MONITOR MOLECULAR ORIGINS AND CONSEQUENCES OF OXIDATIVE STRESS RESEARCH

The term oxidative stress reflects an imbalance in free radical formation within a cell or organism, most commonly in the form of reactive oxygen or nitrogen species (ROS/RNS). ROS/RNS such as superoxide anions, hydroxyl radicals, hydrogen peroxide, nitric oxide, and peroxynitrite originate from a variety of sources including changes in aerobic metabolism, immune activation, UV radiation, heme accumulation, and hypoxia. Failure of the cell’s defense mechanisms to compensate for accumulating insults such as mitochondrial dysfunction, DNA damage, misfolded proteins, and lipid peroxidation can trigger programmed cell death pathways, and has been linked to clinically relevant diseases including cancer, cardiovascular disease, asthma, ischemia, diabetes, and neurodegenerative disease.

Live Cell Analysis
Enzo's expertise in fluorescent probe chemistry and cellular analysis combine to provide high-sensitivity fluorescent probes for profiling free radical production and the cellular consequences of their accumulation under conditions of oxidative stress. Our unique fluorescent probe-based assays and widely cited antibodies enable multiplex detection of ROS/RNS, superoxide, hypoxia, as well as sensitive assays for mitochondrial function, apoptosis, and autophagy.

Immunoenzyme & Antibodies
As a trusted manufacturer of thousands of widely cited and thoroughly validated ELISA kits and antibodies, we understand quality means delivering sensitivity, specificity, and consistency. Over 300 immunoassays and 3,000 antibodies enable sensitive and specific detection of protein and small molecule biomarkers of oxidative stress. Our assay kits and reagents are some of the most widely cited products for quantification of critical stress-regulating metabolic enzymes and stress-responsive pathways.

Small Molecule Chemistry
More than 3,000 biologically characterized small molecules and the industry’s most diverse collection of compound libraries enables the modulation of oxidative stress pathways. Our catalog includes hundreds of REDOX compounds, natural products, and bioactive lipids available as ready-to-screen SCREEN-WELL® libraries or as individual and bulk compounds. Over 50 spin traps and probes facilitate molecular characterization of free radical production.
LIVE CELL, MULTIPLEX ANALYSIS KITS

Accurately Profile Total ROS and Superoxide with Dual-readout Assay

**ROS-ID Total ROS/Superoxide Detection Kit**

- Non-invasive fluorescent probes allow simultaneous discrimination of total ROS and superoxide in live cells
- Distinguish between hydrogen peroxide, peroxynitrite and hydroxyl radicals using included inhibitors
- Dyes compatible with major components of tissue culture media (phenol red, FBS and BSA) for microscopy and flow cytometry
- Red dye for detection of nitric oxide also available (ENZ-51013/ENZ-51001)

**Multiplex Analysis of Total ROS and Superoxide**

Data represents treatment of HeLa cells with Pyocyanin (ROS/SO inducer). Total ROS dye fluoresces green in the presence of ROS, while the SO-specific dye fluoresces yellow/orange (bottom right).

**Convenient Quantifiable Flow Cytometry Assay**

Data represents % of positive HeLa cells following treatment with Pyocyanin (ROS/SO inducer), TBHP (ROS Inducer), or AMA (Superoxide inducer).

<table>
<thead>
<tr>
<th>PRODUCT NAME</th>
<th>PRODUCT #</th>
<th>EX/EM</th>
<th>APPLICATION</th>
</tr>
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<tbody>
<tr>
<td>ROS-ID Total ROS/Superoxide Detection Kit</td>
<td>ENZ-51010</td>
<td>Oxidative Stress 504/524 • Superoxide 530/590 •</td>
<td><img src="microscope.png" alt="Microscopy" /> <img src="flow_cytometry.png" alt="Flow Cytometry" /> <img src="microplate.png" alt="Microplate" /></td>
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<tr>
<td>ROS-ID ROS/RNS Detection Kit</td>
<td>ENZ-51001</td>
<td>Oxidative Stress 504/524 • Superoxide 530/590 • NO 648/666 •</td>
<td><img src="microscope.png" alt="Microscopy" /> <img src="flow_cytometry.png" alt="Flow Cytometry" /></td>
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<tr>
<td>ROS-ID Total ROS Detection Kit</td>
<td>ENZ-51011</td>
<td>504/524 •</td>
<td><img src="microscope.png" alt="Microscopy" /> <img src="flow_cytometry.png" alt="Flow Cytometry" /> <img src="microplate.png" alt="Microplate" /></td>
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<tr>
<td>ROS-ID Superoxide Detection Kit</td>
<td>ENZ-51012</td>
<td>530/590 •</td>
<td><img src="microscope.png" alt="Microscopy" /> <img src="flow_cytometry.png" alt="Flow Cytometry" /> <img src="microplate.png" alt="Microplate" /></td>
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<tr>
<td>ROS-ID NO Detection Kit</td>
<td>ENZ-51013</td>
<td>648/666 •</td>
<td><img src="microscope.png" alt="Microscopy" /> <img src="flow_cytometry.png" alt="Flow Cytometry" /> <img src="microplate.png" alt="Microplate" /></td>
</tr>
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</table>

