

Volume 2

Subject Index

- Abdomen, NO imaging, 892
- Abortion, lipid peroxides, 623
- Acetate, chloroplast DNA, 532
- Acetylcholine
- cognitive function, 437
 - vascular response, 364
- Acidosis, iron delocalization, 429
- Acquired immunodeficiency syndrome (AIDS), 539, 563
- Action potential duration, free radicals, 56
- Adaptor proteins
- endothelial cells, 790
 - redox signaling, 84
- Adenosine nucleotide translocator (ANT), 539
- Adenosine diphosphate (ADP)
- calcium release, 47–52
 - calmodulin interaction, 47
 - redox signaling, 47–52
- Adenosine monophosphate (AMP)
- BMT patients, 99
 - dual functions, 631–640
 - elevating agents, 632, 635
 - immunosuppression, 640
 - inducible early repressor, 640
 - intracellular levels, 636
 - membrane redox systems, 181
 - NOS expression, 631–640
- Adenosine triphosphate (ATP)
- calcium release, 8
 - etoposide effects, 77
 - free radicals, 57
 - hydrolysis, 77
 - phenoxyl radicals, 77
 - proteolysis, 869–871
 - thiol oxidation, 74
- Adhesion molecules
- cell interactions, 821
 - ischemia-reperfusion, 128
 - NOS expression, 394
 - tocopherol interactions, 821–824
- Adrenochrome, schizophrenia, 580
- Adriamycin, membrane redox inhibitor, 220
- Adult respiratory distress syndrome (ARDS), 94, 626
- Adult T-cell leukemia (ATL)
- Tax expression, 727
 - thioredoxin, 519, 522
- Advanced glycation endproducts (AGE), 381
- Aggression, ginkgo biloba, 467–470
- Aging
- antioxidants, 375–377
 - apoptosis, 386
 - atherosclerosis, 379–386
 - basal forebrain, 437–442
 - butylhydroperoxide, 473–481
 - cell proliferation, 386
 - cholinergic system, 437–442
 - cognitive deficits, 437
 - diabetes, 379–386
 - diet, 376
 - dopamine, 449–456
 - immune function, 382
 - ischemia-reperfusion, 366
 - lipoic acid, 473–481
 - neurodegeneration, 449–456
 - oxidative stress, 13, 376, 449
 - signaling pathways, 379–386
 - tocopherol, 408
 - transcription factors, 379
 - vascular sensitivity, 363–367
- Alamethicin, calcium release, 76
- Albumin, HNE-modified, 681–684
- Alcohol, breast cancer, 903, 906
- Alga, redox modulation, 529–534
- Alkylating agents, NO production, 772, 775
- Alkylation, channel effects, 42
- Allicin, LDL oxidation, 491–504
- Alzheimer's disease
- amyloidosis, 317, 414
 - apolipoprotein E, 416
 - cholinergic deficits, 438
 - familial, 417
 - mitochondria, 415
 - myeloperoxidase, 908
 - neuronal damage, 413
 - oxidative stress, 413–418
 - pathogenesis, 317, 416
 - PDI levels, 485–488
 - proteolysis, 417
 - redox abnormalities, 872
 - risk factors, 416
 - tocopherol, 409
 - vascular abnormalities, 415
- Amino acids
- chromosome mapping, 667
 - light chains, 665–670
 - redox-responsive, 865
 - transport system, 665
- Amyloid peptides
- Alzheimer's disease, 317
 - ATP analysis, 319
 - carbonyl content, 319
 - precursor proteins, 317
 - zinc cytotoxicity, 317–323
- Anethole dithiolethione (ADT)
- cell viability, 793
 - endothelium, 789–797
 - PMN adhesion, 782
 - tyrosine kinase, 789
- Angina, NO-mediated, 923
- Angiotensin converting enzyme (ACE), 13
- Antidiabetic drugs, erythrocyte protection, 743
- Antioxidant and Redox Regulation of Genes* (Sens, Sies and Baeurle), 369
- Antioxidant-responsive elements (ARE)
- heme transcription, 165, 168
 - hemopexin complexes, 744
 - metallothionein regulation, 740
- Antioxidants
- aging, 375–377
 - apoptosis, 217–223
 - atherosclerosis, 379–386
 - blood cells, 189–194
 - breast cancer, 903–912
 - coenzyme Q, 260
 - cytokine inhibition, 84–92
 - dietary, 376
 - DNA protection, 905
 - electron transport, 189–194
 - fruits and vegetables, 906
 - heme oxygenase, 123
 - Internet resources, 935–938
 - LDL oxidation, 491–504
 - lipid-soluble, 921
 - lipoprotective, 74
 - liver transplants, 347–353
 - membrane redox system, 214
 - miscarriage, 623–627
 - NO bioactivity, 919–925
 - NOS expression, 123
 - nuclear factors, 85
 - nutritional, 122
 - phenols, 74
 - plasma activity, 191
 - pregnancy, 623–627
 - redox-active metals, 74
 - redox signaling, 83, 935
 - regeneration, 260
 - respiration, 48
 - water-soluble, 923
 - see also specific antioxidant*
- Antracyclines, antitumor drugs, 79
- Aorta, vascular contractility, 364
- Apolipoprotein E, Alzheimer's disease, 416
- Apoptosis
- Alzheimer's disease, 416
 - antioxidant regulation, 217–223
 - Bcl blocking, 537
 - butylhydroperoxide, 352
 - cardiac, 103–111
 - caspase activation, 263
 - ceramide release, 263–272
 - coenzyme Q, 263–272
 - different stimuli, 217
 - DNA laddering, 452
 - dopamine-induced, 451
 - effector phase, 553

- Apoptosis (*continued*)
 future research, 564
 HIV-1 infection, 554
 hydrogen peroxide, 218
 JNK pathway, 451
 membrane redox, 213–224
 mitochondria, 219, 540
 NO activity, 595
 oxidant-induced, 351
 oxidative stress, 215, 221, 451, 557
 plasma membrane, 205, 219
 PMDR involvement, 208
 proteasomes, 106
 redox activity, 156, 554
 ROS generation, 540
 schematic model, 224
 serum withdrawal, 218, 263
 signaling pathways, 546
 sphingomyelinase, 215, 219
 stress-induced, 213–224
 time course, 266
 transcription factors, 381, 441
 ubiquitin proteins, 103–111
 UV-induced, 596
 viral replication, 557
- Apoptosis-inducing factor (AIF), 539
- Apoptosis signal-regulating kinase (ASK), 89
- Arachidonic acid, 286, 544
- Arginine, NO generation, 11
- Aromatic disulfides, channel activity, 18
- Arterial relaxation, NO-mediated, 921
- Asbestos, apoptosis, 381
- Ascorbic acid
 antioxidants, 192
 apoptosis, 221
 autooxidation, 193
 blood cells, 189–194
 cancer therapy, 735
 cell migration, 731
 electron transport, 189, 214
 erythrocytes, 190
 ferricyanide reductase, 190
 fibroblast repression, 727–736
 free radical, 200
 glucose transport, 194
 hepatocytes, 474
 immune response, 191
 intracellular, 730
 LDL oxidation, 331
 leukocytes, 331
 NO bioactivity, 925
 oxidative stress, 727–736
 peptide cleavage, 869
 plasma, 190
 recycling, 190
 regulation, 200
 tumor cells, 191
- Aspartate protease, redox-responsive, 867
- Asphyxia, newborns, 429
- Astrocytes, dopamine effect, 454
- Ataxia, tocopherol deficiency, 399, 407
- Atherosclerosis
 aging, 379–386
 apoptosis, 381
 cholesterol, 401
- LDL oxidation, 327, 492
- NO bioactivity, 917
- NOS suppression, 640
- tocopherol, 401
- Atrial natriuretic factor (ANF), 68
- Autocatalysis, peptide bonds, 869
- Azobis-amidino propane hydrochloride (AAPH), 494
- B**-cells
 cytokine profile, 558
 thioredoxins, 718, 723
- Bacterial artificial chromosomes (BAC), 510
- Bacterial infections, NOS expression, 587
- Basal forebrain
 aging model, 437–442
 cholinergic system, 437
 immunolesion, 439, 441
 transcription factors, 442
- Basement membrane, fibroblast invasion, 727–736
- Bathocuproine disulfonate (BCDS)
 heme oxygenase, 169, 756
 hemopexin system, 754
 JNK activation, 760, 763
 metallothioneins, 756, 761
 MTF-1 activation, 745, 748
- Bax genes, apoptosis, 540
- Bcl genes
 adaptation, 542
 antioxidants, 538
 apoptosis, 219, 221
 cancer etiology, 537
 glutathione levels, 542, 545
 metabolic pathways, 542, 546
 mitochondria, 537, 539
 model systems, 542
 NO effects, 596
 redox pathways, 537–547
 signal transduction, 562
 thioredoxins, 543
 transcription, 542
- Beta-carotene, LDL oxidation, 493, 503
- Bile cells
 HDG formation, 133
 tocopherol, 406
- Blood
 antioxidants, 189–194
 ascorbic acid, 189
 burn patients, 707–714
 thioredoxin levels, 707
- Bone marrow transplantation (BMT)
 BAL results, 97
 nuclear factors, 93–101
 oxidative stress, 93
 patient selection, 94
- Brain
 adrenergic system, 580
 EPR spectroscopy, 884
 hemopexin expression, 160
 immunolesion model, 439
 iron metabolism, 423–428
 NO detection, 888
 respiratory requirements, 415
 thioredoxin expression, 806
 transcription factors, 442
- Brain-derived neurotrophic factor (BDNF), 440
- Breast cancer
 alcohol consumption, 903
 antioxidants, 903–912
 dietary factors, 903
 DNA damage, 904, 907
 environmental causes, 906
 epidemiology, 903
 family history, 905
 fat intake, 906
 gene mutations, 905
 hormonal factors, 903
 oxidants, 903–912
 oxidative stress, 904–907
 polymorphic enzymes, 908
 reproductive events, 903
 risk factors, 903, 905
 ROS activity, 907–911
- Bronchoalveolar lavage (BAL), 95
- Buffy coat cells
 light-responsive, 289
 NADH oxidase, 289–299
 oscillation patterns, 294
- Burn patients
 blood cells, 707
 clinical data, 708
 thioredoxins, 707–714
- Butylhydroperoxide, hepatocytes, 473–481
- Cadmium**
 calcium release, 6
 chloroplast DNA, 531
- Caffeine
 calcium release, 11, 60
 thioloxidation, 78
- Calcineurin, cardiac muscle, 68
- Calcium
 ATPase activity, 75
 calmodulin, 66
 cardiac muscle, 65–69
 force generation, 5, 9
 lung ischemia, 340
 redox signaling, 65–69
 transport, 75
- Calcium release
 cadmium, 6
 caffeine, 11, 60
 heavy metals, 6
 reactive disulfides, 8
 redox modulation, 1
 striated muscle, 8, 10
 sulfhydryls, 17
- Calmodulin
 ADP-ribose interaction, 47
 biphasic effects, 43
 calcium release, 47–52
 channel activity, 43
 redox signaling, 47–52
 ryanodine modulation, 41–44
 sarcoplasmic reticulum, 47
- Calpain, proteolysis, 865
- Cambridge Heart Antioxidant Study, 401
- Cancer cells
 etoposide, 74

