

---

Product Manual

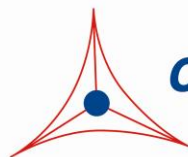
# OxiSelect™ Intracellular Nitric Oxide (NO) Assay Kit (Fluorometric)

## Catalog Number

STA-800	96 assays
STA-800-5	5 x 96 assays

**FOR RESEARCH USE ONLY**  
Not for use in diagnostic procedures

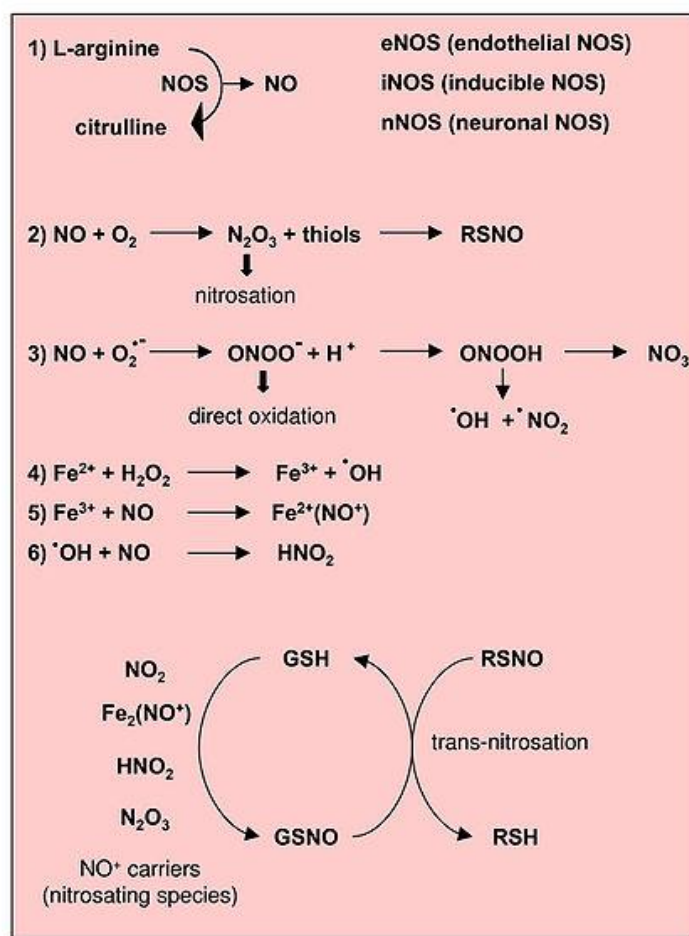
---



**CELL BIOLABS, INC.**  
*Creating Solutions for Life Science Research*

## Introduction

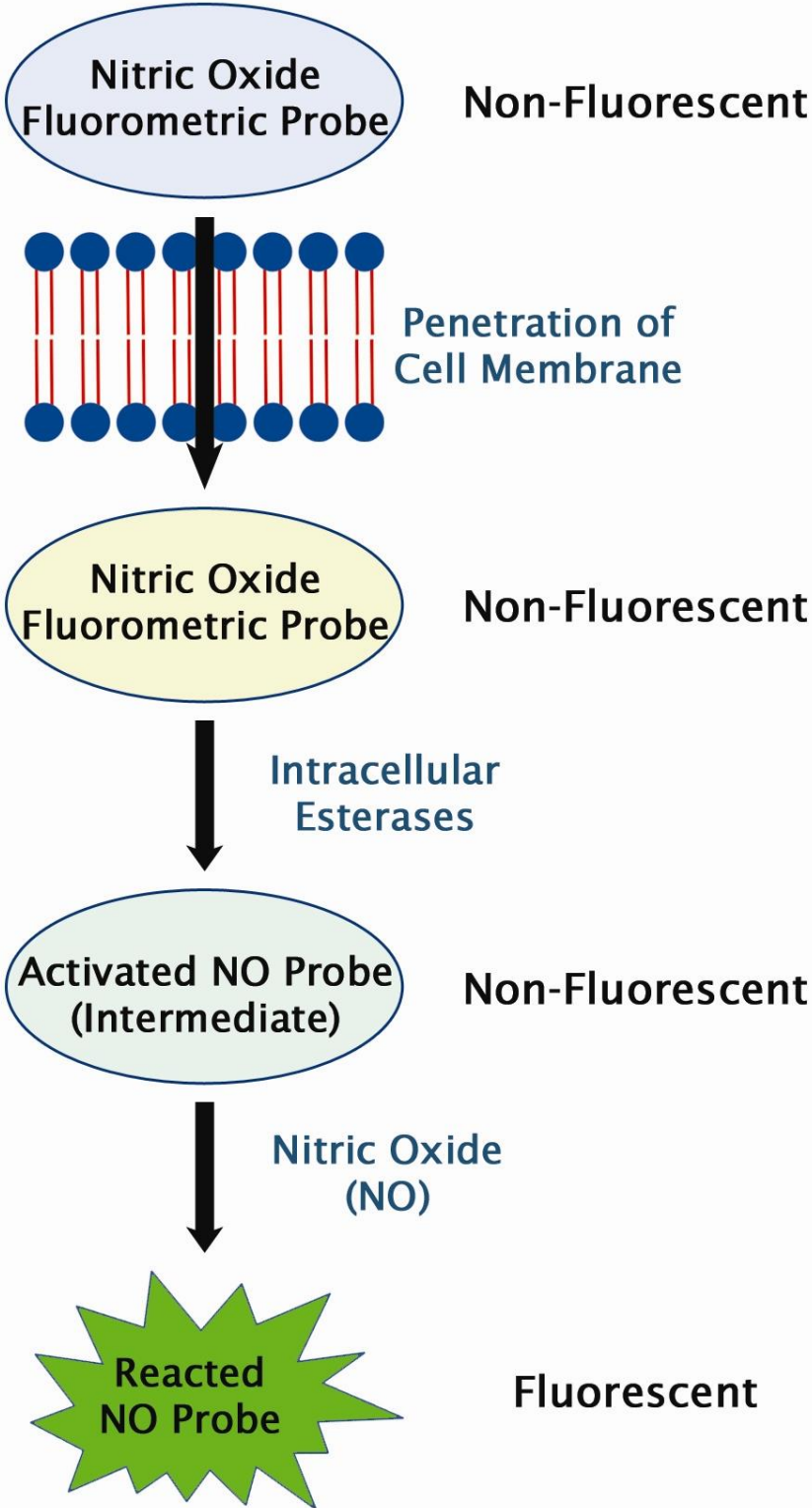
Reactive nitrogen species (RNS) and reactive oxygen species (ROS) work together to damage cells and have been implicated in the pathogenesis of several disease states. RNS are a family of molecules derived from nitric oxide (NO) and superoxide anion ( $O_2^-$ ), produced via nitric oxide synthase (NOS) and NADPH oxidase, respectively (Figure 1). Nitric oxide is an established mediator in vascular diseases, diabetes, renal ischemia, atherosclerosis, inflammatory diseases, and cancer. However, because of its extremely short half life, studies of NO and its physiological role have been challenging.



**Figure 1: Reactions leading to generation of NO and RNS. [1]**

The OxiSelect™ Intracellular Nitric Oxide Assay Kit is a cell-based assay for rapid detection of intracellular NO or NOS activity in cultured cells. In brief, the cell-permeant NO probe passively diffuses into cells and is deacetylated by cellular esterases to a non-fluorescent intermediate. When intracellular nitric oxide encounters this intermediate, it rapidly oxidizes to a highly fluorescent, triazolo-fluorescein analog. The fluorescence intensity is proportional to the NO levels within the cell cytosol (detection limit of ~3 nM). The kit's provided Nitric Oxide Fluorometric Probe is NO specific, has excellent photostability and pH stability, and is detected with standard fluorescein filters. The probe is suitable for flow cytometry, fluorescent microscopy, and fluorescent microplate detection. Each kit provides sufficient reagents to perform up to 96 assays, including blanks, standards, and unknown samples.

