Myeloperoxidase Peroxidation
Fluorometric Assay Kit

Item No. 700160

www.caymanchem.com
Customer Service 800.364.9897
Technical Support 888.526.5351
1180 E. Ellsworth Rd · Ann Arbor, MI · USA
**GENERAL INFORMATION**

**Materials Supplied**

This kit will arrive packaged as a 4°C kit. After opening the kit, store individual components as stated below.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item</th>
<th>Quantity</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>700164</td>
<td>MPO Assay Buffer</td>
<td>1 bottle</td>
<td>4°C</td>
</tr>
<tr>
<td>700023</td>
<td>Resorufin Standard</td>
<td>500 µl</td>
<td>-20°C</td>
</tr>
<tr>
<td>700001</td>
<td>DMSO Assay Reagent</td>
<td>1 ml</td>
<td>RT</td>
</tr>
<tr>
<td>700168</td>
<td>MPO Hydrogen Peroxide</td>
<td>1 vial</td>
<td>4°C</td>
</tr>
<tr>
<td>700166</td>
<td>Myeloperoxidase Assay Reagent</td>
<td>1 vial</td>
<td>-20°C</td>
</tr>
<tr>
<td>700167</td>
<td>MPO Inhibitor</td>
<td>1 vial</td>
<td>4°C</td>
</tr>
<tr>
<td>700002</td>
<td>ADHP Assay Reagent</td>
<td>5 vials</td>
<td>-20°C</td>
</tr>
<tr>
<td>400017</td>
<td>96-Well Solid Plate (black)</td>
<td>2 plates</td>
<td>RT</td>
</tr>
<tr>
<td>400012</td>
<td>96-Well Cover Sheets</td>
<td>2 covers</td>
<td>RT</td>
</tr>
</tbody>
</table>

If any of the items listed above are damaged or missing, please contact our Customer Service department at (800) 364-9897 or (734) 971-3335. We cannot accept any returns without prior authorization.
Safety Data

This material should be considered hazardous until further information becomes available. Do not ingest, inhale, get in eyes, on skin, or on clothing. Wash thoroughly after handling. Before use, the user must review the complete Safety Data Sheet, which has been sent via email to your institution.

Precautions

Please read these instructions carefully before beginning this assay.

If You Have Problems

Technical Service Contact Information

Phone: 888-526-5351 (USA and Canada only) or 734-975-3888
Fax: 734-971-3641
Email: techserv@caymanchem.com
Hours: M-F 8:00 AM to 5:30 PM EST

In order for our staff to assist you quickly and efficiently, please be ready to supply the lot number of the kit (found on the outside of the box).

Storage and Stability

This kit will perform as specified if stored as directed in the Materials Supplied section on page 3 and used before the expiration date indicated on the outside of the box.

Materials Needed But Not Supplied

1. A plate reader with the ability to measure fluorescence using an excitation wavelength of 530-540 nm and an emission wavelength of 585-595 nm
2. Adjustable pipettes and a multichannel or repeating pipette
3. A source of pure water; glass distilled water or HPLC-grade water is acceptable
Background

Myeloperoxidase (MPO) is a member of the heme peroxidase superfamily and is stored within the azurophilic granules of leukocytes. Myeloperoxidase (MPO) is found within circulating neutrophils, monocytes, and some tissue macrophages. A unique activity of MPO is its ability to use chloride as a cosubstrate with hydrogen peroxide to generate chlorinating oxidants such as hypochlorous acid, a potent antimicrobial agent. Recently, evidence has emerged that MPO-derived oxidants contribute to tissue damage and the initiation and propagation of acute and chronic vascular inflammatory diseases. The fact that circulating levels of MPO have been shown to predict risks for major adverse cardiac events and that levels of MPO-derived chlorinated compounds are specific biomarkers for disease progression, has attracted considerable interest in the development of therapeutically useful MPO inhibitors. MPO also oxidizes a variety of substrates, including phenols and anilines, via the classic peroxidation cycle. The relative concentrations of chloride and the reducing substrate determine whether MPO uses hydrogen peroxide for chlorination or peroxidation.

About This Assay

Cayman’s MPO Peroxidation Fluorometric Assay provides a convenient fluorescence-based method for detecting the MPO peroxidase activity in both crude cell lysates and purified enzyme preparations. The assay utilizes the peroxidase component of MPO, where a single two electron oxidation of native enzyme (MPO) to compound I (MPO-I) is followed by two successive one electron reductions back to native enzyme by compound II (MPO-II). The reaction between hydrogen peroxide and ADHP (10-acetyl-3,7-dihydroxyphenoxazine) produces the highly fluorescent compound resorufin (See Figure 1). Resorufin fluorescence can be easily analyzed with an excitation wavelength of 530-540 nm and emission wavelength of 585-595 nm. The kit includes a MPO-specific inhibitor for distinguishing between MPO activity from MPO-independent fluorescence.