- NOX activity, 182
 nuclear factors, 311
 photosensitization, 311
 Capsaicin, NADH inhibitor, 207, 235
 Captopril, ACE inhibitor, 13
 Carbon monoxide, heme oxygenase, 164
 Carbonyls, heme production, 163, 170
 Cardiac muscle
 calcium signaling, 65–69
 excitation-transcription, 67
 gene expression, 67
 hydrogen peroxide, 69
 NO interaction, 5–14
 reactive disulfides, 8
 redox regulation, 65–69
 ryanodine activity, 5, 36, 49
 sarcoplasmic reticulum, 5–14
 sulfhydryl oxidation, 36
 superoxide effects, 49
 Cardiac myocytes
 calcium handling, 58, 68
 depolarization, 68
 free radicals, 58
 Carmustine, BMT patients, 94
 Carnosic acid, LDL oxidation, 491–504
 Caspases
 apoptosis, 263–272
 ceramide effect, 268
 coenzyme Q, 263–272
 lipid activation, 269
 redox signaling, 554
 Catalase
 breast cancer, 909
 NADPH oxidase, 284
 NO bioactivity, 920
 oxidative stress, 909
 vascular activity, 365
 Catecholamines
 antioxidants, 577
 clinical data, 379
 iron transport, 577
 redox signaling, 575–581
 see also Dopamine
 Catecholestrogens, breast cancer, 905
 Catechol-O-methyl transferase (COMT), 911
 Cathepsin B, DHLA activation, 861
 CD4 cells, HIV-1 depletion, 551, 557
 CD38 cells, calcium release, 49
 Cell death. *See* Apoptosis
 Cells
 adaptation, 157
 energy transfer, 859
 environmental stimuli, 157
 oxidation vs. reduction, 861
 redox activity, 213–215
 signaling pathways, 83
 supply-demand, 861
 see also Membrane redox systems
 Central nervous system (CNS)
 aging model, 437–442
 dopamine function, 449
 hypoxia-ischemia, 421
 iron chelators, 421–432
 neuroprotection, 421
 Ceramide, apoptosis, 263–272
 Cerebral ischemia, iron chelators, 428
 Crebrum, thioredoxin, 658
 Chelators. *See* Iron chelators
 Chemokines, photosensitization, 311
 Children, tocopherol, 408
Chlamydomonas alga, redox modulation, 529–534
 Chloroplasts, DNA replication, 529–534
 Chloroquine, proteolysis, 853
 Chlorpromazine, schizophrenia, 581
 Cholecalciferol, ceramide release, 264
 Cholinergic system
 aging model, 437–442
 Alzheimer's disease, 438
 basal forebrain, 437
 deficits, 438
 Chondrocytes, thioredoxin, 658
 Chromosome X, Prx location, 510
 Chronic granulomatous disease, 155
 Cis-diamminedichloroplatinum (CDDP)
 cancer therapy, 696
 cytotoxicity, 698
 thioredoxin, 695–703
 Cobalt
 heme transport, 162, 167
 hemopexin system, 763
 protoporphyrin, 162, 167
 redox activity, 763
 Coenzyme Q
 apoptosis, 263–272
 caspase activation, 263
 catalysis, 216
 cell growth, 179
 ceramide inhibition, 263
 electron transport, 214
 EPR measurement, 253, 257
 LDL conjugation, 327–332
 membrane redox, 177, 216
 NADH reduction, 251–261
 plasma membrane, 251
 signaling pathway, 222
 Cognitive deficits, age-related, 437
 Collagenase, NOS expression, 768
 Colon, thioredoxin, 523
 Colon cancer, NADH oxidase, 239
 Coma, iron chelators, 578
 Contractile failure, free radicals, 55
 Copper
 calcium release, 6
 carbonyl production, 170
 cell surface events, 157
 chelators, 745, 754
 DTC complexes, 885
 gene regulation, 157–173
 heme oxygenase, 169
 heme transport, 157–173
 hemopexin system, 739–750
 LDL oxidation, 328, 495
 MTF-1 activation, 739–750
 NO trapping, 885
 redox activity, 157–173
 Copper-zinc superoxide dismutase (CuZnSOD), 159, 168
 Coronary artery disease, NO bioactivity, 924
 Cortex, glutamate synapses, 577
 Coumarin, ryanodine receptors, 19
 Creatine kinase, plasma levels, 117
 Creatinine, BMT patients, 99
 Cromakalim, lung ischemia, 338, 342
 Cyanobacteria, cell oxidation, 547
 Cyclic AMP response element binding protein (CREB), 99
 Cyclin-dependent kinases (CDK), 417
 Cystamine, calcium release, 7
 Cysteine
 apolipoprotein E, 416
 calcium release, 7, 79
 cell uptake, 696
 channel activity, 27–32
 functional residues, 27
 pathology, 27
 proteases, 864
 protein structures, 827
 redox regulation, 43, 864
 residue location, 31
 Ret polymerization, 844
 ryanodine receptors, 17, 27
 Cystic fibrosis, glutathione efflux, 545
 Cystine, amino acid transport, 665
 Cystinuria, gene mutations, 670
 Cytochrome B
 coenzyme Q, 216
 hemopexin system, 759
 pathway schematic, 762
 redox site, 761
 reductase inhibitor, 763
 Cytochrome C
 apoptosis, 533
 coenzyme Q, 254
 mitochondria, 540
 oxidase activity, 266
 thioredoxin, 806
 Cytokines
 antioxidants, 84–90
 apoptosis, 555, 559
 cell interactions, 823
 Internet resources, 937
 NOS induction, 587, 768
 oxidative stress, 309, 555
 photosensitization, 309
 pregnancy and miscarriage, 627
 redox signaling, 309
 tocopherol effects, 118, 121
 Cytoskeleton
 membrane kinesis, 855
 redox requirement, 868
 D-alanine D-leucine enkephalin (DADLE), 94–98
 Daudi cells, apoptosis, 221
 Dehydroascorbic acid (DHA)
 glucose transport, 201
 instability, 190
 leukocytes, 191
 proteolysis, 854, 860, 871
 redox signaling, 863
 superphysiologic effect, 860
 Deoxyribonucleic acid (DNA)
 alga replication, 529–534
 carcinogenesis, 614