Assay Principle



## **Related Products**

1. STA-310: OxiSelect™ Protein Carbonyl ELISA Kit
2. STA-320: OxiSelect™ Oxidative DNA Damage ELISA Kit (8-OHdG Quantitation)
3. STA-330: OxiSelect™ TBARS Assay Kit (MDA Quantitation)
4. STA-342: OxiSelect™ Intracellular ROS Assay Kit (Green Fluorescence)
5. STA-343: OxiSelect™ Hydrogen Peroxide Assay Kit
6. STA-344: OxiSelect™ Hydrogen Peroxide/Peroxidase Assay Kit
7. STA-347: OxiSelect™ In Vitro ROS/RNS Assay Kit (Green Fluorescence)
8. STA-832: OxiSelect™ MDA Adduct Competitive ELISA Kit
9. STA-838: OxiSelect™ HNE Adduct Competitive ELISA Kit

## **Kit Components**

1. NOS Inhibitor, L-NNA (Part No. 280001): One vial containing 100 mg of L-NNA (CAS Number 2149-70-4, MW 219.20). L-NNA is a competitive inhibitor of nitric oxide synthase (NOS).
2. 5X Cell Lysis Buffer (Part No. 280002): Two 1.5 mL vials.
3. 500X Nitric Oxide Fluorometric Probe (Part No. 280003): One 20 µL amber vial.

## **Materials Not Supplied**

1. Sterile DPBS containing magnesium and calcium
2. Cell culture medium
3. 37°C incubator
4. 10 µL to 1000 µL adjustable single channel micropipettes with disposable tips
5. 50 µL to 300 µL adjustable multichannel micropipette with disposable tips
6. 96-well tissue culture plate

*Note: A tissue culture treated, 96-well fluorescence microtiter plate is required for kinetic/time course experiments.*

7. 96-well fluorescence microtiter plate
8. Fluorescent microplate reader capable of reading 485 nm (excitation) and 530 nm (emission)
9. (Optional) L-Arginine

*Note: Found in most culture media*

10. (Optional) β-NADPH, LPS, IFN-γ, NOS Inducers, NOS Inhibitors

## **Storage**

Store the entire kit at -20°C. Avoid multiple freeze/thaws by aliquoting. The Nitric Oxide Fluorometric Probe is light sensitive and should be maintained in amber tubes.

## **Preparation of Reagents**

- NOS Inhibitor, L-NNA: Weigh out the NOS Inhibitor and dissolve at 0.22 mg/mL, or ~1 mM, in water (L-NNA is difficult to dissolve at concentrations above 0.5 mg/mL). Stir to homogeneity, then sterile filter. Further dilute to the desired final concentration in media. Prepare only enough for immediate applications. Do not store diluted solutions.
- 5X Cell Lysis Buffer: Thaw the 5X Cell Lysis Buffer concentrate at room temperature. Immediately before use, dilute to 1X with deionized water. Stir to homogeneity.
- 500X Nitric Oxide Fluorometric Probe: Thaw the NO Fluorometric Probe at room temperature during assay preparation. Immediately before use, dilute the NO Fluorometric Probe to 1X concentration as follows:
  - If detection will be done in a fluorescence microplate reader, dilute 1:500 with either DPBS or culture media, preferably without phenol red or BSA, which may reduce fluorescence. Sensitivity of cells to serum-free environments should be considered when choosing the diluent. Briefly vortex to homogeneity. Do not store diluted solutions.
  - If detection will be done by fluorescence microscopy, dilute 1:500 with either DPBS or serum-free media only. Media containing serum will quench the probe's intracellular fluorescence and should not be used. Briefly vortex to homogeneity. Do not store diluted solutions.

*Note: For longer term storage, the 500X NO Fluorometric Probe should be aliquoted and frozen at -20°C to avoid multiple freeze/thaws.*

## **Assay Protocol**

### **I. Cell Seeding**

1. Harvest and resuspend cells in culture medium at  $2-5 \times 10^5$  cells/mL.
2. Seed 200  $\mu$ L in each well of either a clear or black, 96-well tissue culture plate. If performing kinetic/time course experiments, a black 96-well tissue culture plate is required.