Figure 1. Assay scheme
Reagent Preparation

1. **MPO Assay Buffer - (Item No. 700164)**
   This bottle contains 50 ml of 1X Assay Buffer. It is ready to use in the assay.

2. **Resorufin Standard - (Item No. 700023)**
   This vial contains 500 μl of a 2 mM solution of resorufin. The reagent is ready to use to prepare the resorufin standard curve.

3. **DMSO Assay Reagent - (Item No. 700001)**
   This vial contains 1 ml of dimethylsulfoxide (DMSO). The reagent is ready to use as supplied.

4. **MPO Hydrogen Peroxide - (Item No. 700168)**
   This vial contains 100 μl of a 30% solution of hydrogen peroxide. Prior to assaying, mix 10 μl with 90 μl of MPO Assay Buffer to yield a 3% solution. Then mix 10 μl of the 3% solution with 1.74 ml of MPO Assay Buffer to prepare a 5 mM solution. The 5 mM solution will be used to prepare the Initiator Solution. The diluted solutions are stable for two hours.

5. **Myeloperoxidase Assay Reagent - (Item No. 700166)**
   This vial contains 50 μl of a 100 μg/ml solution of human polymorphonuclear leukocyte MPO. Thaw and store the enzyme on ice while preparing the reagents for the assay. Prior to assaying, pipette up and down to mix thoroughly because this enzyme settles over time. Mix 25 μl of MPO with 1975 μl of MPO Assay Buffer for a final MPO concentration of 1.25 μg/ml. The diluted enzyme is stable for one hour on ice.

6. **MPO Inhibitor - (Item No. 700167)**
   This vial contains 300 μl of 50 mM 4-aminobenzhydrazide, a MPO inhibitor. Prior to assaying, mix 10 μl of Inhibitor with 490 μl of MPO Assay Buffer. This is enough Inhibitor to assay 50 wells. The diluted Inhibitor is stable for four hours.

7. **MPO Peroxidation Substrate**
   Immediately prior to preparing the Initiator Solution, add 120 μl of DMSO Assay Reagent (Item No. 700001) to one vial of ADHP Assay Reagent (Item No. 700002) and vortex until dissolved. Then add 470 μl of MPO Assay Buffer for a final MPO Peroxidation Substrate concentration of 1 mM. This is enough MPO Peroxidation Substrate to assay 100 wells. Prepare additional vials as needed. The reconstituted MPO Peroxidation Substrate stable for 15 minutes. After 15 minutes, increased background fluorescence will occur.

Sample Preparation

The kit is designed for detection of MPO activity in cell lysates and in purified solutions. This assay is not compatible for use with serum samples. Some reagents have been shown to interfere with this assay, see page 19 for a list of compatible reagents.

Cell Lysate

1. Collect cells (~7 x 10⁶) by centrifugation (i.e., 1,000-2,000 x g for 10 minutes at 4°C). For adherent cells, do not harvest using proteolytic enzymes; rather use a rubber policeman.
2. Sonicate cell pellet in 0.5-1 ml of cold 1X PBS, pH 7.4, on ice.
3. Centrifuge at 10,000 x g for 10 minutes at 4°C.
4. Remove the supernatant and store on ice.
5. We recommend assaying for MPO activity on the same day of collection. If this is not possible, freeze the sample at -80°C. The sample will be stable for at least one week.
Plate Set Up
There is no specific pattern for using the wells on the plate. However, a resorufin standard curve in duplicate has to be assayed with two wells for the sample and the MPO positive control. We suggest that each sample be assayed at least in duplicate. It is also recommended to assay each sample in the presence and absence of the MPO Inhibitor to allow for the correction of non-MPO-independent fluorescence and to record the contents of each well on the template sheet provided on page 22. A typical layout of samples to be measured in duplicate is shown below in Figure 2.

A-H = Resorufin Standards
+ = MPO Positive Control
S = Sample Wells
I = Sample + Inhibitor Wells

Figure 2. Sample plate format
**Standard Preparation**

Mix 50 µl of the Resorufin Standard with 150 µl of MPO Assay Buffer to yield a concentration of 500 µM. Mix 20 µl of this 500 µM standard with 980 µl of MPO Assay Buffer to yield a stock concentration of 10 µM. Add the amount of Resorufin Standard (10 µM) and MPO Assay Buffer to each well of a dilution plate (or microcentrifuge tube) as described in Table 1. The diluted standards are stable for four hours at room temperature.

