**Supplemental Table 1.** List of Proteins with Detected Cysteine-SOH Modifications (excluding those identified in proteomic screens). Each referenced entry indicates the species, particular cysteine residue modified (if known), oxidative treatment that accompanied detection and the methodology employed.

| Protein Name | Species | Cysteine | Detection Method(s)[#] | Oxidant Treatment(s) | Reference |
|---|---|---|---|---|---|
| 1-Cys OxyR | *D. radiodurans* | 210 | N | cumene-hydroperoxide | (*1*) |
| 1-Cys Prx | *B. taurus* | | T | hydrogen peroxide, peroxynitrite | (*2*) |
| 20S Proteasome | *S. cerevisiae* | | N | hydrogen peroxide | (*3*) |
| 20S Proteasome | *S. cerevisiae* | | N | hydrogen peroxide | (*4*) |
| Actin | *H. sapiens* | | D | hydrogen peroxide | (*5*) |
| Actin | *H. sapiens* | | D, SR | no treatment | (*6*) |
| Actin | *R. norvegicus* | 217 | MS, SR | no treatment, x-ray irradiation | (*7*) |
| Alcohol Dehydrogenase | *S. cerevisiae* | | DR | hydrogen peroxide | (*8*) |
| AhpC (C165S) | *S. typhimurium* | 46 | N | peroxynitrite | (*9*) |
| AhpC (C165S) | *S. typhimurium* | 46 | N | hydrogen peroxide | (*10*) |
| AhpC (C165S) | *S. typhimurium* | 46 | T | hydrogen peroxide | (*11*) |
| AhpC (C165S) | *S. typhimurium* | 46 | DR | hydrogen peroxide | (*12*) |
| AhpC (C165S) | *S. typhimurium* | 46 | DR | hydrogen peroxide | (*13*) |
| AhpE | *M. tuberculosis* | 45 | T | hydrogen peroxide | (*14*) |
| AhpE | *M. tuberculosis* | 45 | X | no treatment | (*15*) |
| Akt1 | *H. sapiens* | 310 | MS | no treatment, hydrogen peroxide | (*16*) |
| Albumin | *B. taurus* | 34 | SR | hydrogen peroxide | (*17*) |
| Albumin | *B. taurus* | 34 | SR | hydrogen peroxide, xanthine oxidase | (*18*) |
| Albumin | *H. sapiens* | 34 | DR | hydrogen peroxide | (*8*) |
| Albumin | *H. sapiens* | 34 | D | nitric oxide (anaerobic) | (*19*) |
| Albumin | *B. taurus* | 34 | N | hydrogen peroxide + bicarbonate | (*20*) |
| Albumin | *B. taurus* | 34 | N | hydrogen peroxide + nitrite, hydrogen peroxide + bicarbonate | (*21*) |
| Albumin | *H. sapiens* | 34 | N | taurine chloramine | (*22*) |
| Albumin | *H. sapiens* | 34 | T | hydrogen peroxide | (*23*) |
| Albumin | *H. sapiens* | 34 | N, D | hydrogen peroxide, peroxynitrite | (*24*) |
| Aldose Reductase | *H. sapiens* | 298 | D | peroxynitrite | (*25*) |