*Note: Overnight induction of NOS activity (e.g.  $\beta$ -NADPH, LPS, IFN- $\gamma$ ) may be performed immediately after cell plating.*

3. Incubate overnight at 37°C, 5% CO<sub>2</sub> (cells should be > 80% confluent).

### **II. Induction of NOS Activity**

1. Prepare and mix all reagents thoroughly before use.
2. Perform induction of NOS activity to desired wells. Induced, non-induced, media only, and blank wells (without NO Probe) should be assayed in triplicate. NOS inhibitors may also be added.
3. Proceed to Section III, IV or V for the desired detection method.

### III. Kinetic/Time Course Experiments in Fluorescence Plate Reader (Black Plate Required)

1. Aspirate/remove media from the wells and add 100  $\mu$ L of 1X Nitric Oxide Fluorometric Probe (see Preparation of Reagents section above) to each tested well. NOS inducers/inhibitors may also be added.

*Note: Media-only wells (without cells) should be included and subtracted as background.*

2. Cover the plate wells to protect the reaction from light.
3. Incubate at 37°C for the desired time period(s) (typically 30-120 minutes).
4. Read the fluorescence with a fluorometric plate reader at 480 nm/530 nm.

### IV. End Point Experiments in Fluorescence Microtiter Plate Reader (Black or Clear Plate)

1. Aspirate/remove media from the wells and add 100  $\mu$ L of 1X Nitric Oxide Fluorometric Probe (see Preparation of Reagents section above) to each tested well. NOS inducers/inhibitors may also be added.

*Note: Media-only wells (without cells) should be included and subtracted as background.*

2. Cover the plate wells to protect the reaction from light.
3. Incubate at 37°C for 2 hours.
4. Add 100  $\mu$ L of 1X Cell Lysis Buffer (see Preparation of Reagents section above) to each tested well. Mix well and incubate for 5 minutes.
5. For measurement:
  - If already in a black 96-well tissue culture plate, wells can be directly read in a fluorometric plate reader at 480 nm/530 nm.
  - If in a clear 96-well tissue culture plate, transfer 150  $\mu$ L of the mixture to a 96-well plate suitable for fluorescence measurement. Read the fluorescence with a fluorometric plate reader at 480 nm/530 nm.

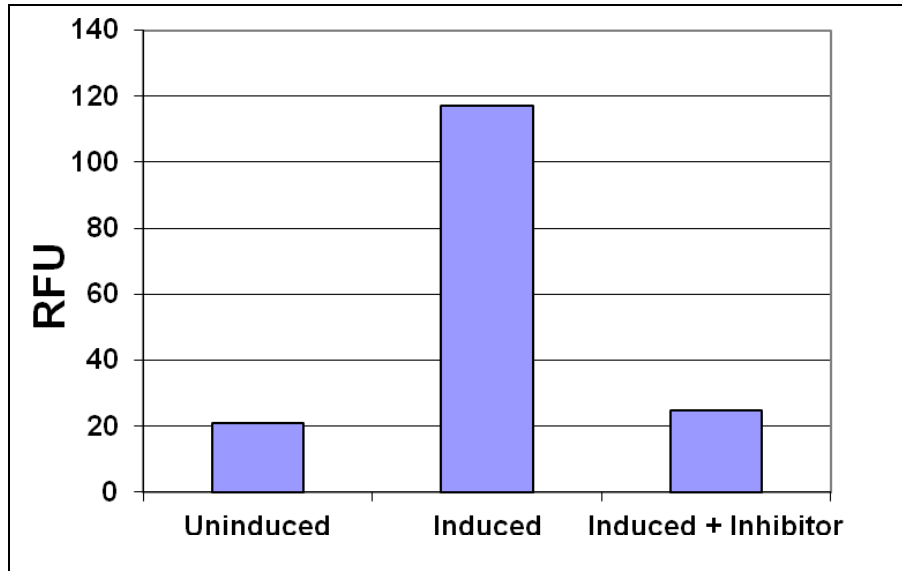
### V. Fluorescence Microscopy Detection

1. Aspirate/remove media from the wells and discard. Gently wash the wells 2 times with 250  $\mu$ L DPBS (containing magnesium and calcium). Remove the last wash and discard.
2. Add 100  $\mu$ L of 1X Nitric Oxide Fluorometric Probe (see Preparation of Reagents section above) to each tested well.
3. Cover the plate wells to protect the reaction from light.
4. Incubate at 37°C for 30-120 minutes.
5. View cells with a fluorescence microscope using FITC filter set.

