantothenate	2.65E+00	1.4068	0.039119	1.4076
Alanine	2.89E+00	1.5335	0.045708	1.34

Supplementary Table 3: Volcano analysis comparing molecular features in the 0.25 M ammonia dataset against those in the NaOH pH 10.18 dataset (n=3), where metabolites identified in the analysis exhibited a fold change (FC) greater than 2 and a *p*-value < 0.05 (adjusted using FDR correction). Volcano analysis was performed using the web-based software MetabAnalyst 6.0.

Metabolite	FC	log2(FC)	p.adjusted	-log10(p)
ELR (Tryptic Peptide)	5.11E+08	28.928	2.52E-05	4.5991
2,7-Dimethylnaphthalene	3.45E+07	25.038	6.44E-05	4.191
Uric Acid	2.01E-07	-22.248	0.000134	3.8726
Atrazine	4.19E+06	21.997	0.000171	3.7681
3-Hydroxybenzaldehyde	1.97E-08	-25.597	0.000191	3.7186
PC (16:1/16:1) (del9-cis)	1.06E-07	-23.172	0.000191	3.7186
Tributylammonium	3.59E-07	-21.411	0.000191	3.7186
Astilbin	7.94E-08	-23.586	0.0002	3.6995
allo-Threonine	1.71E+07	24.03	0.000287	3.5424
3,4-Dihydroxy-L-phenylalanine	4.74E+06	22.175	0.000912	3.0399

Supplementary Table 4: Volcano analysis comparing molecular features in the NaOH pH 10.18 dataset against those in the control dataset (n=3), where metabolites identified in the analysis exhibited a fold change (FC) greater than 2 and a *p*-value < 0.05 (adjusted using FDR correction). Volcano analysis was performed using the web-based software MetabAnalyst 6.0.

Metabolite	FC	log2(FC)	p.adjusted	-log10(p)
PS 37:04	1.07E+09	29.99	5.76E-11	10.24
Fumarate	3.92E+08	28.546	2.03E-06	5.693
9-OxoODE	1.89E-08	-25.654	2.03E-06	5.693
N-Acetylserotonin	8.06E-08	-23.565	2.19E-06	5.6599
PS 41:06	1.80E+07	24.099	6.28E-06	5.202
1,2-Dimyristoyl-sn-glycero-3-phosphocholine	1.24E-07	-22.941	6.28E-06	5.202
NVNDVIAPAFVK (Tryptic Peptide)	3.55E-09	-28.07	1.02E-05	4.9923
Linolenic Acid	1.49E-08	-26	1.02E-05	4.9923
Glutarylcarntine	1.23E-09	-29.595	1.06E-05	4.975
Adenosine-5'-monophosphate	8.12E-10	-30.198	1.09E-05	4.9635
Glycerol-3-phosphate	8.37E+07	26.319	1.68E-05	4.7746
5-Hydroxymethyluracil	1.65E-08	-25.852	1.68E-05	4.7746
ELR (Tryptic Peptide)	2.11E-09	-28.821	1.72E-05	4.7637
Bishomo-gamma-linolenic Acid (20:3)	2.43E-08	-25.293	1.72E-05	4.7637
Reserpine	3.77E+07	25.167	1.72E-05	4.7637
Indole-3-ethanol	1.72E-09	-29.115	3.59E-05	4.4451
allo-Threonine	6.04E-08	-23.981	4.15E-05	4.3815
CMP-Sialic acid	1.75E+07	24.058	4.37E-05	4.3599
Thiabendazole	6.62E+06	22.659	4.37E-05	4.3599
Terbutryn	4.61E+06	22.137	7.12E-05	4.1475
Imazapyr	3.46E-08	-24.784	7.31E-05	4.136
Astilbin	1.26E+07	23.586	7.42E-05	4.1295
N-(3-Phenylpropionyl)-glycine	9.76E-08	-23.288	0.000154	3.8122
PE 38:02	8.20E-08	-23.539	0.001566	2.8052
PE (O-34:03)	5.53E+01	5.788	0.022256	1.6526
N-Acetylglutamate	2.24E+00	1.1659	0.042834	1.3682
Riboflavin	4.18E-01	-1.259	0.04393	1.3572
LysoPC (13:0)	3.92E+00	1.9699	0.049445	1.3059

Supplementary Table 5: Metabolites significantly altered (p -value lower than 0.05 (FDR corrected)) between the three treatment conditions assessed by ANOVA with Tukey's multiple comparison test ($n=3$). p -values without FDR adjustment are also shown. ANOVA analysis was performed using the web-based software MetabAnalyst 6.0.