| | | | | | |
|---|---|---|---|---|---|
| Aldose Reductase | *H. sapiens* | 298, 303 | D | hydrogen peroxide | (*26*) |
| Aldose Reductase | *R. norvegicus* | 80, 92, 298, 303 | D, MS | ischemia | (*26*) |
| Alpha1 Antitrypsin | *H. sapiens* | 232 | N | hydrogen peroxide | (*27*) |
| Arylamine N-acetyltransferase | *H. sapiens* | 68 | D | hydrogen peroxide | (*28*) |
| Bacterioferritin Comigratory Protein (C50S) | *E. coli* | 45 | N | hydrogen peroxide | (*29*) |
| Bacterioferritin Comigratory Protein | *E. coli* | 45 | N | no treatment | (*30*) |
| Betaine Aldehyde Dehydrogenase | *P. aeruginosa* | 286 | X | no treatment | (*31*) |
| Calreticulin | *H. sapiens* | | DR | no treatment | (*32*) |
| Cathepsin K | *H. sapiens* | 25 | D | NOR-1 (nitric oxide donor) | (*33*) |
| CDC25B Phosphatase (C426S) | *H. sapiens* | 473 | MS | hydrogen peroxide | (*34*) |
| Cytosolic Branched Chain Aminotransferase | *H. sapiens* | 335 | D | hydrogen peroxide | (*35*) |
| Formylglycine Generating Enzyme | *H. sapiens* | 336 | X | no treatment | (*36*) |
| Glutathione Reductase | *H. sapiens* | 63 | X | S-nitrosoglutathione | (*37*) |
| Glutathione S Transferase (microsomal) | *R. norvegicus* | 49 | SR | peroxynitrite | (*38*) |
| Glutathione S Transferase (mitochondrial) | *R. norvegicus* | | SR | gallic acid | (*39*) |
| GAPDH | *O. cuniculus* | 149 | BA | o-iodosobenzoate | (*40*) |
| GAPDH | *S. domestica* | 149 | D, DR | o-iodosobenzoate | (*41*) |
| GAPDH | *O. cuniculus* | 149 | SR | hydrogen peroxide | (*42*) |
| GAPDH | *S. domestica* | 149 | SR | o-iodosobenzoate, iodine monochloride | (*43*) |
| GAPDH (C153S) | *B. stearothermophilus* | 149 | SR | hydrogen peroxide | (*44*) |
| GAPDH | *S. domestica* | 149 | SR | trinitroglycerin | (*45*) |
| GAPDH | *H. sapiens* | | DR | no treatment, hydrogen peroxide | (*32*) |
| GAPDH | *O. cuniculus* | 149 | D | hydrogen peroxide | (*5*) |
| GAPDH | *H. sapiens* | 152 | D | hydrogen peroxide | (*5*) |
| Gpx3/Orp1 | *S. cerevisiae* | 36 | DR | hydrogen peroxide | (*46*) |
| Gpx3/Orp1 (C64S,C82S) | *S. cerevisiae* | 36 | N | hydrogen peroxide | (*47*) |
| Hemoglobin (beta chain) | *H. sapiens* | 93 | D, MS | hydrogen peroxide | (*48*) |
| hORF6 | *H. sapiens* | 47 | X | no treatment | (*49*) |

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|---|---|---|---|---|---|
| IgG1 | *H. sapiens* | 231 | MS | hydrogen peroxide | (*50*) |
| Ikappa B Kinase (beta subunit) | *M. musculus* | 179 | D | hydrogen peroxide | (*51*) |
| Malate Synthase G | *E. coli* | 617 | X | no treatment | (*52*) |
| Methionine Sulfoxide Reductase A (C86S,C198S,C206S) | *E. coli* | 51 | T | hydrogen peroxide, methionine sulfoxide | (*53*) |
| Methionine Sulfoxide Reductase A (C198S) | *N. meningitis* | 51 | X | no treatment | (*54*) |
| Methionine Sulfoxide Reductase B | *D. melanogaster* | 124 | D | methionine sulfoxide | (*55*) |
| Methionine Sulfoxide Reductase B (C31S) | *X. campestris* | 117 | T | no treatment | (*56*) |
| Methionine Sulfoxide Reductase B1 | *A. thaliana* | 186 | MS | methionine sulfoxide | (*57*) |
| Mitochondiral Branched Chain Aminotransferase (C318A) | *H. sapiens* | 315 | MS, D | hydrogen peroxide | (*58*) |
| Mitochondrial 1-Cys Prx | *S. cerevisiae* | 91 | MS | hydrogen peroxide | (*59*) |
| MKP-3 (C287S,C309S) | *H. sapiens* | 293 | MS | hydrogen peroxide | (*60*) |
| NADPH Oxidase | *L. sanfranciscensis* | 42 | X | no treatment | (*61*) |
| NADH peroxidase | *E. faecalis* | 42 | NMR | no treatment | (*62*) |
| NADH peroxidase | *S. faecalis* | 42 | T | no treatment | (*63*) |
| NADH peroxidase | *E. faecalis* | 42 | X | no treatment | (*64*) |
| NADH peroxidase | *S. faecalis* | 42 | X | no treatment | (*65*) |
| Nitrile Hydratase | *P. thermophilia* | 113 | X | no treatment | (*66*) |
| OhrR (C127S,C131S) | *X. campestris* | 22 | N | cumene-hydroperoxide | (*67*) |
| OhrR | *B. subtilis* | 15 | N, MS | cumene-hydroperoxide | (*68*) |
| OxyR | *E. coli* | 199 | N | hydrogen peroxide | (*69*) |
| NF-kappaB (p50 subunit) | *H. sapiens* | 62 | D | hydrogen peroxide | (*70*) |
| Papain | *C. papaya* | 25 | SR, T | hydrogen peroxide | (*71*) |
| Papain | *C. papaya* | 25 | DR | hydrogen peroxide | (*8*) |
| Papain | *C. papaya* | 25 | DR | hydrogen peroxide | (*13*) |
| Papain | *C. papaya* | 25 | D | hydrogen peroxide | (*5*) |
| Papain | *C. papaya* | 25 | N | hydrogen peroxide, tryptophan-hydroperoxide | (*72*) |
| PAPS reductase | *E. coli* | | DR | hydrogen peroxide | (*8*) |
| PILB (C348S) | *N. meningitis* | 206 | T, D | methionine sulfoxide | (*73*) |