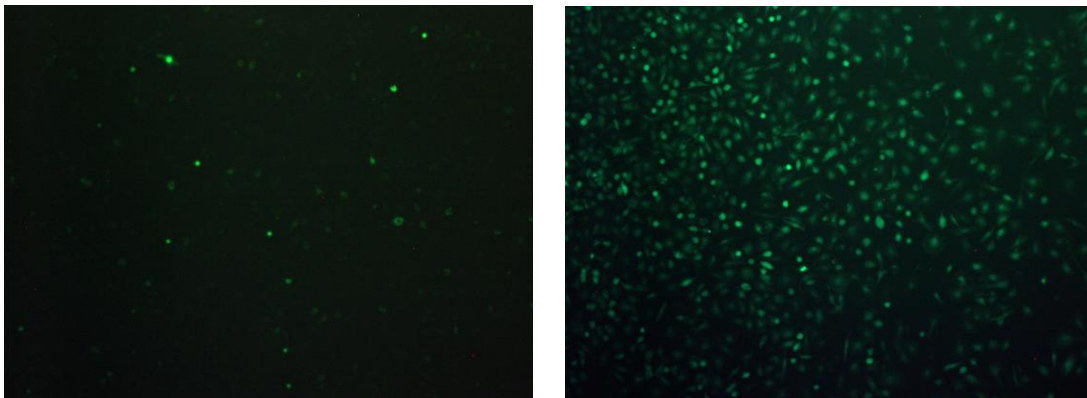
*Note: To reduce the background fluorescence during imaging, aspirate the media/NO Fluorometric Probe and replace with fresh DPBS.*

## Example of Results

The following figures demonstrate typical Nitric Oxide Assay results. Fluorescence measurement was performed on SpectraMax Gemini XS Fluorometer (Molecular Devices) with a 485/538 nm filter set and 530 nm cutoff. One should use the data below for reference only. This data should not be used to interpret actual results.



**Figure 2. NOS Induction of RAW 264.7 Cells.** RAW 264.7 cells were seeded at 100,000 cells/well in a 96-well plate. Induction was performed for 20 hrs with 50 ng/mL LPS and 10 ng/mL IFN- $\gamma$ . Wells were either uninduced (left), induced (middle), or induced and followed with 2 hr incubation of 50 $\mu$ M L-NNA (right). Microtiter plate detection was performed as described in the Assay Protocol (end point after 2 hours).



**Figure 3. NOS Induction of RAW 264.7 Cells.** RAW 264.7 cells were seeded at 100,000 cells/well in a 96-well plate. Wells were either uninduced (left) or induced with 50 ng/mL LPS and 10 ng/mL IFN- $\gamma$  (right) for 20 hours at 37°C. Fluorescence microscopy detection was performed as described in the Assay Protocol.

## References

1. Novo E, and Parola M. (2008) *Fibrogenesis Tissue Repair*, **1**:5.
2. Ignarro, LJ. (2002) *J. Physiol. Pharmacol.* **53**:503-514.
3. Hickok, JR and Thomas, DD. (2010) *Curr. Pharm. Des.* **16**:381-391.
4. Thomas, DD et al. (2008) *Free Radic. Biol. Med.* **45**:18-31.

