PROSTAGLANDIN E₂ [¹²⁵I] RIA KIT

Description
The prostaglandin E₂ [¹²⁵I] assay system provides the quantitative determination of prostaglandin E₂ (PGE₂). PGE₂ can be assayed in the range 3.1-200 pg/tube. Each kit contains materials sufficient for 100 assay tubes, permitting the construction of one standard curve and assay of 23 unknowns in triplicate.

Introduction
Arachidonic acid, released from the cell wall by phospholipase A₂, is converted to prostaglandin endoperoxides on the effect of cyclooxygenase/endoperoxide synthase. Endoperoxides are then converted to a series of prostanoids including prostaglandin E₂ (PGE₂). PGE₂ plays an important role in various biological functions and in pathological processes. Because of this, there are efforts in research to obtain some correlation between PGE₂ concentration and the normal or pathological functions investigated.

PGE₂ has been detected in a variety of human tissues. Because of low concentration, its quantitation requires sensitive procedures. With the use of a high specific activity iodinated derivative of PGE₂ as tracer and rabbit anti-PGE₂ antiplasma as specific antibody, sensitive determination of PGE₂ in biological fluids can be achieved with high sample capacity.

 Principle of the method
This assay is based on the competition between unlabelled PGE₂ and a fixed quantity of ¹²⁵I-labelled PGE₂ for a limited number of binding sites on PGE₂ specific antibody. Allowing to react a fixed amount of tracer and antibody with different amounts of unlabelled ligand the amount of tracer bound by the antibody will be inversely proportional to the concentration of unlabelled ligand. Upon addition of magnetizable immunosorbent the antigen-antibody complex is bound on solid particles which are then separated by either magnetic sedimentation or centrifugation. Counting the radioactivity of solid phase enables a standard curve to be constructed and samples to be quantitated.
Contents of the kit

1 vial TRACER
0.3 ml per vial, containing about 75 kBq $[^{125}\text{I}]$TME in ethanolic solution

1 vial STANDARD, lyophilised,
containing 10 ng/ml PGE$_2$
in buffer with 0.01% thimerosal

1 vial ANTISERUM, lyophilised,
containing polyclonal PGE$_2$ antiserum (rabbit) in
buffer with 0.01% thimerosal.

1 bottle ASSAY BUFFER CONCENTRATE.
20 ml per bottle, containing 0.01% thimerosal.

1 bottle MAGNETIC IMMUNOSORBENT (MIS).
Ready to use.
55 ml per bottle, containing paramagnetic particles in buffer with 0.1% NaN$_3$.

Quality certificate.
Pack leaflet.

Materials and equipment required

Round bottom polystyrene or polypropylene assay tubes, about 12 x 75 mm
Plastic film to cover tubes
Precision pipettes (100 µl and 500 µl)
Vortex mixer
Magnetic separator, or, alternatively, centrifuge
Decanting racks
Gamma counter
Orbital shaker
Repeating pipettes

Preparation of reagents

TRACER
One vial of the tracer concentrate contains about 75 kBq of PGE$_2$-$[^{125}\text{I}]$TME in ethanolic solution and is stable for at least two month, if stored at -20°C. Dilute the tracer with 10 ml assay buffer prediluted with water from the assay buffer concentrate. The resulting solution contains about 75 kBq of the tracer in 50 mM phosphate buffer, pH 7.3, with 0.1% gelatin and 0.01% thimerosal. The diluted solution is stable until expiry date if stored at -20°C.

ANTISERUM
The antiserum was raised in rabbit against a bovine serum albumin conjugate of PGE$_2$. Stored at 2-8°C, the lyophilised antiserum is stable until expiry date.
Reconstitute the antiserum by adding 10 ml of distilled water with gentle mixing to avoid foaming. Make sure that the lyophilised material is in solution. After reconstitution, the solution contains PGE$_2$ antiserum of appropriate binding ability in 50 mM phosphate buffer, pH 7.3, with 0.1% gelatin and 0.01% thimerosal. This solution should be stored at 2-8 °C. Under these conditions the solution is stable until at least the date of expiry.

STANDARD
Reconstitute the lyophilised standard by adding exactly 1.0 ml distilled water. Make sure that the lyophilised material is in solution. The resulting solution contains 10 ng of PGEM per ml in 50 mM phosphate buffer, pH 7.3 with 0.1% gelatin and 0.01% thimerosal.
Stored at -20°C this stock solution is stable until the date of expiry.
An appropriate aliquot of the standard concentrate is used to prepare a series of standard dilutions according to the suggested dilution scheme shown later. Diluted standard solutions must not be stored.