**Multiplex, Real-time Analysis of Hypoxia and ROS in Live Cells**

**ROS-ID Hypoxia/Oxidative Stress Detection Kit (ENZ-51042)**

- Sensitive hypoxia dye fluoresces red when converted by nitroreductases
- Total ROS dye enables simultaneous detection of hypoxia (red) and ROS (green)
- Non-toxic, cell-permeable dyes optimized to avoid artifactual fluorescence
- Suitable for microscopic or flow cytometric analysis of adherent or suspension cells

**Simultaneously Monitor Hypoxic Status and ROS Formation**

Bright red fluorescence of the Hypoxia probe is observed following its conversion by cellular nitroreductases under hypoxic conditions such as those induced chemically by treatment with the hypoxia-mimetic Deferoxamine (DFO). The assay facilitates simultaneous quantification of hypoxic status (FL3/red) and presence of ROS (FL1/green) by flow cytometry.
MITO-ID Extracellular O$_2$ Sensor Kits

This oxygen-sensitive phosphorescent probe can be used to assess O$_2$ consumption by cultured cells, isolated mitochondria, microorganisms, tissues, and enzymes.

- Phosphorescent probe increases in signal intensity with O$_2$ consumption (↓O$_2$ levels)
- Amenable to 96- and 384-well microplates for high-throughput analysis on standard fluorescence plate readers (Ex/Em 380/650 nm)
- Cell-permeable probe also available for tracing intracellular O$_2$ levels
- Multiplex with MITO-ID pH Sensor Probe to confirm mitochondrial toxicity

### Detect Mitochondrial Dysfunction Within Minutes of Treatment

Assessment of mitochondrial function with MITO-ID Extracellular O$_2$ Sensor Kit (A) or traditional ATP assay (B) following treatment with mitochondrial inhibitors (Oligomycin, Rotenone, Antimycin), uncoupling agent (FCCP), or control (DMSO). Results illustrate that drug-induced mitochondrial dysfunction is evident immediately post-treatment (A) despite varying levels of viability at 24 hours by ATP assay (B).

<table>
<thead>
<tr>
<th>PRODUCT NAME</th>
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</thead>
<tbody>
<tr>
<td>MITO-ID Extracellular O$_2$ Sensor Kit</td>
<td>ENZ-51044</td>
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<tr>
<td>MITO-ID Extracellular O$_2$ Sensor Kit (High Sensitivity)</td>
<td>ENZ-51045</td>
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<tr>
<td>MITO-ID Intracellular O$_2$ Sensor Probe</td>
<td>ENZ-51046</td>
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<tr>
<td>MITO-ID Extracellular O$_2$ Sensor Probe</td>
<td>ENZ-51047</td>
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</table>

### Efficiently Monitor Glycolytic Activity

Acidification profiles of HepG2 cells treated with glucose transport inhibitors (2DG, Oxamate) or mitochondrial inhibitor (Antimycin) relative to control.