- Deoxyribonucleic acid (DNA) (*continued*)
 cloning and expression, 665–670
 damage, 614
 fragmentation factor, 540
 NO target, 589
 peroxisome proliferators, 614
 redox modulation, 529–534
- Desferrioxamine
 brain penetration, 431
 cell cycle, 432
 eicosanoid metabolism, 432
 iron chelators, 430
 lung ischemia, 338
- Diabetes
 aging, 379–386
 dopamine, 449–456
 NO bioactivity, 920
 tocopherol, 409, 922
 transcription factors, 381
- Diamide
 channel effects, 42
 proteolysis, 853, 857, 871
 redox signaling, 863
- Diaphorase, quinone reduction, 216
- Dichlorophenolindophenol, electron acceptor, 278
- Dieldrin, breast cancer, 907
- Diet, antioxidants and aging, 376
- Diethoxyphosphoryl-methylpyrroline oxide (DEPMO), 781
- Diethylene triaminepentaacetic acid (DTPA), 170
- Diethylhexyl phthalate (DEMP), 615
- Diethylmaleate, NOS expression, 770, 775
- Dihydrolipoic acid (DHLA), 855, 866
- Dimethylpyrroline oxide (DMPO), 357
- Dinitrosyl dithiolate iron complexes (DNIC), 894
- Diphenylene iodonium (DPI), 784
- Diseases
 age-related, 375–377
 antioxidants, 375
 gene mapping, 804
 nitrotyrosine, 590
 NOS expression, 587
 peroxynitrites, 588
 redox role, 13
 sulfhydryls, 13
- Dismuting complexes, iron-dopamine, 578
- Disulfhydryls
 biologic reactions, 856
 metal binding, 857
 pharmacology, 856
- Disulfides
 reactive compounds, 7
 ryanodine receptors, 27
 sarcoplasmic reticulum, 7
- Dithiocarbamate (DTC)
 biological effects, 885
 heme induction, 168
 iron complexes, 882
 monitoring, 886
 tissue distribution, 893
- Dithiopyridines
 calcium release, 1, 7
- NO bioactivity, 924
 ryanodine activity, 27
 thiol oxidation, 78
- Dithionitrobenzoic acid, 27, 30
- Dithiothreitol
 calcium release, 7
 channel effects, 42
 NO production, 771, 775
 protease activator, 866
 proteolysis, 857, 860
 redox signaling, 863
 thiol activation, 74, 76
- Dopamine
 aging, 449–456
 apoptosis, 451
 astrocytes, 454
 DNA laddering, 452
 electrophysiology, 450
 injection model, 453
 neurodegeneration, 449
 neurotoxicity, 450
 oxidative metabolism, 451
 oxidative stress, 449–456
 Parkinson's disease, 580
 receptor signaling, 449
 redox signaling, 576
 schizophrenia, 580
- Doxorubicin, ryanodine activation, 18
- Ebselen, thioredoxin reductase, 818
- Ehrlich cells, membrane redox, 181
- Electron paramagnetic resonance (EPR), 233
- Electron spin resonance (ESR), 356, 779
- Electron transport
 antioxidants, 189–194
 ascorbic acid, 189
 blood cells, 189
 enzyme activity, 192
 membrane redox, 213
 pathway schematic, 762
 plasma membrane, 239
 quinone-dependent, 220
 system model, 239
 transmembrane, 192, 233
- Embryo
 glutaredoxin, 653
 oxygen sensitivity, 653
 thioredoxin, 653–660
- Endocytosis, heme transport, 158
- Endoplasmic reticulum, protein expression, 12, 18
- Endosomes, redox hypothesis, 577
- Endothelial cell adhesion molecules (ECAM)
 inflammation, 391
 NO inhibition, 392
 NOS expression, 394
- Endothelial cells
 ADT regulation, 789–797
 HDG formation, 133
 hypoxanthine-stimulated, 792
 LDL oxidation, 374
 leukocyte interactions, 821–824
 neutrophil adhesion, 822
- oxidative stress, 790
 tocopherol, 822
 tyrosine kinase, 789–797
- Endothelium-derived relaxing factor (EDRF), 917
- Endotoxin, NOS induction, 768
- Environmental stimuli, 157, 629
- Enzymes
 breast cancer, 904, 907
 NOS expression, 585–597
 redox reactions, 854
 sulfur reactions, 856
- Eosinophil cytotoxicity enhancing factor (ECEC), 718
- Epidermal growth factor (EGF)
 membrane redox, 178
 Prx inhibition, 507–516
- Erythrocytes
 ascorbic acid, 190
 oxidant damage, 243–249
 troglitazone, 243
- Estrogens
 antioxidants, 905
 breast cancer, 904
- Ethylmaleamide, cell reduction, 236
- Ethylmethanesulfonate (EMS), 772, 775
- Etoposide
 antitumor activity, 73, 79
 ATP activity, 77
 calcium release, 73–80
 cancer therapy, 74
 cytotoxicity, 74
 oxidative stress, 74
 phenoxyl radicals, 73–80
- Eukaryocytes
 DNA replication, 529
 photosensitization, 303
- Ewing's sarcoma, apoptosis, 109
- Excitation-contraction
 free radicals, 55–63
 hydrogen peroxide, 59
 redox regulation, 65
 sodium-calcium exchange, 61
- Extracellular matrix. Tax effects, 732
- Extracellular signal-regulated kinases (ERK)
 heme activation, 170
 NOS expression, 587, 594
 photosensitization, 304
 signaling pathways, 382
- Factor VIII, thioredoxin, 714
- Fas-associated death domain (FADD), 554
- Fas ligand, redox signaling, 554, 557
- Fat substitutes, tocopherol, 407
- Fatty acids
 apoptosis, 544
 binding proteins, 544
 electron transport, 331
 radical detoxification, 331
 tocopherol absorption, 407
- Ferric citrate, hemopexin system, 757
- Ferricyanide
 ascorbic acid, 202
 cell growth, 213

- electron acceptor, 278
- NADPH oxidase, 278, 280
- plasma membrane, 198
- reduction pathways, 202
- Ferritin**
 - brain levels, 422
 - cell protection, 159
 - cytosolic expression, 759
- Ferrochelatase, heme synthesis, 165**
- Fetus**
 - glutaredoxin, 653
 - redox regulation, 654
 - thioredoxin, 653–660
- Fibroblasts**
 - ascorbic acid, 727–736
 - basement membrane, 727
 - cell migration, 728
 - membrane invasion, 727
 - NADPH oxidase, 286
 - oxidative stress, 727
 - RHA analysis, 667
 - Tax-expressing, 727
- Flavin adenine dinucleotide (FAD), 643, 648**
- Flavocytochromes, iron uptake, 202**
- Flavonoids, LDL oxidation, 491–504**
- Flavoproteins**
 - hemopexin system, 754
 - superoxide production, 784
- Fluorodeoxyuridine, DNA replication, 529**
- Focal adhesion kinase (FAK)**
 - adherent cells, 790
 - ADT effect, 796
 - tyrosine phosphorylation, 794
- Food supply, genetic engineering, 406**
- Force generation, calcium regulation, 5, 9**
- Forebrain**
 - aging model, 437–442
 - cholinergic system, 437
 - transcription factors, 442
- Fos genes**
 - light chains, 670
 - membrane redox, 178
- Frataxin, mitochondrial protein, 461**
- Free radicals**
 - aging effects, 376
 - ascorbic acid, 200
 - ATP synthesis, 57
 - calcium handling, 58
 - cardiac myocytes, 58
 - characterization, 781
 - contractile failure, 55
 - desferrioxamine, 431
 - electromechanics, 56
 - electron transport, 214
 - excitation-contraction, 55–63
 - generating systems, 55
 - initiators, 246
 - Internet resources, 935
 - metabolic changes, 57
 - multicellular, 56
 - myocardial metabolism, 62
 - oxidative damage, 246
 - redox regulation, 2
 - single-cell, 57
 - sodium-calcium exchange, 60
 - UVEC production, 781
- Friedrich's ataxia, lymphoblasts, 461–464**
- Frontal cortex, ginkgo biloba, 469**
- Garlic. *See* Allicin**
- Gastric cancer**
 - clinical data, 522
 - immunohistochemistry, 521
 - thioredoxin, 519–525
- Gene expression**
 - cell surface events, 157
 - heme transport, 157–173
 - Internet resources, 937
 - redox regulation, 69, 157
- Ginkgo biloba, aggression, 467–470**
- Glabridin, LDL oxidation, 491–504**
- Gliotoxin, ryanodine activity, 28**
- Glucose**
 - HIV-1 infection, 560
 - metabolism, 560, 863
 - protein transport, 854
 - redox reactions, 854–861
- Glucose-phosphate dehydrogenase (GPDH), 485**
- Glutamate**
 - amino acid transport, 665
 - cell uptake, 697
 - cognitive function, 437
 - ROS production, 576
 - synapse diagram, 576
- Glutaredoxin**
 - complex structures, 837
 - embryo and fetus, 653–660
 - enzyme reactions, 828
 - immunoreactivity, 656
 - oxidized and reduced, 836
 - protease activator, 866
 - proteolysis, 855, 860
 - redox regulation, 829, 836
 - target complexes, 836
 - tissue distribution, 655
- Glutathione**
 - ADT effect, 793, 795
 - Alzheimer's disease, 485
 - Bcl expression, 542
 - calcium release, 2, 7
 - chloroplast DNA, 532
 - HeLa cells, 700
 - heme transport, 158
 - hepatocytes, 767–776
 - HIV-1 patients, 552
 - mitochondria, 544
 - NO bioactivity, 924
 - NO production, 767–776
 - oxidative stress, 552
 - protease activity, 866, 871
 - proteolysis, 854, 857
 - UVEC content, 793
- Glutathione peroxidase**
 - breast cancer, 910
 - NO bioactivity, 921
 - oxidative stress, 910
 - selenocysteine, 644
- Glutathione reductase, dimeric form, 832**
- Glutathione S-transferase (GST), 910**
- Glyceraldehyde-phosphate dehydrogenase (GAPDH), 199**
- Glycine, peroxisome proliferator, 613**
- Glycoprotein 120**
 - HIV-1 infection, 558
 - oxidative stress, 564
- Glycyrrhizin**
 - clinical data, 691
 - hepatitis therapy, 687
- Granulocytes**
 - heme oxygenase, 119
 - NOS expression, 119
 - physical exercise, 114
 - tocopherol effects, 119
- Growth factors, apoptosis, 222**
- Haptoglobin, heme transport, 159**
- Health, redox role, 13**
- Heart**
 - apoptosis, 103–111
 - contractility, 108
 - enzyme deficiency, 462
 - Friedrich's ataxia, 462
 - function, 105
 - glutaredoxin, 656, 659
 - hemodynamics, 105, 108
 - histology, 105
 - myopathy, 13
 - oxidative stress, 13
 - proteasomes, 106
 - redox response, 869
 - thioredoxin, 656, 659
 - ubiquitin proteins, 103
 - see also* Cardiac muscle
- Heart attack, tocopherol, 409**
- Heat shock proteins (HSP), 113**
- Heavy chains, amino acid transport, 665**
- Heavy metals**
 - calcium release, 6, 9
 - ryanodine receptors, 6
 - sulfhydryl reactions, 17
- HeLa cells**
 - cystine uptake, 696
 - NADPH oxidase, 279
 - NOX activity, 182
 - thioredoxin, 698
- Helper T-cells, thioredoxin activity, 718, 723**
- Heme**
 - catabolism, 164
 - cell oxidation, 162
 - structure, 161
 - synthesis, 165
- Heme oxygenase**
 - Alzheimer's disease, 415
 - cell surface events, 753–764
 - copper activation, 740, 750
 - cytoplasmic, 115
 - desferrioxamine, 432
 - flow cytometry, 121
 - gene regulation, 157–173