ASSAY BUFFER CONCENTRATE
To prepare assay buffer for use in the assay system add 80 ml distilled water to the bottle after warming it to room temperature and mix thoroughly. The diluted assay buffer contains 50 mM phosphate buffer, pH 7.3 with 0.1% gelatin and 0.01% thimerosal. Stored at 2-8 °C diluted buffer is stable until the date of expiry.

MAGNETIC IMMUNOSORBENT
This reagent contains paramagnetic particles coated with anti-rabbit immunoglobulin suspended in 50 mM phosphate buffer, pH 7.3 with 0.1% sodium-azid and 0.05% Triton X-100. Stored at 4 °C, it is stable until expiry date.

Sample handling

A./Collection and storage

Because of "de novo" prostanoid synthesis brought about by tissue injury, a special care should be taken to inhibit artifactual production during collection. In addition, PGE₂ can be converted to PGA₂ as an artifact of sample handling. Pitfalls encountered with artifactual formation of prostanoids necessitate the sample handling being done under strictly controlled conditions. Blood samples should be collected in pre-chilled plastic or siliconized glass tubes containing anticoagulant and cyclooxygenase inhibitor. In our laboratories blood is drawn in polypropylene tube containing 10% (v/v) of 2% EDTA (pH 7.3) with 1mM indomethacin. At this concentration we have found no interference of indomethacin in the assay. The plasma is separated by centrifugation and assayed as soon as possible. If storage of plasma samples is necessary, -70°C or lower is recommended, since during a long-time storage at -20°C an increased PGE₂-like immunoreactivity was reported. Urine samples should be stored at -20°C after pooling the single samples collected from one patient. For tissue sample storage at -70°C or lower until assay is recommended.

B./Preparation of samples prior to assay

Plasma

Solid-phase extraction of human plasma
The low concentration of analyte on one hand and the non-specific interference with tracer binding obtained with unextracted plasma on the other, will necessitate extraction of plasma prior to assay. At our laboratories solid-phase extraction on Amprep C₂ (Amersham International plc) minicolumns has been applied successfully according to the following procedure.

1) Pretreat the minicolumn according to manufacturer's instruction.
2) Adidify plasma to pH 3 by the addition of 80 µl 2M citric acid and dilute with 4 volume of water, pH 3.
3) Apply dilute plasma to the column. Apply a slight positive pressure or suction to achieve appr. 0.5 ml/min flow rate.
4) Wash the column with 4 ml water and discard eluate.
5) Wash the column with 4 ml 15% ethanol and discard eluate.
6) Wash the column with 4 ml hexane or petroleum ether and discard eluate.
7) Wash with 4 ml ethyl-acetate and collect eluate in polypropylene tubes.
8) Dry the eluate at room temperature with gentle stream of nitrogen or with vacuum evaporation.
9) Reconstitute the dry residue with assay buffer.

This procedure usually results in a negligible loss of PGE\(_2\) with a recovery over 90%, as checked by \[^3\text{H}\]-PGE\(_2\) as recovery marker. In spite of high recovery expected, it is suggested that user follow extraction efficiency throughout procedure employed in his laboratory. To achieve this 1000 - 2000 cpm of \[^3\text{H}\]-PGE\(_2\) should be added to samples prior to extraction and procedure recovery is calculated from radioactivity measured from an aliquot of assay sample.

Solvent residues, impurities, as well as biological matrix itself may often introduce considerable degree of non-specific immunoreactivity. It is important that contribution of this non-specific interference to real PGE\(_2\) concentration be evaluated. To achieve this prostaglandin-free biological sample (to estimate matrix contribution) and/or buffer (to determine method-blank only) should be subjected to the procedure strictly identical to that used for unknowns. Concentration of unknowns should be corrected accordingly.

Urine

Urine contains high level of immunoreactive PGE\(_2\), generally regarded as being of renal origin. Its concentration is high enough to allow for such a dilution prior to assay that minimizes the interference of non-specific factors. At our laboratories urine is successfully assayed directly with dilutions up to 1:100.

Tissues

Tissue samples after homogenization and separation of aqueous phase can be extracted according to procedure outlined above for plasma. Because of difficulties encountered with determination of both recovery and matrix contribution, it remains the investigator's responsibility to validate his own procedure.