| | | | | | |
|---|---|---|---|---|---|
| Prx | *A. pernix* | 50 | X | no treatment | (*74*) |
| Prx1 | *H. sapiens* | | DR | hydrogen peroxide | (*32*) |
| Prx1 | *H. sapiens* | | D | hydrogen peroxide | (*5*) |
| Prx1 | *S. cerevisiae* | | D | hydrogen peroxide | (*75*) |
| Protein Tyrosine Phosphatase 1B | *H. sapiens* | 215 | X | no treatment | (*76*) |
| Rab1a | *H. sapiens* | 26, 126 | DR | hydrogen peroxide | (*32*) |
| S100A8 | *M. musculus* | 41 | MD, D | hypochlorous acid | (*77*) |
| SarZ | *S. aureus* | 13 | N, X | cumene-hydroperoxide | (*78*) |
| S-Formylglutathione Hydrolase | *S. cerevisiae* | 60 | X | no treatment | (*79*) |
| Shp1 | *M. musculus* | 453 | DR | phorbol myristate acetate + ionomycin | (*80*) |
| Shp2 | *M. musculus* | 459 | DR | phorbol myristate acetate + ionomycin | (*80*) |
| Sortase A | *S. pyogenes* | 208 | X | no treatment | (*81*) |
| Tetrachlorohydroquinone Dehalogenase | *S. chlorophenolicus* | 13 | D | hydrogen peroxide | (*82*) |
| Thiocyanate Hydrolase | *E. coli* | 133 | X | no treatment | (*83*) |
| Thiocyanate Hydrolase | *T. thioparus* | 133 | X | no treatment | (*84*) |
| Thiol Peroxidase (C82S,C95S) | *E. coli* | 61 | N | cumene-hydroperoxide | (*85*) |
| Tsa1 (C170S) | *S. cerevisiae* | | N | hydrogen peroxide | (*75*) |
| Ulp1 | *S. cerevisiae* | 580 | X | no treatment | (*86*) |
| Vaccinia H1-Related Protein | *H. sapiens* | 124 | N | hydrogen peroxide | (*87*) |
| YajL | *E. coli* | 106 | X | no treatment | (*88*) |
| YbiS | *E. coli* | 186 | DR | no treatment, hydrogen peroxide | (*89*) |
| YhaK | *E. coli* | 122 | X | no treatment | (*90*) |

Legend for Detection Methodology: N = 7-chloro-4-nitrobenzo-2-oxa-1,3-diazole (NBD-Cl), T = 5-thio-2-nitrobenzoate (TNB), D = 5,5-dimethyl-1,3-cyclohexanedione (Dimedone), SR = Selective Reduction, MS = Direct Mass Spectrometry, DR = Dimedone Derivatives, X = X-ray Crystal Structure, NMR = $^{13}C$ NMR, BA = benzylamine.

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