Metabolite	f.value	p.value	- log ₁₀ (p)	FDR	Tukey's HSD
9-OxoODE	23884	1.98E-12	11.703	1.11E-09	Ammonia-Control; PH-Control
N-Acetylserotonin	18876	4.01E-12	11.397	1.12E-09	Ammonia-Control; PH-Control
Linolenic Acid	6186.4	1.1387E-10	9.9436	2.0122E-08	Ammonia-Control; PH-Control
Glutarylcarntine	5717.4	1.4424E-10	9.8409	2.0122E-08	Ammonia-Control; PH-Control
2,7-Dimethylnaphthalene	4865.6	2.34E-10	9.6309	2.61E-08	Ammonia-Control; PH-NH ₃
Bishomo-gamma-linolenic Acid (20:3)	3586.7	5.84E-10	9.2338	5.43E-08	Ammonia-Control; PH-Control
ELR (Tryptic Peptide)	2697.2	1.37E-09	8.8628	1.09E-07	PH-Control; PH-Ammonia
Indole-3-ethanol	2327.8	2.13E-09	8.6712	1.49E-07	Ammonia -Control; PH-Control
Atrazine	2112.3	2.8525E-09	8.5448	1.6497E-07	Ammonia -Control; PH- Ammonia
Glycerol-3-phosphate	2022.2	3.25E-09	8.488	1.65E-07	Ammonia -Control; PH-Control
CMP-Sialic acid	2021.9	3.25E-09	8.4878	1.65E-07	Ammonia -Control; PH-Control
Astilbin	1379.1	1.02E-08	7.9902	4.76E-07	PH-Control; PH-Ammonia
PS 37:04	765.86	5.9404E-08	7.2262	2.5498E-06	Ammonia -Control; PH-Control; PH-Ammonia
allo-Threonine	715.65	7.27E-08	7.1382	2.90E-06	PH-Control; PH-Ammonia
PE 38:02	284.79	1.1328E-06	5.9458	0.00004214	Ammonia -Control; PH-Control
PE (O-34:03)	45.702	0.00023373	3.6313	0.0081513	Ammonia -Control; PH-Control
Sorbitol	32.74	0.00059145	3.2281	0.019413	Ammonia -Control; PH-Control
N,N-Dimethylglycine	30.626	0.00071015	3.1487	0.022015	Ammonia -Control; PH-Control
Pantothenate	28.839	0.00083655	3.0775	0.022551	Ammonia -Control; PH- Ammonia

PC 34:02	28.822	0.000838	3.0768	2.26E-02	Ammonia -Control; PH-Control
D-allo-Isoleucine	28.686	0.000849	3.0712	2.26E-02	Ammonia -Control; PH-NH3
N-Acetylglutamate	25.653	0.0011478	2.9401	0.028623	Ammonia -Control; PH-Control
Alanine	25.391	0.0011798	2.9282	0.028623	Ammonia -Control; PH-NH3
N-Acetyl-L-aspartic Acid	24.091	0.0013579	2.8671	0.031572	Ammonia -Control; PH-Control
Stearic Acid (18:0)	22.984	0.001539	2.8128	0.033617	Ammonia -Control; PH-Control
Indoleacetaldehyde	22.832	0.0015664	2.8051	0.033617	Ammonia -Control; PH- Ammonia
Mannitol	20.965	0.0019616	2.7074	0.04054	Ammonia -Control; PH-Control
Riboflavin	19.872	0.0022566	2.6465	0.044971	PH-Control; PH- Ammonia
L-Tryptophanamide	19.588	0.0023426	2.6303	0.045076	Ammonia -Control; PH-Control
PE 36:05	18.741	0.0026273	2.5805	0.048867	Ammonia -Control; PH-Control