<table>
<thead>
<tr>
<th>Well (or Tube)</th>
<th>10 µM Resorufin Standard (µl)</th>
<th>MPO Assay Buffer (µl)</th>
<th>Final Concentration (µM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>200</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>195</td>
<td>0.25</td>
</tr>
<tr>
<td>C</td>
<td>10</td>
<td>190</td>
<td>0.5</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>180</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>40</td>
<td>160</td>
<td>2</td>
</tr>
<tr>
<td>F</td>
<td>100</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>G</td>
<td>160</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>H</td>
<td>200</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 1. Preparation of the Resorufin Standards

**Performing the Assay**

1. **Standard Wells** - add 60 µl of MPO Assay Buffer and 50 µl of Standard (wells or tubes, A-H) per well in the designated wells on the plate (see Sample plate format, Figure 2, page 10).
2. Read the plate in a plate reader using an excitation wavelength of 530-540 nm and an emission wavelength of 585-595 nm. This will allow you to establish an appropriate gain for detecting the entire range of the standards. This gain will then be used when assaying the samples.
3. In a suitable tube, prepare the Initiator Solution according to the table below:

<table>
<thead>
<tr>
<th>Reagents</th>
<th>50 wells</th>
<th>100 wells</th>
<th>150 wells</th>
<th>200 wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPO Assay Buffer</td>
<td>2.24 ml</td>
<td>4.48 ml</td>
<td>6.72 ml</td>
<td>8.96 ml</td>
</tr>
<tr>
<td>MPO Peroxidation Substrate (1 mM)</td>
<td>250 µl</td>
<td>500 µl</td>
<td>750 µl</td>
<td>1 ml</td>
</tr>
<tr>
<td>Hydrogen Peroxide (5 mM)</td>
<td>10 µl</td>
<td>20 µl</td>
<td>30 µl</td>
<td>40 µl</td>
</tr>
</tbody>
</table>

Table 2. Initiator Solution Preparation
4. **MPO Positive Control Wells** - add 50 µl of MPO Assay Buffer and 10 µl of 1.25 µg/ml Myeloperoxidase Assay Reagent to two wells.

5. **Sample Wells** - add 50 µl of MPO Assay Buffer and 10 µl of experimental sample to two wells. To obtain reproducible results, the amount of myeloperoxidase added to the wells should fall within the range of the assay. When necessary, samples should be diluted with MPO Assay Buffer or concentrated with a centrifugal concentrator with a molecular weight cut-off of 30 kDa to bring the enzymatic activity to this level.

6. **Inhibitor Wells** - add 40 µl of MPO Assay Buffer, 10 µl of diluted MPO Inhibitor, and 10 µl of sample to two wells.

<table>
<thead>
<tr>
<th>Well Type</th>
<th>MPO Assay Buffer</th>
<th>Myeloperoxidase Assay Reagent (1.25 µg/ml)</th>
<th>Sample</th>
<th>MPO Inhibitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Control</td>
<td>50 µl</td>
<td>10 µl</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sample</td>
<td>50 µl</td>
<td>-</td>
<td>10 µl</td>
<td>-</td>
</tr>
<tr>
<td>Inhibitor</td>
<td>40 µl</td>
<td>-</td>
<td>10 µl</td>
<td>10 µl</td>
</tr>
</tbody>
</table>

**Table 3. Pipetting Summary**

7. Begin the reactions by quickly adding 50 µl of the Initiator Solution to the positive control, sample, and inhibitor wells.

8. Read the plate in a plate reader every 30 seconds for 15 minutes using an excitation wavelength of 530-540 nm and emission wavelength of 585-595 nm.

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**ANALYSIS**

**Calculations**

**Plot the Standard Curve**

1. Determine the average fluorescence of the standards. Subtract the fluorescence value of the standard A from itself and all other standards. This is the corrected fluorescence.

2. Plot the corrected fluorescence values (from step 1 above) of each standard as a function of the final concentration of resorufin from Table 1. See Figure 3, on page 16, for a typical standard curve.

**Determine MPO Activity**

1. Determine the average fluorescence of each sample and sample plus inhibitor.

2. Determine the change in fluorescence (RFU) per minute for the sample and sample plus inhibitor by:

   a. Plotting the fluorescence values as a function of time to obtain the slope (rate) of the linear portion of the curve. An example of human polymorphonuclear leukocyte MPO assayed with and without MPO inhibitor over time is shown in Figure 4, on page 17.