<table>
<thead>
<tr>
<th>PRODUCT NAME</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MITO-ID Extracellular pH Sensor Probe</td>
<td>ENZ-51048</td>
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</table>

QUANTIFY LOSS OF MMP IN LIVE CELLS

MITO-ID Membrane Potential Cytotoxicity Assay Kit

A real-time mitochondrial membrane potential assay with superior sensitivity

- 10X more sensitive than JC-1 with superior aqueous solubility
- Photostable dual-emission dye
- No-wash/no-medium removal
- Separate MITO-ID Red/Green assays available for detection of mitochondrial mass
- Suitable for high-throughput applications

<table>
<thead>
<tr>
<th>PRODUCT NAME</th>
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</thead>
<tbody>
<tr>
<td>MITO-ID Membrane Potential Cytotoxicity Assay Kit</td>
<td>ENZ-51019</td>
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</table>

Detect MMP Perturbations with 10X More Sensitivity than JC-1

HeLa cells were treated with increasing CCCP concentration and stained with JC-1 or MITO-ID. Improved aqueous solubility of the MITO-ID dye and no-wash protocol minimizes variability, leading to a higher Z-factor (> 0.9) than that obtained with JC-1.
High-sensitivity ELISA & Detection Kits

<table>
<thead>
<tr>
<th>PRODUCT NAME</th>
<th>PRODUCT #</th>
<th>SIZE</th>
<th>READOUT</th>
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<tbody>
<tr>
<td>12(S)-HETE ELISA Kit</td>
<td>ADI-900-050</td>
<td>1 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>ALDetect™ Lipid Peroxidation Assay Kit</td>
<td>BML-AK170</td>
<td>100 Assays</td>
<td>Colorimetric</td>
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<tr>
<td>Cu/Zn-Superoxide Dismutase ELISA Kit</td>
<td>ALX-850-033</td>
<td>1 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>Cytochrome C (h) ELISA Kit</td>
<td>ADI-900-141</td>
<td>1 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>Direct 8-iso-PGF$_2$$\alpha$, ELISA Kit</td>
<td>ADI-900-091</td>
<td>1 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>Glutathione (total) Detection Kit</td>
<td>ADI-900-160</td>
<td>4 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>HO-1 (human), ELISA Kit</td>
<td>ADI-EKS-800</td>
<td>1 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>iMUNOSETS® HO-1 (mouse)</td>
<td>ADI-960-071</td>
<td>5 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>HO-1 (rat), ELISA Kit</td>
<td>ADI-EKS-810A</td>
<td>1 x 96 Wells</td>
<td>Colorimetric</td>
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<td>Hydrogen Peroxide Detection Kit</td>
<td>ADI-907-015</td>
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<td>Myeloperoxidase (human), ELISA Kit</td>
<td>ADI-900-115</td>
<td>1 x 96 Wells</td>
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<tr>
<td>Nitric Oxide (Total) Detection Kit</td>
<td>ADI-917-020</td>
<td>2 x 96 Wells</td>
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<td>OXI-TEK TBARS Assay Kit</td>
<td>ALX-850-287</td>
<td>160 Tests</td>
<td>Fluorometric</td>
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<tr>
<td>Protein Carbonyl ELISA Kit</td>
<td>ALX-850-312</td>
<td>1 x 96 Wells</td>
<td>Colorimetric</td>
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<tr>
<td>Red Hydrogen Peroxide Assay Kit</td>
<td>ENZ-51004</td>
<td>5 x 96 Wells</td>
<td>Fluorometric</td>
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Widely-cited Antibodies

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<tr>
<th>PRODUCT NAME</th>
<th>PRODUCT #</th>
<th>SPECIES</th>
<th>PRODUCT NAME</th>
<th>PRODUCT #</th>
<th>SPECIES</th>
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<tr>
<td>Biliverdin Reductase, pAb</td>
<td>ADI-OSA-400</td>
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<td>HIF-1α, mAb (Hα111a)</td>
<td>ADI-OSA-602</td>
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<td>Calnexin, pAb</td>
<td>ADI-SPA-860</td>
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<td>H0-1, mAb (H0-1-1)</td>
<td>ADI-OSA-110</td>
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<tr>
<td>Calreticulin, mAb (FMC 75)</td>
<td>ADI-SPA-601</td>
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<td>H0-1, mAb (H0-1-2)</td>
<td>ADI-OSA-111</td>
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<tr>
<td>Calreticulin, pAb</td>
<td>ADI-SPA-600</td>
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<td>H0-1, pAb</td>
<td>ADI-SPA-895</td>
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<tr>
<td>Cu/Zn SOD, pAb</td>
<td>ADI-SOD-100</td>
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<td>INOS, pAb</td>
<td>ADI-KAS-N0001</td>
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<tr>
<td>eNOS, pAb</td>
<td>ADI-905-386</td>
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<td>Metallothionein, mAb (UC1MT)</td>
<td>ADI-SPA-550</td>
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<td>Grp94, mAb (9G10)</td>
<td>ADI-SPA-850</td>
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<td>PDI mAb (1D3)</td>
<td>ADI-SPA-891</td>
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MODULATE WITH PRO- AND ANTI-OXIDANT COMPOUNDS