- Heme oxygenase (*continued*)
 hemoexin, 753–764
 leukocytes, 113–123
 mRNA levels, 164, 757
 physical exercise, 113–123
 tocopherol, 113–123
 transferrin, 757
- Heme transport
 cell surface events, 157
 gene regulation, 157–173
 hemolysis, 158
 hemoexin, 157–173
 plasma membrane, 158
 redox activity, 157–173
- Hemoexin
 cell protection, 159
 ferric citrate, 757
 functions, 753
 metallothioneins, 753–764
 MTF-1 activation, 739–750
 oxidative stress, 158
 receptor regulation, 159
 redox scheme, 754
 signaling mechanisms, 162
 transcription factors, 162
- Heparin, calcium release, 13
- Hepatic carcinogens, 611
- Hepatitis B
 clinical data, 690
 glycyrrhizin, 687–692
 patient data, 688
 thioredoxin, 687–692
 ursodeoxycholic acid, 687
- Hepatitis C
 clinical data, 690
 glycyrrhizin, 687–692
 patient data, 688
 thioredoxin, 687–692
 ursodeoxycholic acid, 687
- Hepatocytes
 aging effects, 473–481
 butylhydroperoxide, 473
 glutathione, 767–776
 lipoic acid, 473–481
 NO production, 767–776
 peroxisome proliferators, 610
- Hepatoprotective drugs, thioredoxin, 687–692
- High-density lipoprotein (HDL), 399
- Highly active antiretroviral therapy (HAART), 563
- Histidine
 monoclonal antibodies, 682
 SAPK inhibition, 305
- Homocysteine
 calcium release, 7
 HeLa cells, 701
- Hormone metabolism, oxidative stress, 911
- Human immunodeficiency virus (HIV)
 NOS expression, 587
 promoter schematic, 556
 thioredoxin levels, 691
- HIV-1 infection
 antioxidant therapy, 562
 cysteine deficiency, 552
 gene transcription, 556
- glucose transport, 560
 metabolic changes, 539
 NAC treatment, 563
 oxidative stress, 551
 redox mechanisms, 551–564
 vaccine research, 562
- Hybrid genes, polymerization, 844
- Hybridomas, thioredoxin, 646, 718, 723
- Hydrogen peroxide
 Alzheimer's disease, 415
 Bcl expression, 541
 calcium release, 60, 66
 cardiac muscle, 69
 channel modulator, 42
 fibroblasts, 462
 hydroxyl formation, 360
 metabolic changes, 58
 mitochondria, 541
 NO bioactivity, 920
 peroxisomes, 609, 614
 ryanodine modification, 38
 sodium-calcium exchange, 61
 thioredoxin, 804, 815
 vascular sensitivity, 363–367
- Hydroxy-deoxyguanosine (HDG)
 DNA analysis, 129
 ischemia-reperfusion, 127
 liver-specific, 127–133
- Hydroxy nonenals (HNE)
 albumin, 681–684
 cytopathology, 683
 ischemia-reperfusion, 127
 lipid peroxidation, 128
 liver-specific, 127–133
- Hydroxyl radicals
 Alzheimer's disease, 414
 breast cancer, 905
 ESR spectroscopy, 356
 ion channel activity, 38
 NADPH photosensitization, 355
 ryanodine modification, 38
 singlet oxygen, 355–361
 tumor cells, 734
- Hypercholesterolemia, NO bioavailability, 918
- Hyperglycemia
 NO bioactivity, 920
 transcription factors, 381
- Hypertension, NO bioactivity, 920
- Hyperthermia, heme oxygenase, 123
- Hypoxia
 cell diagram, 427
 CNS ischemia, 421–432
 iron chelators, 421
 neuroprotection, 421
 transcription factor, 432
- Hypoxia inducible factor 1 (HIF-1)
 iron regulation, 426
 oxygen tension, 157
 schematic model, 171
- Immunodeficiency. See Human immunodeficiency virus**
- Immunoglobulin G (IgG)
 cholinergic deficit, 439
 Parkinson's disease, 580
- Immunotoxins, cholinergic system, 439
- Individual anaerobic threshold (IAT), 114
- Infection, redox activity, 167
- Inflammation
 acute and chronic, 391–395
 leukocyte adhesion, 391
 nitric oxide, 391–395
- Inositol, calcium release, 13
- Institute for Scientific Information (ISI), 935
- Integrins, cell interactions, 821
- Intercellular adhesion molecule 1 (ICAM-1)
 cell interactions, 821
 interleukin 1, 823
- Interferon- γ
 cell differentiation, 180
 ceramide release, 264
 NO detection, 890
 NOS expression, 631, 639
- Interferons, hepatitis therapy, 692
- Interleukin 1
 adhesion molecules, 823
 antioxidants, 85
 ceramide release, 264
 NOS expression, 587
 nuclear factors, 83–90
 oxidative stress, 555
 ROS generation, 310
 thioredoxin, 519
- Interleukin 2
 NOS expression, 632
 thioredoxin, 519
- Interleukin 6
 aging effects, 382
 physical exercise, 118
 tocopherol, 118, 121
- Interleukin 8
 physical exercise, 118
 tocopherol, 118, 121
- Interleukin-converting enzyme (ICE)
 apoptosis, 219, 268
 ceramide release, 264
- Internet resources, antioxidants, 935–938
- Iodoacetamide, cell reduction, 236
- Ion channels, ryanodine receptors, 35–39
- Iron
 CNS ischemia, 423–428
 depletion, 425
 depolarization, 335
 free radicals, 430
 Friedrich's ataxia, 462
 hypoxia regulation, 426
 lung ischemia, 335–343
 membrane potential, 340
 metabolism, 423–428
 NOS expression, 430
 oxidation, 423
 plasma membrane, 201
 regulatory proteins, 423
 redox activity, 156, 415
 release, 335–343
 transport, 156, 577
 tyrosine catalysis, 430
 uptake schematic, 159

- Iron chelators
 CNS ischemia, 421–432
 cerebrum, 428, 431
 coma, 578
 hypoxia-ischemia, 421
 lung ischemia, 338, 342
 neuroprotection, 421
 stroke, 428–430
- Iron complexes
 chemical bases, 883
 dithiocarbamate, 882
 EPR spectroscopy, 890
 NO affinity, 880, 887
 tissue distribution, 893
 types, 894
- Ischemia
 ACE inhibitor, 13
 free radicals, 55
 heme transport, 158
 hypoxia, 421–432
 oxidative stress, 13
- Ischemia-reperfusion
 aging effects, 366
 heme actions, 739
 histology, 133
 hydroxy nonenals, 127–133
 liver transplants, 349
 peroxiredoxins, 349
 Pringle maneuver, 128
 Prx proteins, 349
- Isoprostanes
 SICP data, 96
 measuring, 97
 oxidative stress, 94
- Janus kinases**, NOS expression, 587, 594
- Jun kinases**
 cardiac apoptosis, 110
 gene regulation, 166
 heme oxygenase, 166, 169
 hemopexin system, 745, 756
 light chains, 670
- Jun N-terminal kinase (JNK)**
 apoptotic signaling, 451
 dopamine oxidation, 451
 hemopexin system, 745, 760
 photosensitization, 304, 307
- Jurkat cells**
 NADPH oxidase, 279
 peroxiredoxins, 512
 thioredoxin, 718, 723
- Ketanserin**, ginkgo biloba, 469
- Kidney**
 dopamine oxidation, 452
 glutaredoxin, 656
 thioredoxin, 656
- Kupffer cells**
 hepatocarcinogenesis, 612
 oxidant production, 615
 peroxisome proliferators, 610
 signaling pathways, 612
- Kyoto Encyclopedia of Genes and Genomes*, 936
- Lactacystin**, apoptosis, 109
- Laser scanning cytometer**, 386
- Learning**, cholinergic function, 438
- Leprosy**, NOS expression, 588
- Leukemia cells**
 apoptosis, 264, 266
 Bcl expression, 271
 caspase activity, 269
 ceramide effect, 270
 thioredoxin, 718, 723
- Leukocytes**
 endothelial interactions, 821
 extravasation, 393
 heme oxygenase, 113–123
 inflammation, 391
 nitric oxide, 392
 NOS expression, 113–123
 plasma levels, 117
 rolling and adhesion, 392
 thioredoxin, 717–726
 tocopherol, 113–123
 tumor cells, 191
- Licorice**. *See* Glycyrrhizin
- Light chains**
 amino acid transport, 665–670
 cloning and expression, 665
 electrophilic agents, 670
 flanking region, 668
 sequence alignment, 667
- Lipid hydroperoxides**, troglitazone, 247
- Lipid peroxidation**
 liver, 684
 NO bioactivity, 596, 918
 oxidative stress, 74, 99, 692
 thioredoxin levels, 689
- Lipids**
 aging effects, 379
 caspase activation, 269
- Lipoic acid**
 aging effects, 473–481
 ATP synthesis, 481
 butylhydroperoxide, 473
 dietary intervention, 477
 dose response, 479
 hepatocytes, 473–481
- Lipoproteins**, tocopherol, 399
- Liposomes**, oxidant stress, 247
- Liver**
 albumin synthesis, 684
 antioxidants, 347–353
 cancer, 239, 611
 coenzyme Q, 252
 enzyme levels, 128
 glutaredoxin, 656, 659
 HDG formation, 127–133
 hemopexin, 164
 hydroxy nonenals, 127
 ischemia-reperfusion, 127
 NADH oxidase, 239
 NO detection, 888
 oxidative damage, 349
 peroxisome proliferators, 610
 plasma membrane, 252
 thioredoxin, 523, 656
 tocopherol, 398
- Liver transplants**
 animal model, 352
 cytoprotection, 347–353
 ischemia-reperfusion, 349
 peroxiredoxins, 347
 Prx expression, 350
- Low-density lipoproteins (LDL)**
 adhesion molecules, 823
 allicin, 491
 antioxidants, 328, 491
 atherosclerosis, 327, 492
 carnosic acid, 491
 carotenoids, 492
 coenzyme Q, 327–332
 diene conjugation, 327
 endothelial cells, 374
 glabridin, 491
 lycopene inhibition, 491
 oxidation, 491–504
 oxidative stress, 822
 thiocetic acid, 327
 tocopherol, 327–332
 troglitazone, 743, 748
- Low-fat diets**, tocopherol absorption, 406
- Lucigenin**, limitations, 780
- Lung**
 cytokine expression, 100
 iron release, 335–343
 lipid peroxidation, 337
 nuclear factors, 100
 perfusion model, 336
 protein oxidation, 337
 shear stress, 335–343
 thioredoxin, 523
- Lung cancer**
 myeloperoxidase, 908
 NADH oxidase, 239, 279
- Lung ischemia**
 animal model, 335
 endothelial cells, 341
 iron release, 335–343
 ROS generation, 337, 343
- Lycopene**
 allicin synergism, 502
 chemical structure, 496
 LDL oxidation, 491–504
 plasma levels, 494
 tocopherol synergy, 498
- Lymphoblasts**, metal salts, 464–468
- Lymphocytes**, nitric oxide, 119, 674
- Lymphokines**, oxidative stress, 560
- Lymphoma**
 apoptosis, 109
 cystine uptake, 703
- Lysinuric protein intolerance**, 670
- Lysosomes**, abnormalities, 414
- Macrophages**, NOS expression, 635, 639
- Mammalian cells**
 NADH oxidase, 231–240
 plasma membrane, 231
 redox control, 231–240
- Manganese superoxide dismutase (MnSOD)**
 breast cancer, 909
 oxidative stress, 909