### Assay procedure

#### Day 1

1) Prepare reagents as described previously.
2) Equilibrate all reagents (except MIS) and samples to room temperature and mix before use.
3) Prepare dilution series of PGE\(_2\) working standards. Suggested dilution scheme to cover the range 3.1-200 pg/tube is shown in Table 1.
4) Label triplicate tubes according to Table 2. (Determinations can equally be performed using duplicates.)
5) Refer to Table 2. for steps 6-18.
6) Pipette 100 µl of assay buffer into tubes 4-9.
7) Pipette 100 µl of each diluted standard in triplicate (A through G into tubes 10-30).
8) Pipette 100 µl of each sample in triplicate into tubes 31-100.
9) Pipette 100 µl of assay buffer into all tubes except 1-3.
10) Pipette 100 µl of tracer solution into each tube.
11) Pipette 100 µl of assay buffer into tubes 4-6 (Non-specific binding).
12) Pipette 100 µl of antiserum into all tubes except 1-6. Be sure that tubes 4-100 contain an identical volume (400 µl).
13) Centrifuge all tubes fo 10-30 seconds at appr. 100 rpm. (Note: Vortexing is not suggested, since a considerable ratio of PGE\(_2\) tracer can stick to the wall of tubes above surface level of the incubation mixture).
14) Incubate tubes at 4°C overnight (16-20 hours).

<table>
<thead>
<tr>
<th>Tube</th>
<th>Volume of standard dilutions</th>
<th>Volume of buffer</th>
<th>Amount, pg/tube</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td></td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>800</td>
<td>200</td>
</tr>
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<td>----</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>A</td>
<td>200 of sol. s</td>
<td>800</td>
<td>200</td>
</tr>
<tr>
<td>B</td>
<td>500 of sol. A</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>C</td>
<td>500 of sol. B</td>
<td>500</td>
<td>50</td>
</tr>
<tr>
<td>D</td>
<td>500 of sol. C</td>
<td>500</td>
<td>25</td>
</tr>
<tr>
<td>E</td>
<td>500 of sol. D</td>
<td>500</td>
<td>12.5</td>
</tr>
<tr>
<td>F</td>
<td>500 of sol. E</td>
<td>500</td>
<td>6.2</td>
</tr>
<tr>
<td>G</td>
<td>500 of sol. F</td>
<td>500</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Notes: vial "s" is prepared by reconstituting the lyophilised standard with 1.0 ml distilled water
To prepare standard dilution and to dissolve or dilute assay buffer must be used.

Day 2

15) Place T tubes on a separate tube rack. Gently shake and swirl the bottle containing magnetic immunosorbent until homogeneity. Add 500 µl to each tube except T. When using a single pipette, swirl the bottle of MIS after every 15-20 tubes. With the use of a repeating pipette (e.g. Eppendorf), there is no need for repeated homogenisation of MIS reagent.

16) Thoroughly vortex mix all tubes and incubate them for 15 minutes at room temperature.

17) Separate the bound fraction by using one of the following procedures.

**Magnetic separation**

Attach the rack on to the magnetic separator base and ensure that every tube is in contact with the base plate. Let the MIS particles settle for 5 minutes. Do not remove the rack from the separator base after the separation of the solid and liquid phases. Pour off and discard the supernatant. Keeping the separator inverted, place the tubes on a pad of absorbent tissue and allow to drain for 2 minutes.

**Centrifugation**

Centrifuge all tubes for 15 minutes at 1500xg or greater. Aspirate the supernatant taking care to avoid disturbing the precipitate.

18) Count the radioactivity of all tubes preferably not less than 60 seconds.

19) Calculate the concentrations as described under *Calculation of results*.

<table>
<thead>
<tr>
<th>Table 2. Assay Protocol, Pipetting Guide (all volumes in microliters)</th>
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</thead>
<tbody>
<tr>
<td>Tubes</td>
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<tr>
<td>-------</td>
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<td></td>
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</tbody>
</table>
Sample | Buffer | Tracer | Buffer | Antiserum |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
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<td>100</td>
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<td>100</td>
</tr>
</tbody>
</table>

Centrifuge at 100 rpm for 10-30 seconds.
Incubate at 4°C overnight (16-20 hours)

Magnetic immunosorbent | Vortex mix | Incubate for 15 minutes at room temperature |
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>500</td>
<td></td>
<td></td>
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<tr>
<td>500</td>
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<td>500</td>
<td></td>
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</tr>
</tbody>
</table>

Incubate for 15 minutes at room temperature

Place the tubes on the magnetic separator for 5 minutes or centrifuge for 15 minutes at 1500xg

Decant the supernatant and blot the tubes

Count all tubes

Calculation of results

The calculation is illustrated using representative data. The assay data collected should be similar to those shown in Table 3. Calculate the average counts per minute (CPM) for each triplicate of assay tubes.

