# Distinct Short-Term Response of Intracellular Amino Acids in *Saccharomyces cerevisiae* and *Pichia pastoris* to Oxidative and Reductive Stress

**Table S1.** Vitamin solution and Trace elements for Verduyn Medium [13]

| **1000X Vitamin solution for Verduyn medium** | |
|---|---|
| **Components** | **Composition(g/L)** |
| D-biotin | 0.05 |
| Ca-D-pantothenate | 1 |
| Nicotinic acid | 1 |
| Myo-inositol | 25 |
| Thiamine hydrochloride | 1 |
| Pyridoxal hydrochloride | 1 |
| p-aminobenzoic acid | 0.2 |
| **100X Trace Elements for Verduyn medium** | |
| **Components** | **Composition(g/L)** |
| $Na_2EDTA$ | 1.5 |
| $ZnSO_4.7H_2O$ | 0.45 |
| $MnCl_2.2H_2O$ | 0.1 |
| $CoCl_2.6H_2O$ | 0.03 |
| $CuSO_4.5H_2O$ | 0.03 |
| $Na_2MoO_4.2H_2O$ | 0.04 |
| $CaCl_2.2H_2O$ | 0.45 |
| $FeSO_4.7H_2O$ | 0.3 |
| $H_3BO_3$ | 0.1 |
| KI | 0.01 |

**Table S2.** The amino acid standards used as an external calibration for HPLC

| Amino acid standards | Abbreviations | $R^2$ | Slope | Intercept | Range (g/L) |
|---|---|---|---|---|---|
| Tryptophan | TRP | 0.999 | 1.86E-08 | -0.004 | 0.01-1 |
| Phenylalanine | PHE | 0.997 | 1.93E-08 | -0.012 | 0.01-1 |
| Alanine | ALA | 0.984 | 1.11E-08 | -0.253 | 0.1-2 |
| Valine | VAL | 1.000 | 1.18E-08 | -0.008 | 0.01-1 |
| Isoleucine | ILE | 1.000 | 2.15E-08 | -0.016 | 0.01-0.5 |
| Leucine | LEU | 0.999 | 1.93E-08 | -0.041 | 0.01-1 |
| Glycine | GLY | 0.970 | 9.47E-09 | 0.123 | 0.05-2 |
| Cysteine | CYS | 0.914 | 1.97E-07 | -0.265 | 0.1-1 |
| Glutamate | GLU | 1.000 | 1.95E-08 | 0.008 | 0.01-1 |
| Serine | SER | 1.000 | 1.03E-08 | 0.007 | 0.01-1 |
| Aspartate | ASP | 0.996 | 2.73E-08 | -0.013 | 0.005-1 |
| Proline | PRO | 0.988 | 2.16E-07 | -0.157 | 0.1-1 |
| Arginine | ARG | 0.984 | 4.22E-08 | -0.660 | 0.1-5 |
| Methionine | MET | 0.854 | 3.31E-07 | -0.104 | 0.5-0.01 |
| Asparagine | ASN | 0.999 | 1.24E-07 | -0.008 | 0.01-1 |
| Glutamine | GLN | 0.883 | 4.64E-08 | -0.800 | 0.1-4 |
| Lysine | LYS | 0.990 | 1.17E-08 | -0.045 | 0.01-1 |

**Table S3.** The effect of 5 mM $H_2O_2$-induced oxidative stress as well as 20 mM DTT-induced reductive stress on intracellular amino acid levels is presented in μmol/gDW for *S.cerevisiae*