- Manganese superoxide dismutase (MnSOD) (*continued*)
 scavenging, 781
 TNF resistance, 382
- Mastocytoma, NADPH oxidase, 279, 282
- Matrix metalloproteases (MMP), 733, 735
- Melanoma
 NADPH oxidase, 282
 Ret kinases, 846
- Membrane redox systems
 AMP regulation, 181
 antioxidants, 178
 ascorbic acid, 178
 cell growth, 213–215
 coenzyme Q, 177, 216
 signaling pathways, 178
 stress apoptosis, 213–224
 transformation, 177–183
 transporters, 35
 ultraviolet effect, 181
- Memory, cholinergic function, 438
- Mercaptans, calcium release, 7
- Metabolism, redox-dependent, 864
- Metabolites
 protein oxidation, 854
 redox signaling, 861
- Metal ions, proteolysis, 865
- Metal-responsive elements (MRE), 165, 743
- Metal-responsive transcription factor 1 (MTF-1)
 constitutive expression, 742
 copper activation, 739
 DNA binding, 171
 hemopexin system, 739–750
 protein interactions, 750
 receptor occupancy, 743
- Metal salts, lymphoblasts, 464–468
- Metal-sulfur complexes, NO targets, 589
- Metalloendoproteases, redox-unresponsive, 867
- Metallothioneins
 cell surface events, 753–764
 heme transcription, 166
 hemopexin system, 740, 753
 mRNA expression, 757
 oxidative stress, 743
 transferrin effect, 757
- Metals
 LDL oxidation, 501
 protein oxidation, 854
 redox activity, 74, 861
see also specific metals
- Methanethiosulfonate, sulfydryl oxidation, 18
- Microtubules, oxidative stress, 415
- Miscarriage, antioxidants, 623–627
- Mitochondria
 abnormalities, 414
 aging effects, 473
 apoptosis, 219, 540, 674, 805
 Bcl regulation, 537
 coenzyme Q, 264
 cytofluorometry, 674
 electron transport, 219
 glutathione, 544
 HIV-1 infection, 551–564
 membrane potential, 673–678
 metabolic control, 558
 neurodegenerative diseases, 806
 neuronal damage, 414
 nitrosylation, 806
 NO dysfunction, 673–678
 organellokinesis, 416
 Parkinson's disease, 806
 redox mechanisms, 553
 ROS generation, 540, 553, 805
 targeting sequences, 803
 thioredoxin system, 801–807
 transmembrane potential, 551–564
 uncoupling proteins, 544
- Mitogen-activated protein kinases (MAPK)
 aging effects, 380
 Alzheimer's disease, 417
 cytokine activation, 87
 dopamine effect, 456
 heme transport, 163
 membrane redox, 178
 NOS expression, 587, 594
 oxidative stress, 555
 photosensitization, 304–307
 redox signaling, 304–307
 ROS activation, 48
 signaling pathways, 380
- Mitogen extracellular signal regulatory kinase (MEK), 87, 181
- Mitogenesis, dopamine, 455
- Mixed disulfides, redox-responsive, 864
- Monoamine oxidase inhibitor (MAOI)
 aggression, 467–470
 catecholamines, 575
 ginkgo biloba, 467
- Monocytes
 heme oxygenase, 118
 physical exercise, 114
 thioredoxin, 717–726
- Mononuclear cells, selenium levels, 647
- Mucin, thioredoxin, 525
- Multiple endocrine neoplasia 2 (MEN-2), 842
- Multiple sclerosis, NOS expression, 588
- Muscle
 ATP delivery, 863
 contraction, 49
 functional demand, 862
 redox status, 862
 signal transduction, 49
see also Cardiac muscle
- Myc genes, membrane redox, 178, 181
- Myeloperoxidase, breast cancer, 908
- Myocardium
 free radicals, 62
 proteolysis, 869–871
 redox response, 869
- N-acetylcysteine (NAC)
 AIDS patients, 539
 nuclear factors, 94
 SAPK inhibition, 305
- N-ethylmaleimide (NEM)
 channel activity, 18, 42
 ferricyanide effect, 202
- NO production, 773
 ryanodine activation, 11
 sulfhydryl sites, 12
- Natural killer cells (NK)
 mitochondrial dysfunction, 673–679
 Prx-enhanced, 352
- Necrosis, NO-induced, 595
- Nef proteins
 oxidative stress, 564
 redox signaling, 554
- Nerve growth factor (NGF)
 apoptosis, 219
 cholinergic deficits, 439
 CNS aging, 440
 Jun kinases, 169
- Neuroblastoma, membrane redox, 178
- Neurocomputation, synaptic plasticity, 575
- Neurodegenerative diseases
 age related, 449–456
 dopamine, 449
 lymphoblasts, 464–468
- Neuroepithelium, thioredoxin, 656
- Neurofibrillary tangles, 414
- Neurogenesis, Alzheimer's disease, 417
- Neuromelanin, catecholamine metabolism, 579
- Neuromodulators, redox signaling, 575
- Neurons
 Alzheimer's disease, 413
 hypoxia-ischemia, 421
 injury, 421–432
 iron chelators, 421
 oxidative changes, 414
 thioredoxin, 806
 zinc effect, 321
- Neuroprotective agents, 421–432
- Neurotoxins, dopamine, 450
- Neurotransmitters, cognitive function, 437
- Neutrophils
 adhesion molecules, 789
 catecholamine signaling, 575
 electron transport, 233
 NADPH oxidase, 284, 373
- Nicotinamide adenine dinucleotide (NAD), 50
- NAD, reduced form (NADH)
 apoptosis, 207
 coenzyme Q, 251–261
 ESR spectroscopy, 779
 ferricyanide reductase, 198
 kinetic parameters, 255
 membrane redox, 177, 214
 NO bioavailability, 918
 plasma membrane, 251–261
 UVEC evidence, 779–786
- NADH oxidase (NOX)
 buffy coat cells, 289
 cancer patients, 182, 232
 cell surface, 289–299
 characteristics, 289
 hepatoma cells, 182
 inhibitors, 236, 283
 light-responsive, 289
 membrane redox, 177
 plasma membrane, 197, 231
 redox control, 231–240