SCREEN-WELL REDOX Compound Library (BML-2835)

The SCREEN-WELL REDOX Library contains 84 ready-to-screen compounds with defined prooxidant or antioxidant activity. All compounds come pre-dissolved in DMSO and are available in bulk quantities for resupply.

- Glutathione peroxidase inhibitors
- Hydroperoxides
- Lazaroids
- Metal chelators
- Polyphenolics
- Radical scavengers
- SOD mimetics
- Thiols
- Thiol traps

SELECT SMALL MOLECULE MODULATORS

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>PRODUCT #</th>
<th>ACTIVITY</th>
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<tr>
<td>Buthionine sulfoximine</td>
<td>BML-FR117</td>
<td>γ-Glutamyl transpeptidase inhibitor</td>
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<tr>
<td>Cannosic Acid</td>
<td>ALX-270-264</td>
<td>Antioxidant</td>
</tr>
<tr>
<td>Eicosapentaenoic acid</td>
<td>BML-FA001</td>
<td>Inhibits PGE$_2$ formation</td>
</tr>
<tr>
<td>L-Ergothioneine</td>
<td>BML-FR111</td>
<td>Antioxidant</td>
</tr>
<tr>
<td>Resveratrol</td>
<td>BML-FR104</td>
<td>Antioxidant</td>
</tr>
</tbody>
</table>
Our broad range of scientific expertise and manufacturing capabilities enables us to provide a comprehensive set of solutions for oxidative stress.

**EPIGENETICS**

- Sample Extraction Kits
  - EPIXTRACT® Kits
- Sample Conversion Kits
  - 5-Methylcytosine
  - 5-Hydroxymethylcytosine
- Drug Discovery Assays and Active Enzymes
  - Deacetylation
    - CHEMILUM DE LYS® HDAC & Sirtuin Assay
    - FLUOR DE LYS® HDAC & Sirtuin Assays
    - COLOR DE LYS® HDAC & Sirtuin Assays
  - Active HDAC & Sirtuin Enzymes
    - Acetylation/Methylation/Demethylation
    - SUMOylation
    - Ubiquitinylation
- Epigenetic Activators and Inhibitors
  - SCREEN-WELL® Epigenetics Library
  - HDAC Inhibitors
  - SIRT Modulators
  - Other Epigenetic Modulators

**DETECTION ASSAYS**

- ELISA-Based
  - Antibodies for Detecting Epigenetic Changes
    - Ubiquitinylation
    - Lysine Modifications
    - SUMOylation
    - DNA Methylation
    - Histone Modifications

**CELL DEATH & VIABILITY**

- CELLESTIAL® ASSAY KITS & DYES
  - Cell Death & Viability
  - Autophagy
  - Aggresome & Inclusion Body Detection
  - Apoptosis/Necrosis
  - Senescence
  - Viability
- Cell Function
  - Cell Cycle Analysis
  - Cell Tracking & Lineage
  - Calcium Mobilization
  - Oxidative Stress
  - Hypoxia
  - Multidrug Resistance
- Cell Structure & Organelle Detection
  - Nucleus
  - Endoplasmic Reticulum
  - Golgi Apparatus
  - Lysosomes
  - Mitochondria
  - Multiple Organelles

**IMMUNOASSAY KITS**

- Bioprocess
- Cancer
- Cardiovascular
- Cell Death
- Cell Signaling
- Cyclic Nucleotides
- Cytokines
- Eicosanoids
- Endocrinology/Hormones
- Epigenetics
- Immunology
- Immunity/Inflammation
- Metabolism
- Neuroscience
- Oxidative Stress
- Proteostasis/Chaperones

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Put our experience to work for you!
Our broad range of scientific expertise and manufacturing capabilities enables us to provide a comprehensive set of solutions for oxidative stress.