| ***S.cerevisiae* CEN.PK113-7D** | | | | |
|---|---|---|---|---|
| **5 mM $H_2O_2$** | | | | |
| | **Concentration(μmol/gDW cell)** | | | |
| | **0 min** | **1 min** | **3 min** | **5 min** |
| **ALA** | 25.54±10.36 | 25.85±3.72 | 31.95±16.44 | 27.71±16.47 |
| **ARG** | 84.95±34.81 | 81.74±68.57 | 107.22±47.03 | 107.86±66.01 |
| **ASN** | 13.55±4.84 | 15.97±5.11 | 15.52±7.41 | 13.99±4.71 |
| **ASP** | 51.82±10.38 | 53.29±9.18 | 55.06±17.98 | 54.34±25.39 |
| **CYS** | 45.28±56.61 | 64.24±51.44 | 73.45±42.69 | 85.94±37.95 |
| **GLU** | 320.10±114.74 | 290.64±127.94 | 317.12±177.14 | 338.18±178.62 |
| **GLY** | 32.89±2.55 | 46.08±25.34 | 32.51±8.84 | 35.06±5.32 |
| **MET** | 174.90±9.58 | 118.24±95.84 | 134.28±117.65 | 200.32±30.67 |
| **PHE** | 2.68±0.42 | 1.69±0.15 | 2.84±1.14 | 3.32±1.54 |
| **SER** | 4.44±0.40 | 3.86±0.53 | 4.66±0.40 | 4.56±0.62 |
| **TRP** | 1.14±0.11 | 1.97±2.23 | 1.26±1.30 | 1.09±0.22 |
| **VAL** | 8.53±3.09 | 7.25±4.04 | 8.31±6.85 | 8.96±5.96 |
| **ILE+LEU** | 19.34±4.49 | 13.52±1.49 | 15.38±4.82 | 17.37±0.21 |
| **LYS** | 11.62±4.52 | 11.78±8.23 | 19.78±2.00 | 14.47±9.60 |
| **GLN** | 187.46±82.18 | 174.57±123.80 | 248.46±98.17 | 231.16±176.41 |
| **PRO** | 194.98±70.21 | 144.04±3.54 | 161.57±0.39 | 162.47±4.29 |
| **20 mM DTT** | | | | |
| | **Concentration(μmol/gDW cell)** | | | |
| | **0 min** | **1 min** | **3 min** | **5 min** |
| **ALA** | 23.53±2.06 | 18.89±14.84 | 17.15 | 13.10±5.02 |
| **ARG** | 110.81±16.44 | 118.43±9.94 | 108.19 | 108.10±11.07 |
| **ASN** | 17.67±7.97 | 11.70±3.09 | 10.47 | 9.10±1.75 |
| **ASP** | 37.87±2.88 | 30.38±11.01 | 29.74 | 23.98±5.23 |
| **CYS** | 98.62±3.20 | 91.96±20.87 | 91.35 | 79.25±13.55 |
| **GLU** | 377.07±39.13 | 325.46±157.54 | 358.57 | 317.43±85.46 |
| **GLY** | 36.46±0.76 | 36.48±4.63 | 34.51 | 32.05±5.21 |
| **MET** | 236.20±67.58 | 416.91±54.19 | 308.25 | 400.22±23.46 |
| **PHE** | 2.40±0.62 | 2.24±0.51 | 2.02 | 2.61±0.11 |
| **SER** | 4.14±0.15 | 3.73±0.69 | 3.74 | 3.54±0.88 |
| **TRP** | 4.19±1.39 | 4.59±1.73 | 4.08 | 5.19±0.57 |
| **VAL** | 8.89±0.76 | 6.79±4.36 | 6.69 | 6.19±0.93 |
| **ILE+LEU** | 14.66±1.42 | 12.63±0.49 | 8.22 | 9.80±0.02 |
| **LYS** | 7.14±0.64 | 6.53±1.02 | 7.44 | 6.87±1.67 |
| **GLN** | 304.92±0.39 | 263.39±164.39 | 288.90 | 247.14±53.58 |
| **PRO** | 152.56±15.34 | 273.41±14.14 | 141.48 | 201.42±58.99 |