- serum levels, 238
- structure and function, 197
- thiol inhibition, 182
- transmembrane, 277–286
- tumor-associated, 181
- NAD phosphate, reduced form (NADPH)
 - Alzheimer's disease, 485
 - cell reductive energy, 859
 - coenzyme Q, 251–261
 - dose response, 254
 - ESR spectroscopy, 779–786
 - heme catabolism, 165
 - hydroxyl radicals, 355–361
 - kinetic parameters, 255
 - membrane redox, 177
 - mitochondria, 558
 - NO bioavailability, 918
 - peroxisome proliferators, 616
 - photosensitization, 355–361
 - plasma membrane, 251–261
 - proteolysis, 855
 - redox signaling, 85, 561
 - respiratory burst, 155
 - selenocysteine catalysis, 643
 - singlet oxygen, 355–361
 - thioredoxin system, 817, 831
 - UVEF evidence, 779–786
- NADPH oxidase
 - cell surface, 277–286
 - electron transport, 233
 - fatty acid metabolism, 286
 - inhibitors, 284
 - neutrophils, 373
 - SOD production, 278
 - transmembrane, 277–286
- Nitrates, AMP elevating agents, 632
- Nitric oxide (NO)
 - aging research, 376
 - antioxidants, 919
 - bioactivity, 919–925
 - biological systems, 879, 886
 - cardiac muscle, 5–14
 - cell function, 592–595
 - channel modulator, 42
 - chemical donors, 675
 - chemistry, 586
 - cultured cells, 887
 - cysteine potentiation, 9
 - cytotoxicity, 595, 879
 - detection and imaging, 879
 - endogenous, 879
 - EPR spectroscopy, 879
 - gene transcription, 595
 - glutamate production, 576
 - glutathione regulation, 767–776
 - hepatocytes, 767
 - hydrophilic traps, 887
 - inflammation, 391–395
 - iron complexes, 880
 - leukocyte adhesion, 392
 - living animals, 889
 - mitochondrial dysfunction, 673
 - molecular targets, 589–592
 - monitoring, 886
 - nitrosative stress, 586
 - organs and tissues, 887–891
 - properties, 880
 - protein oxidation, 854
 - reaction products, 586, 880
 - redox regulation, 5–14
 - redox signaling, 22, 214, 861
 - ryanodine interaction, 5–14
 - sarcoplasmic reticulum, 5
 - skeletal muscle, 5–14
 - spin trapping, 881
 - thiol oxidation, 5–14
 - tissue distribution, 893
 - transcription factors, 392
- Nitric oxide synthase (NOS)
 - aging research, 376
 - AMP expression, 631–640
 - bacterial meningitis, 891
 - cellular targets, 587
 - cytoplasmic, 115
 - disease localization, 590
 - enzyme activity, 585–597
 - flanking region, 634
 - gene expression, 631–640
 - inducible form, 767
 - inflammation, 392
 - isozymes, 631
 - leukocytes, 113–123
 - liver dysfunction, 677
 - mRNA levels, 636, 767
 - oxidative stress, 775, 917
 - physical exercise, 113–123
 - promoter activity, 637
 - protein levels, 636
 - redox control, 917–925
 - tocopherol effects, 113–123
 - vascular bioavailability, 917
- Nitrites
 - AMP agents, 632
 - hepatocytes, 770
- Nitrosative stress, 586, 594
- Nitrosothiols
 - NO bioactivity, 924
 - ryanodine activity, 28
- Nitrosylation
 - gene transcription, 595
 - ryanodine activity, 28
 - thiols, 9
- Nitrotyrosine, disease localization, 590
- Non-insulin dependent diabetes mellitus (NIDDM)
 - albumin levels, 681–684
 - clinical data, 682
 - oxidative stress, 681
 - troglitazone, 743
- Norepinephrine, MAO deficiency, 467
- Normoxia, cell diagram, 427
- Nuclear factors
 - antioxidants, 94
 - BMT patients, 93–101
 - gene expression, 157
 - heme signaling, 169
 - interleukin 1- β , 83–90
 - isoprostanes, 98
 - NOS expression, 631, 768
 - oxidative stress, 93–101
 - photosensitization, 308
 - signaling pathway, 83–90
- Tax expression, 732
- thioredoxin complex, 834
- tocopherol inhibition, 823
- Okadaic acid, caspase activation, 270
- Oleoresin, LDL oxidation, 495
- Olestra, 407
- Oligodendrocytes, iron content, 422
- Organellokinesis, mitochondria, 416
- Organochlorines, breast cancer, 907
- Organomercurials, ryanodine activity, 28
- Organs, NO detection, 887–891
- Ossification, endochondral, 660
- Osteosarcoma, NADPH oxidase, 279
- Ovary cells, ryanodine receptors, 13
- Oxidants
 - breast cancer, 903–912
 - erythrocytes, 243–249
 - peroxisome proliferators, 607–617
 - redox signaling, 83–90
 - signaling molecules, 616
 - troglitazone, 243–249
- Oxidative stress
 - age-related, 449–456
 - Alzheimer's disease, 413–418
 - apoptosis, 215, 451, 557
 - ascorbic acid, 727–736
 - BMT patients, 93–101
 - breast cancer, 904–907
 - calcium transport, 74
 - cell injury, 131
 - coenzyme Q, 217
 - controversy, 563
 - dopamine, 449–456
 - etoposide, 74
 - fluorography, 732
 - future research, 564
 - gene transcription, 556
 - HIV-1 infection, 551–564
 - hormone metabolism, 911
 - hyperreactive thiols, 22
 - intensity, 94
 - intracellular, 158
 - isoprostanes, 94, 99
 - lipid peroxidation, 94
 - liver diseases, 692
 - metabolism, 413, 559
 - mitosis, 413–418
 - neurodegeneration, 449
 - NIDDM pathophysiology, 681
 - NO bioactivity, 917
 - nuclear factors, 93–101
 - quinones, 22
 - redox potential, 13
 - ryanodine receptors, 22
 - schizophrenia, 581
 - zinc effects, 322
- Oxidoreductase complexes, 829
- Oxygen
 - embryo sensitivity, 653
 - light chains, 669
 - mRNA expression, 669
 - nitric oxide, 586
 - sensing model, 171
- Oxyl radicals, sources, 48

- Palmitate**, peroxisome proliferators, 613
- Pancreas**, thioredoxin, 660
- Papain**, mixed disulfide, 864
- Parenchymal cells**, peroxisome proliferators, 609
- Parkinson's disease**
catecholamines, 579
dopamine, 449
- Paxillin**, tyrosine phosphorylation, 794
- Pentose phosphate pathway**, oxidative stress, 560
- Peptide bonds**, autocatalysis, 869
- Peptidyl aldehydes**, apoptosis, 109
- Peroxidases**, calcium transport, 78
- Peroxidation**. *See* Lipid peroxidation
- Peroxiredoxins**
animal model, 507
antioxidants, 812
biologic functions, 352, 508
characterization, 507
cytoprotection, 507–516
EGF inhibition, 507
flow cytometry, 351
gene manipulation, 350
liver transplants, 347–353
PCR analysis, 510
phylogentic analysis, 510
redox signaling, 509
ROS inhibition, 507–516
sequence analysis, 508
subtypes, 508
- Peroxisome proliferators**
action mechanism, 607–617
activated receptors, 609, 614
animal models, 608
biohazards, 608
carcinogen markers, 610
chemical sources, 608
general use, 607
induction mechanisms, 609
oxidants, 607–617
responsive element, 610
risk assessment, 607
ROS mechanism, 614
signaling pathways, 612
species comparison, 610
tumor promoters, 616
types, 608
- Peroxisomes**, physiology, 609
- Peroxynitrites**
cell damage, 775
diseases, 588
oxidative stress, 918
- Pesticides**, breast cancer, 907
- Phenols**
antioxidants, 74
LDL oxidation, 492
types, 80
- Phenoxyl radicals**
ATP hydrolysis, 77
calcium release, 73
coenzyme Q, 258
etoposide, 73–80
- Phenylephrine**, vascular response, 364
- Pheochromocytoma**, amyloid toxicity, 318
- Phosphate networks**, high-energy, 863
- Phosphatidylinositol**, transfer protein, 400
- Phosphatidylinositol kinases (PIK)**, 307
- Phospholipids**, tocopherol transport, 399
- Photosensitization**
cellular targets, 303
hydroxyl radicals, 355–361
MAPK pathways, 304–307
mechanisms, 302
mitochondrial damage, 303
NADPH reaction, 355–361
nuclear factors, 308
PIK pathway, 307
porphyrin-mediated, 307
process diagram, 302
redox signaling, 301–311
ROS generation, 302
singlet oxygen, 355–361
uroporphyrin-mediated, 355–361
- Phthalate esters**, peroxisome proliferators, 608
- Phthalocyanine**, calcium release, 7
- Physical exercise**
heme oxygenase, 113
immune response, 122
NOS expression, 113–123
tocopherol effect, 113
- Physostigmine**, memory function, 438
- Plasma membrane**
acute regulation, 232
amino acid transport, 665
apoptosis, 205
ascorbic acid, 200
bioenergetics, 205
biological stress, 373
biomedical aspects, 155
cell adaptation, 157
coenzyme Q, 251–261
electron transport, 156, 198, 231
erythrocytes, 198
ferricyanide reductase, 199
growth control, 203
heme transport, 158, 162
iron uptake, 201
mammalian cells, 231–240
mitogenic activity, 203
NADH oxidase, 197, 231, 251
pH changes, 203
redox control, 231–240
second messengers, 204
system model, 239
transport systems, 232
- Plasma membrane NADH-oxidoreductase (PMOR)**
apoptosis, 208
cell differentiation, 204
redox schematic, 208
structure and function, 197
transformation, 204
- Plasma Membrane Redox Systems and Their Role in Biological Stress and Disease* (Asard, Berczi and Caubergs), 371
- Platelet-activating factor (PAF)**, 822
- Platelet-derived growth factor (PDGF)**, 178, 219
- Platelets**, thioredoxin, 712
- Poly ADP-ribose polymerase (PARP)**
apoptosis, 110
photosensitization, 307
- Polychlorinated biphenyls (PCB)**, 907
- Polymorphic enzymes**, breast cancer, 908
- Polymorphonuclear neutrophils (PMN)**
NOS activity, 394
UVEC adhesion, 791
- Polyphenols**, LDL oxidation, 491–504
- Polysaccharides**, redox-dependent, 867
- Porphyrins**
calcium release, 6
photosensitization, 307
sulfhydryl oxidation, 18
- Potassium**
channel agonists, 340
free radicals, 56
lung ischemia, 340, 343
- Pregnancy**, antioxidants, 623–627
- Presenilin genes**, Alzheimer's disease, 417
- Probucol**, NO bioactivity, 922
- Proliferating cell nuclear antigen (PCNA)**, 521
- Prostaglandins**, ion current profile, 96
- Prostate cancer**, apolipoprotein E, 417
- Protease inhibitors**
proteolysis, 855
redox-dependent, 867
- Proteases**
apoptosis, 103
DHA vs. glutathione, 871
oxidative stress, 564
proteolysis, 855
redox reactions, 554, 856, 864
- Proteasomes**
apoptosis, 103
cardiac function, 106
- Protein disulfide isomerase (PDI)**
Alzheimer's disease, 485
immunoreactivity, 486
structures, 829
- Protein kinase C (PKC)**
apoptosis, 222
heme transport, 166
LDL oxidation, 922
peroxisome proliferators, 613
tocopherol effects, 123, 822
- Protein kinases**, Internet resources, 937
- Protein phosphatase**
ceramide-activated, 270
tocopherol inhibition, 401
- Protein tyrosine kinases (PTK)**, 842
- Proteins**
aging effects, 379
conjugation, 868
DNA complexes, 383
folding, 854
glucose transport, 854–861
metal ions, 868
oxidation vs. reduction, 854
redox reactions, 827, 854
signaling pathways, 383
tissue content, 871
unfolding, 867

Proteolysis

- ATP-mediated, 852, 858
- diamide, 853
- effector mechanisms, 864–869
- energy flow, 862
- experimental agents, 852
- glucose pathway, 855
- intracellular, 871
- metabolic intervention, 852, 863
- myocardial, 869–871
- neuroendocrine factors, 852
- oxidative agents, 862
- pharmacology, 872
- redox-responsive, 851–872
- selective control, 862
- therapeutic applications, 872
- transfer pathway, 855