## Recent Product Citations

1. Acharya, A. et al. (2022). Microgravity-induced stress mechanisms in human stem cell-derived cardiomyocytes. *iScience*. doi: 10.1016/j.isci.2022.104577.
2. Wu, C.Y. et al. (2021). Non-Thermal Reactive N<sub>2</sub>/He Plasma Exposure to Inhibit Epithelial Head and Neck Tumor Cells. *Coatings*. **11**(11):1284. doi: 10.3390/coatings11111284.
3. Pectol, D.C. et al. (2020). Effects of Glutathione and Histidine on NO Release from a Dimeric Dinitrosyl Iron Complex (DNIC). *Inorg Chem*. doi: 10.1021/acs.inorgchem.0c02196.
4. Khang, M.K. et al. (2020). Enhanced Endothelial Cell Delivery for Repairing Injured Endothelium via Pretargeting Approach and Bioorthogonal Chemistry. *ACS Biomater Sci Eng*. doi: 10.1021/acsbiomaterials.0c00957.
5. Hosomi, K. et al. (2020). Lymphoid Tissue-Resident Alcaligenes Establish an Intracellular Symbiotic Environment by Creating a Unique Energy Shift in Dendritic Cells. *Front Microbiol*. doi: 10.3389/fmicb.2020.561005.
6. Lou, F. et al. (2020). Excessive Polyamine Generation in Keratinocytes Promotes Self-RNA Sensing by Dendritic Cells in Psoriasis. *Immunity*. S1074-7613(20)30234-X. doi: 10.1016/j.immuni.2020.06.004.
7. Singh, K.S. et al. (2020). African-centric TP53 variant increases iron accumulation and bacterial pathogenesis but improves response to malaria toxin. *Nat Commun*. **11**(1):473. doi: 10.1038/s41467-019-14151-9.
8. Arora, S. et al. (2020). Topography elicits distinct phenotypes and functions in human primary and stem cell derived endothelial cells. *Biomaterials*. doi: 10.1016/j.biomaterials.2019.119747.
9. Kuriakose, A.E. et al. (2019). Characterization of Photoluminescent Polylactone-Based Nanoparticles for Their Applications in Cardiovascular Diseases. *Front Bioeng Biotechnol*. **7**:353. doi: 10.3389/fbioe.2019.00353.
10. Pectol, D. C. et al. (2019). Towards the Optimization of Dinitrosyl Iron Complexes as Therapeutics for Smooth Muscle Cells. *Molecular Pharmaceutics*. doi: 10.1021/acs.molpharmaceut.9b00389.
11. Simanjuntak, Y. et al. (2018). Ebselen alleviates testicular pathology in mice with Zika virus infection and prevents its sexual transmission. *PLoS Pathog*. **14**(2):e1006854. doi: 10.1371/journal.ppat.1006854.
12. Jia, H. et al. (2018). Endothelial cell functions impaired by interferon in vitro: Insights into the molecular mechanism of thrombotic microangiopathy associated with interferon therapy. *Thromb Res*. **163**:105-116. doi: 10.1016/j.thromres.2018.01.039.
13. Paesano, L. et al. (2016). Markers for toxicity to HepG2 exposed to cadmium sulphide quantum dots; damage to mitochondria. *Toxicol*. **374**:18-28.
14. Hung, C. Y. et al. (2016). Card9-and MyD88-mediated IFN- $\gamma$  and nitric oxide productions are essential for resistance to subcutaneous coccidioides infection. *Infect Immun*. doi:10.1128/IAI.01066-15.
15. Nasrallah, R. et al. (2015). Endoglin potentiates nitric oxide synthesis to enhance definitive hematopoiesis. *Biology Open*. **4**:819-829.



16. Syed, D. N. et al. (2014). Involvement of ER stress and activation of apoptotic pathways in fisetin induced cytotoxicity in human melanoma. *Arch Biochem Biophys.* **563**:108-117.

### **Warranty**

These products are warranted to perform as described in their labeling and in Cell Biolabs literature when used in accordance with their instructions. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THIS EXPRESSED WARRANTY AND CELL BIOLABS DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR PARTICULAR PURPOSE. CELL BIOLABS' sole obligation and purchaser's exclusive remedy for breach of this warranty shall be, at the option of CELL BIOLABS, to repair or replace the products. In no event shall CELL BIOLABS be liable for any proximate, incidental or consequential damages in connection with the products.

### **Contact Information**

Cell Biolabs, Inc.  
7758 Arjons Drive  
San Diego, CA 92126  
Worldwide: +1 858-271-6500  
USA Toll-Free: 1-888-CBL-0505  
E-mail: [tech@cellbiolabs.com](mailto:tech@cellbiolabs.com)  
[www.cellbiolabs.com](http://www.cellbiolabs.com)

©2013-2022: Cell Biolabs, Inc. - All rights reserved. No part of these works may be reproduced in any form without permissions in writing.