**Table S4.** The effect of 5 mM $H_2O_2$-induced oxidative stress as well as 20 mM DTT-induced reductive stress on intracellular amino acid levels is presented in μmol/gDW *P.pastoris*

| *P.pastoris ATCC28485* | | | | |
|---|---|---|---|---|
| **5 mM $H_2O_2$** | | | | |
| | **Concentration(μmol/gDW cell)** | | | |
| | **0 min** | **1 min** | **3 min** | **5 min** |
| **ALA** | 16.54±1.90 | 19.08±5.14 | 16.40±0.28 | 15.41±1.33 |
| **ARG** | 127.18±35.89 | 137.92±30.18 | 150.52±9.71 | 129.01±20.33 |
| **ASN** | 14.27±3.28 | 13.00±1.45 | 10.84±3.07 | 16.06±6.22 |
| **ASP** | 35.96±0.27 | 51.40±14.84 | 63.64±8.60 | 53.05±5.38 |
| **CYS** | 55.90±15.75 | 72.69±10.79 | 65.54±10.85 | 56.38±7.70 |
| **GLU** | 291.22±41.68 | 207.11±125.39 | 242.24±102.42 | 240.75±57.00 |
| **GLY** | 27.75±0.58 | 28.14±0.64 | 25.39±4.33 | 27.47±0.66 |
| **MET** | 47.28±24.75 | 62.47±30.99 | 45.46±20.63 | 50.17±27.57 |
| **PHE** | 0.71±0.39 | 1.04±0.06 | 0.55±0.17 | 0.55±0.17 |
| **SER** | 3.56±0.08 | 3.64±0.01 | 3.21±0.50 | 4.16±0.02 |
| **TRP** | 2.10±0.08 | 1.29±0.25 | 1.33±0.62 | 1.68±0.26 |
| **VAL** | 3.23±0.17 | 3.28±0.19 | 3.27±0.34 | 2.99±0.59 |
| **ILE+LEU** | 5.16±2.89 | 5.80±0.25 | 4.29±1.05 | 4.38±0.99 |
| **LYS** | 7.31±1.45 | 9.35±1.81 | 9.37±0.51 | 7.62±0.21 |
| **GLN** | 329.94±93.13 | 364.41±79.06 | 368.06±13.09 | 312.15±15.03 |
| **PRO** | 135.20±28.15 | 71.42±31.91 | 85.35±91.51 | 105.40±62.77 |
| **20 mM DTT** | | | | |
| | **Concentration(μmol/gDW cell)** | | | |
| | **0 min** | **1 min** | **3 min** | **5 min** |
| **ALA** | 20.09±4.79 | 14.32±4.93 | 11.49±7.84 | 18.04±1.38 |
| **ARG** | 220.64±19.29 | 174.46±26.68 | 148.92±72.26 | 206.86±25.56 |
| **ASN** | 11.60±0.86 | 10.70±2.25 | 10.54±0.11 | 12.46±0.85 |
| **ASP** | 42.27±16.28 | 33.71±6.54 | 26.87±14.78 | 47.90±2.68 |
| **CYS** | 48.61±16.56 | 36.60±4.51 | 28.32±13.95 | 45.36±9.63 |
| **GLU** | 260.22±42.36 | 191.69±70.26 | 162.02±116.34 | 243.25±24.40 |
| **GLY** | 31.45±2.12 | 27.77±5.23 | 29.11±0.99 | 29.56±2.03 |
| **MET** | 85.30±13.62 | 80.23±18.59 | 73.88±24.27 | 98.91±21.98 |
| **PHE** | 0.80±0.25 | 0.82±0.58 | 0.43±0.11 | 0.55±0.03 |
| **SER** | 5.11±1.65 | 4.55±1.95 | 5.31±1.17 | 4.57±0.66 |
| **TRP** | 3.03±2.24 | 1.54±0.23 | 1.31±1.02 | 1.44±0.36 |
| **VAL** | 4.32±0.26 | 2.42±1.20 | 2.11±1.77 | 3.07±0.53 |
| **ILE+LEU** | 7.03±0.96 | 4.02±0.49 | 3.45±1.67 | 4.00±0.53 |
| **LYS** | 13.31±2.42 | 8.39±6.30 | 7.42±7.75 | 13.02±1.60 |
| **GLN** | 395.40±69.40 | 366.13±16.85 | 292.31±78.45 | 383.41±100.14 |
| **PRO** | 260.38±260.01 | 232.71±196.17 | 187.42±57.79 | 114.56±37.46 |