Prx genes

- characterization, 507–518
- chromosome mapping, 509
- cloning and expression, 510
- EGF inhibition, 507–516
- mRNA expression, 514
- nucleotide sequence, 512
- phylogenetic analysis, 510
- protein expression, 511, 515
- ROS inhibition, 507–516

Prx proteins

- core structure, 349
- cytoprotection, 347–353
- liver damage, 349

Quinones

- breast cancer, 910
- calcium release, 6
- membrane redox, 182
- oxidative stress, 22
- ryanodine function, 18

Rac proteins

- antioxidants, 85, 88
- membrane redox, 181

Ras genes, cell growth, 180

Reactive nitrogen species (RNS), 2

Reactive oxygen species (ROS)

- aging research, 376
- antioxidants, 623
- apoptosis, 538, 805
- ascorbic acid, 733
- breast cancer, 907–911
- calcium release, 2, 78
- cell injury, 47
- contractile failure, 55
- cytofluorometry, 674
- dietary fat, 906
- endothelial cells, 789
- generation, 908
- HIV-1 infection, 551–564
- immune function, 626
- ischemia-reperfusion, 128
- ligand interaction, 48
- lung ischemia, 337, 343
- membrane transporters, 35
- mitochondria, 540, 553, 805
- muscle contraction, 66
- NIDDM patients, 681

- nuclear factors, 73
- oxyradical stress, 48
- pathways, 355
- peroxisome proliferators, 614
- phagocyte activation, 48
- photodynamic therapy, 302
- pregnancy, 623
- production, 551–564
- protein oxidation, 854, 857
- Prx inhibition, 507–516
- redox signaling, 47, 214, 861
- regulation, 47
- ryanodine modulation, 42
- sarcoplasmic reticulum, 49
- scavenging activity, 733
- signal transduction, 728
- transcription, 114
- tumor suppressor genes, 507
- types, 805
- vascular cells, 363, 779

Redox regulation

- alga, 529–534
- calcium signaling, 65
- cardiac muscle, 65–69
- chloroplasts, 529–534
- excitation-transcription, 69
- free radicals, 2
- gene transcription, 69
- glutaredoxin, 829, 836
- high-capacity, 231–240
- mammalian cells, 231
- mechanisms, 551, 829
- molecular views, 827–837
- muscle contraction, 69
- NADH oxidase, 231–240
- nitric oxide, 5, 917
- plasma membrane, 231–240
- protein structures, 827–837
- ryanodine receptors, 41–44
- skeletal muscle, 1
- thioredoxin, 831–835

Redox signaling

- ADP ribose, 47–52
- antioxidants, 83, 935
- Bcl expression, 543
- calcium release, 47
- calmodulin, 47–52
- catecholamines, 675–581
- cytokines, 83–90
- HIV-1 infection, 554
- Internet resources, 935–938
- intervention, 861–864
- MAPK pathways, 304–307
- mitochondria, 561
- NIK activation, 83–90
- nuclear factors, 308
- peroxiredoxins, 509
- photosensitization, 301–311
- PIK pathway, 307
- ROS function, 827
- sarcoplasmic reticulum, 47–52
- superoxide-triggered, 47
- thioredoxin, 629
- transmembrane potential, 561
- working model, 51

Redox systems

- apoptosis, 213–224
- Bcl function, 537–547
- biological stress, 373
- biomedical aspects, 155
- cell surface events, 157
- copper, 157–173
- energy transfer, 859
- gene regulation, 157
- glucose reactions, 854–861
- plasma membrane, 155, 373
- proteolysis, 851
- synaptic plasticity, 576
- Reducing agents, NO production, 772
- Ref proteins, thioredoxin complex, 834
- Reperfusion
 - free radicals, 55
 - heme transport, 158
 - injury, 127
 - oxidative stress, 13
 - see also* Ischemia-reperfusion

Respiratory burst, 155

Respiratory system

- nitric oxide, 593
- thioredoxin, 656

Ret kinases

- activation mechanisms, 841–847
- biological significance, 846
- cysteine location, 844
- dimerization, 843
- polymerization, 843
- UV irradiation, 841–847

Ret proteins

- dimerization, 845
- oncogenesis, 842

Retinoblastoma, membrane redox, 178

Retinoic acid, cell differentiation, 180

Retinoid X receptor (RXR), 609

Retinol, NADH oxidase, 298

Retroviral vectors, Prx genes, 349

Rfp-Ret proteins

- cross-linkage, 847
- polymerization, 845
- signal sequence, 842

Rheumatoid arthritis, NOS expression, 588

Ribonuclease protein assay (RPA), 384

Ribonucleic acid (RNA)

- aging effects, 379
- signaling pathways, 383

Ring finger motif, 843

Rosmarinic acid, LDL oxidation, 491–504

Rotenone

- apoptosis, 219
- superoxide production, 785

Ryanodine receptors

- activating responses, 30
- biphasic actions, 18
- calcium release, 73–80
- calmodulin, 41–44
- cardiac muscle, 5–14
- channel activity, 27–32
- complex structure, 19–21
- cystein regulation, 17, 27
- cytoplasmic domain, 31
- gating, 7
- heavy metals, 6
- inhibiting responses, 30

- Ryanodine receptors (*continued*)
 ion channels, 35–39
 luminal domain, 32
 membrane, 31
 multichannel, 32
 nitrosylation, 28, 38
 NO interaction, 5–14
 oxidizing agents, 6, 27
 redox regulation, 41–44
 reducing agents, 29
 sarcoplasmic reticulum, 5
 sensors, 21
 sidedness, 38
 single-channel, 7, 30
 skeletal muscle, 5–14
 structure, 13
 sulfhydryls, 17–23
 superoxide-triggered, 51
 thiol activation, 73–80
 thiol oxidation, 7, 27
- S-nitroso-N-acetylpenicillamine (SNAP), 11, 28
- Saporin, cholinergic deficit, 439, 442
- Sarcolemma, signal transduction, 65
- Sarcoplasmic reticulum
 ADP ribose, 47–52
 ATP activity, 77
 calcium release, 17, 47
 calmodulin, 47
 cardiac muscle, 5–14
 etoposide, 75
 free radicals, 58
 ion channel activity, 36
 muscle contraction, 73
 NO interaction, 5–14
 phenoxyl radicals, 75
 reactive disulfides, 8
 redox regulation, 1
 ryanodine receptors, 5–14
 skeletal muscle, 5
 skinned fibers, 8
 sulfhydryls, 13
 superoxide effects, 47
- Schizophrenia, catecholamine signaling, 580
- Scopolamine, cognitive deficit, 438
- Second messengers
 nitric oxide, 879
 plasma membrane, 204
- Selected ion current profile (SICP), 96
- Selectin
 cell interactions, 821
 leukocyte rolling, 397
- Selenium
 antioxidant defense, 816
 biological effects, 643
 coenzyme Q, 217, 252
 deficiency, 644, 816
 mononuclear cells, 647
 thioredoxin reductase, 813
- Selenocysteine
 insertion sequence, 815
 thioredoxin reductase, 643
- Senile plaques, Alzheimer's disease, 414
- Serine proteases, redox-responsive, 867
- Serotonin, brain levels, 467
- Severe burns, thioredoxin, 707–714
- Shear stress, pulmonary, 335–343
- Signal transduction
 Bcl genes, 543
 cardiac muscle, 1
 Internet resources, 936
 NO effects, 593
 redox alterations, 543
- Signal Transduction Society, 936
- Signaling pathways
 aging effects, 379–386
 apoptosis, 546
 Bcl regulation, 546
 biochemistry, 382
 cell measurements, 382–386
 imaging methods, 384
 kinase activity, 382
 molecular techniques, 382
- Silver, calcium release, 6
- Singlet oxygen, photosensitization, 355–361
- Skeletal muscle
 calcium release, 8, 65
 NO interaction, 5–14
 reactive disulfides, 8
 redox regulation, 1, 41
 ryanodine receptors, 5–14
 sarcoplasmic reticulum, 5
 sulfhydryl oxidation, 36
- Skin, glutaredoxin, 657
- Skinned fibers, sarcoplasmic reticulum, 8
- Small intestine, thioredoxin, 657
- Smooth muscle cells. *See* Vascular smooth muscle cells
- Sodium-calcium exchange
 free radicals, 60
 hydrogen peroxide, 61
 muscle relaxation, 65
- Sphingomyelinase, apoptosis, 215, 219
- Spinal cord, transcription factors, 442
- Spleen cells, HADH oxidase, 281
- Steroid hormones, breast cancer, 904
- Stomach cancer, thioredoxin, 520
- Stress
 apoptosis, 213–224
 catalase, 909
 membrane redox, 213
 physical exercise, 113
 schizophrenia, 580
see also Oxidative stress
- Stress-activated protein kinase (SAPK)
 apoptosis, 219
 cytokines, 87
 photosensitization, 304
- Striatum
 cholinergic deficits, 438
 dopamine oxidation, 452
 glutamate synapses, 577
- Stroke, iron chelators, 428–430
- Substantia nigra, thioredoxin, 806
- Sulfhydryls
 calcium release, 79
 channel effects, 42
 disulfide interaction, 7
 function, 17–23
- health and disease, 13
 hyperreactive, 17
 localization, 43
 multifunction, 32
 oxidizing agents, 18
 protease activators, 866
 redox regulation, 13, 43
 ryanodine receptors, 17–23
 sarcoplasmic reticulum, 6
 sidedness, 38
- Sulfur
 biologic reactions, 856
 nitrosylation, 857
 redox reactions, 856
- Superoxide dismutase (SOD)
 apoptosis, 539
 breast cancer, 909
 extracellular, 909
 hydrogen peroxide, 56
 hydroxyl formation, 359
 hypertension, 920
 ischemia-reperfusion, 48
 NO bioactivity, 919
 nuclear factors, 94
 oxidative stress, 909
 photosensitization, 309
 pregnancy and miscarriage, 626
 tetrazolium salt, 233
- Superoxides
 ADP ribose, 50
 anions, 47–52
 calmodulin, 50
 desferrioxamine, 431
 ESR spectroscopy, 779–786
 Kupffer cells, 615
 membrane protein, 784
 mitochondria, 540
 nitric oxide, 586, 917
 nonphagocytes, 373
 oxidase activity, 782
 substrate specificity, 782
 UVEC production, 779
 vascular reactivity, 367
- Synaptic plasticity, redox hypothesis, 576
- T**-cells
 apoptosis pathways, 555
 HIV-1 depletion, 551, 557
- Tat genes, fibroblasts, 727–736
- Tat proteins
 oxidative stress, 556, 564
 redox signaling, 554, 556
- Tension, free radicals, 56
- Tetradecanoylphorbol acetate (TPA), 215
- Tetramethyl piperidone (TEMP), 357
- Tetrahymena* cells, light-responsive, 289–299
- Tetrazolium salt
 cell reduction, 235
 electron acceptor, 233
 NADPH oxidase, 279
- Thapsigargin
 lung ischemia, 340
 PIK inhibitor, 307