   OR

   b. Select two points on the linear portion of the curve and determine the change in fluorescence during that time using the following equation:

   
   \[
   \text{RFU/min} = \frac{\text{RFU (Time 2)} - \text{RFU (Time 1)}}{\text{Time 2 (min)} - \text{Time 1 (min)}}
   \]
3. Calculate the MPO activity using the equation below. One unit is defined as the amount of enzyme that will cause the formation of 1 nmol of fluorophore per minute at 25°C.

\[
\text{Myeloperoxidase Activity (nmol/min/ml)} = \frac{\text{Sample slope (RFU/min) - Inhibitor slope (RFU/min)}}{\text{Resorufin standard curve slope (RFU/µM)}} \times \text{Sample dilution}
\]

Sample Data:
The data shown here is an example of the data typically produced with this kit. Your results may vary, and therefore should not be directly compared to these samples.

Figure 3. Resorufin Standard Curve

\[
y = 4820x + 574 \\
r^2 = 0.999
\]

Figure 4. Human polymorphonuclear leukocyte MPO assayed with and without MPO inhibitor.
Performance Characteristics

Precision:
When a series of sixteen MPO measurements were performed on the same
day, the intra-assay coefficient of variation was 2.8%. When a series of sixteen
MPO measurements were performed on five different days under the same
experimental conditions, the inter-assay coefficient of variation was 3.12%.

Assay Range:
Under the standardized conditions of the assay described in this booklet, the
dynamic range of the kit is 0-10 µM of resorufin.

Interferences

The following reagents were tested in the assay for interference in the assay:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Will Interfere</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buffers</strong></td>
<td></td>
</tr>
<tr>
<td>Tris</td>
<td>No</td>
</tr>
<tr>
<td>HEPES</td>
<td>Yes</td>
</tr>
<tr>
<td>Phosphate</td>
<td>No</td>
</tr>
<tr>
<td><strong>Detergents</strong></td>
<td></td>
</tr>
<tr>
<td>Polysorbate 20 (0.1%)</td>
<td>Yes</td>
</tr>
<tr>
<td>Polysorbate 20 (1%)</td>
<td>Yes</td>
</tr>
<tr>
<td>Triton X-100 (0.1%)</td>
<td>Yes</td>
</tr>
<tr>
<td>Triton X-100 (1%)</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Protease Inhibitors/Chelators/Enzymes</strong></td>
<td></td>
</tr>
<tr>
<td>EDTA (1 mM)</td>
<td>No</td>
</tr>
<tr>
<td>EGTA (1 mM)</td>
<td>No</td>
</tr>
<tr>
<td>Trypsin (10 µg/ml)</td>
<td>No</td>
</tr>
<tr>
<td>PMSF (1 mM)</td>
<td>Yes</td>
</tr>
<tr>
<td>Leupeptin (10 µg/ml)</td>
<td>No</td>
</tr>
<tr>
<td>Antipain (10 µg/ml)</td>
<td>No</td>
</tr>
<tr>
<td>Chymostatin (10 µg/ml)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Solvents</strong></td>
<td></td>
</tr>
<tr>
<td>Ethanol (10 µl)</td>
<td>No</td>
</tr>
<tr>
<td>Methanol (10 µl)</td>
<td>No</td>
</tr>
<tr>
<td>Dimethylsulfoxide (10 µl)</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
</tr>
<tr>
<td>BSA (0.1%)</td>
<td>Yes</td>
</tr>
<tr>
<td>Glutathione (1 mM)</td>
<td>Yes</td>
</tr>
<tr>
<td>Glycerol (5%)</td>
<td>No</td>
</tr>
</tbody>
</table>
Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Recommended Solutions</th>
</tr>
</thead>
</table>
| Erratic values; dispersion of duplicates/triplicates | A. Poor pipetting/technique  
B. Bubble in the well(s) | A. Be careful not to splash the contents of the wells  
B. Carefully tap the side of the plate with your finger to remove bubbles |
| No fluorescence detected in the sample wells | Sample was too dilute | A. Re-assay the sample using a lower dilution  
B. Concentrate the sample with a centrifugal concentrator with a 30 kDa cut-off |
| The plate reader exhibited ‘MAX’ values for the wells | The gain setting is too high | A. Reduce the gain and re-read  
B. Make sure to establish the gain using the resorufin standards before assayng your samples |
| No inhibition was seen with the MPO inhibitor | A. MPO activity is too low to detect  
B. The sample does not contain MPO  
C. Sample contains something that is interfering with the assay | A. Re-assay the sample using a lower dilution  
B. Check the interference section for possible interfering reagents (see page 19) |

References

Warranty and Limitation of Remedy

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