- Thimerosal
 ryanodine activity, 28
 sulfhydryl oxidation, 18
- Thiobarbituric reactive substances (TBARS)
 LDL oxidation, 495
 lung ischemia, 336, 343
 plasma levels, 115, 118
- Thioctic acid, LDL conjugation, 327–332
- Thiols
 activation, 30
 ATP activity, 74
 biphasic actions, 9
 calcium release, 73–80
 cell reduction, 236
 channel activity, 9, 42
 coumarin reaction, 20
 cytoplasmic, 31
 disulfides, 829
 endogenous, 31
 hyperreactive, 17–23
 luminal domain, 31
 membrane, 31
 Michael addition, 20
 modified, 31
 NADPH oxidase, 282
 nitrosylation, 9
 NO oxidation, 5–14
 oxidative stress, 22
 physiology, 21
 reagents, 7
 redox sensors, 21
 reducing agents, 774
 ryanodine receptors, 5, 73
 single-channel, 30
 sulfhydryl gating, 9
- Thioredoxin reductase
 amino acid sequence, 646
 chromosome localization, 814
 cloning and analysis, 814
 cytosolic activity, 648
 ebselen reactions, 818
 enzyme assays, 803
 hydrogen peroxide, 815
 mechanisms, 815
 mitochondria, 803
 monoclonal antibodies, 645
 NADPH substrates, 813
 protein activity, 643–649
 selenium reactivity, 813
 selenocysteine, 643–649
 structure and function, 813, 831
 tumor cells, 813
- Thioredoxins
 antibodies, 520, 523
 antioxidants, 811–817
 apoptosis, 724
 ATP regulation, 806
 bacterial models, 801, 835
 biochemistry, 835
 blood levels, 707
 burn injury, 707–714
 CDDP resistance, 695–703
 cellular activity, 629, 722
 chromosome localization, 803
 cytoprotection, 520
 cytosolic system, 801
 dimeric forms, 832
 embryo and fetus, 653–660
 enzyme reaction, 828
 extracellular, 714
 functions, 802, 805
 gastric cancer, 519–525
 genomic organization, 803
 hepatitis patients, 687–692
 HIV infection, 553, 691
 immunohistochemistry, 653–660
 immunoreactivity, 656
 interleukin 1, 83–90
 intracellular, 723
 leukocytes, 717–726
 lipid peroxides, 688
 mammal and yeast, 801
 mitochondria, 801–807
 monocytes, 717–726
 NMR imaging, 834
 nuclear factors, 83–90
 oxidative stress, 708, 721
 peptide recognition, 835
 protease activator, 866
 protein expression, 522
 proteolysis, 855, 861
 redox regulation, 831–835
 severe burns, 707–714
 signaling pathway, 83–90
 target molecules, 703, 834
 thrombocytes, 713
 tissue localization, 655
 TNF inhibition, 83–90
 transcription factors, 523
 truncated form, 722
- Thrombocytes, thioredoxin, 713
- Thyroid gland, glutaredoxin, 656, 661
- Tissue, NO detection, 887–891
- Tocopherol
 absorption, 398, 406
 adhesion molecules, 821–824
 adult requirements, 401
 aging effects, 408
 antioxidant, 244
 apoptosis, 221
 associated protein, 399
 ataxia, 399, 407
 atherosclerosis, 922
 chemical structure, 244, 496
 children, 408
 cholesterol-adjusted, 116
 chronic disease, 408
 coenzyme Q, 216, 252
 cytokine response, 118
 distribution, 398
 dose response, 406
 duodenal absorption, 398
 electron transport, 190
 endothelial cells, 822
 epidemiology, 408
 fat absorption, 406
 food sources, 406
 function, 405
 future research, 405–409
 genetic engineering, 406
 heme oxygenase, 113–123
 hepatic uptake, 399, 407
 hypercholesterolemia, 922
 immune function, 409
 LDL conjugation, 327–332
 LDL oxidation, 491–504
 leukocytes, 113–123
 lycopene synergism, 498
 major sources, 397
 metabolism, 406
 metabolites, 408
 natural compounds, 398
 NO bioactivity, 921
 NOS expression, 113–123
 physiology, 400, 405
 PKC inhibition, 401
 plasma levels, 115
 protein binding, 397–402
 regulation, 405–409
 supplementation, 113, 409
 tissue-specific, 400
 transfer protein, 398
 transport, 398, 406
 urinary metabolite, 402
 women, 408
- Tocotrienol, chemical structure, 496
- Tomato. *See* Lycopene
- Transaldolase, ROS production, 561
- Transcription factors
 aging effects, 379–386
 amino acid transport, 668
 apoptosis, 381
 biochemistry, 382
 cholinergic system, 441
 dopamine oxidation, 453
 hypoxia, 432
 molecular techniques, 382
 NO effects, 594
 peroxisome proliferators, 613
 redox-sensitive, 381, 742
- Transferrin
 apoptosis, 220
 brain levels, 422
 heme transport, 159
 iron uptake, 201
 plasma membrane, 201
- Transition metals, lymphoblasts, 462
- Transnitrosylation, mechanisms, 894
- Transplants. *See* Liver transplants
- Transplasma membrane
 electron transport, 233
 inhibitor effects, 283
 NADPH oxidase, 277–286
- Trauma, heme transport, 158, 739
- Triadin, ryanodine receptors, 19
- Troglitazone
 antioxidant, 246
 erythrocytes, 243–249
 structure, 244
- Trolox, NO protection, 676
- Tuberculosis, NOS expression, 587
- Tubules
 depolarization, 8
 thioredoxin, 656
- Tumor cells
 ascorbic acid, 730
 leukocytes, 191

- Tumor cells (*continued*)
 membrane redox, 181
 NADPH oxidase, 284
 selenium, 813
 Tax effects, 731
 thioredoxin, 523
- Tumor necrosis factor- α
 adhesion molecules, 823
 antioxidants, 85
 apoptosis, 109, 219, 381
 breast cancer, 908
 ceramide release, 264
 heme oxygenase, 123
 ischemia-reperfusion, 128
 Kupffer cells, 612
 liver cells, 123
 MnSOD resistance, 382
 NOS expression, 587, 631
 nuclear factors, 310
 oxidative stress, 555, 908
 redox signaling, 554
 thioredoxin inhibition, 83–90
- Tumor suppressor genes
 heme transcription, 169
 ROS generation, 507–516
- Tumorigenesis, environmental factors, 842
- Tyrosinase
 ATP activity, 77
 eptopside oxidation, 75
 phenoxyl radicals, 75
- Tyrosine kinase, ADT regulation, 789–797
- Tyrosine phosphorylation, 791
- Ubiquinone.** *See* Coenzyme Q
- Ubiquitin**
 activation, 104
 apoptosis, 103
 cardiac, 103–111
 proteasomes, 107
- Ulcer, gastric, 520
- Ultraviolet irradiation, Ret kinases, 841–847
- Umbilical vein endothelial cells (UVEC)
 ADT effect, 794
 ESR spectroscopy, 779
 free radicals, 781
 NADH evidence, 779–786
 NO production, 924
 oxidase response, 782
 PMN adhesion, 791
 radical species, 783
 tyrosine phosphorylation, 793
 viability, 794
- Upstream stimulating factor (USF), 740, 744
- Uridine diphosphate, breast cancer, 911
- Uroporphyrins, photosensitization, 355–361
- Ursodeoxycholid acid, hepatitis B, 687–692
- Vanilloids**, apoptosis, 220
- Vascular cell adhesion molecule 1 (VCAM-1)
 cell interactions, 821
 inflammation, 392
 interleukin 1, 823
 NOS expression, 394
- Vascular disorders
 aging effects, 363–367
 hydrogen peroxide, 363
 NO bioavailability, 917–925
 transcription factors, 381
- Vascular smooth muscle cells (VSMC)
 aging effects, 363
 contractility, 364
 hydrogen peroxide, 363
 NOS expression, 635, 639
 signaling pathways, 381
 supershift assay, 383
- Ventricular myocytes, calcium signaling, 66
- Very low density lipoprotein (VLDL), 399
- Viral infections, oxidative stress, 557
- Vitamin C. *See* Ascorbic acid
- Vitamin E. *See* Tocopherol
- Voltage-dependent anion channel (VDAC), 539
- Von Willebrand factor. *See* Factor VIII
- Vpr proteins
 oxidative stress, 564
 redox signaling, 554
 ROS production, 563
- Women**, tocopherol, 408
- Xanthine oxidase**, hydrogen peroxide, 56
- Xanthine oxidoreductase (XOR), 906
- Xenobiotics. *See* Peroxisome proliferators
- Yeast**
 iron uptake, 202
 thioredoxin, 804
- Zinc**
 Alzheimer's disease, 318
 amyloid toxicity, 317–323
 calcium release, 6
 cell viability, 319
 lipid peroxidation, 318
 oxidative stress, 322
 pheochromocytoma, 319