Calculate the percent $B_0/T$ for zero standard ($S_0$) by using the following equation: (See Note-1)

$$\% B_0/T = \frac{S_0 \text{ cpm} - \text{NSB cpm}}{T \text{ cpm} - \text{NSB cpm}} \times 100$$

Calculate the normalized percent binding for each standard, control and sample respectively by using the following equation: (See Note-2)

$$\% B/B_0 = \frac{S_{A-G} \text{ / sample cpm} - \text{NSB cpm}}{S_0 \text{ cpm} - \text{NSB cpm}} \times 100$$

Using semi-logarithmic graph paper plot $B/B_0\%$ for each standard versus the corresponding concentration of PGE$_2$. Figure 1 shows a typical standard curve. (See Note-2)

Determine the PGE$_2$ concentration of the unknown samples by interpolation from the standard curve. Do not extrapolate values beyond the standard curve range.

Notes on procedure

1) $B_0/T$ is an optional quality control parameter unnecessary for determination of sample concentrations. If this is ignored, one more sample can be measured instead of total count.

2) Calculation by computing data using logit-log or other fitting programs may also be applied but is not dealt with here.
<table>
<thead>
<tr>
<th>Tubes</th>
<th>Tube No</th>
<th>Count cpm</th>
<th>Average cpm</th>
<th>Average net cpm</th>
<th>B/B0 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1 2 3</td>
<td>24435 24511 24489</td>
<td>24478</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSB</td>
<td>4 5 6</td>
<td>1137 1071 1139</td>
<td>1115</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₀ 0 pg/tube</td>
<td>7 8 9</td>
<td>10269 10276 10322</td>
<td>10289 9173</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sₐ 3.1 pg/tube</td>
<td>10 11 12</td>
<td>8576 8691 8531</td>
<td>8599 7483 81.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sₖ 6.2 pg/tube</td>
<td>13 14 15</td>
<td>7565 7668 7646</td>
<td>7626 6510 70.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sₐ 12.5 pg/tube</td>
<td>16 17 18</td>
<td>6442 6312 6588</td>
<td>6447 5331 58.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sₐ 25 pg/tube</td>
<td>19 20 21</td>
<td>5538 5752 5431</td>
<td>5573 4458 48.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sₐ 50 pg/tube</td>
<td>22 23 24</td>
<td>4593 4638 4474</td>
<td>4568 3452 37.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sₐ 100 pg/tube</td>
<td>25 26 27</td>
<td>3700 3650 3642</td>
<td>3664 2548 27.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sₐ 200 pg/tube</td>
<td>28 29 30</td>
<td>2854 2896 2791</td>
<td>2847 1731 18.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1.
A typical standard curve
(Do not use to calculate sample values)
Characterization of the assay

Assay parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSB/T</td>
<td>&lt; 6%</td>
</tr>
<tr>
<td>B0/T</td>
<td>41.51 ± 5.57%</td>
</tr>
<tr>
<td>ED-50</td>
<td>21.85 ± 3.78 pg/tube</td>
</tr>
</tbody>
</table>

Specificity

Cross reactivity was defined in per cent by weight at the 50% displacement level.

- Prostaglandin E\(_2\) 100.0 %
- Thromboxane B\(_2\) < 0.01 %
- 6-keto-PGF\(_{1\alpha}\) 0.04 %
- Prostaglandin F\(_{2\alpha}\) 2.0 %
- Prostaglandin D\(_2\) 0.14 %
- Prostaglandin A\(_2\) 0.4 %
- Prostaglandin B\(_2\) 0.02 %
- Prostaglandin E\(_1\) 100.0 %
- Prostaglandin E\(_{1\alpha}\) 1.4 %
- 15-keto-PGE\(_2\) 0.14 %
- 13,14-dihydro-15-keto-PGE\(_2\) < 0.01 %
- 13,14-dihydro-15-keto-PGF\(_2\) 0.05 %
- 13,14-dihydro-15-keto-PGD\(_2\) < 0.01 %
- 13,14-dihydro-15-keto-PGA\(_2\) < 0.01 %
- 13,14-dihydro-6,15-diketo-PGF\(_{2\alpha}\) < 0.01 %
- 6-keto-PGE\(_1\) 1.6 %
- 11-dehydro-TXB\(_2\) 0.04 %
- 2,3-dinor-TXB\(_2\) 0.04 %
- 2,3-dinor-6-keto-PGF\(_{1\alpha}\) 0.05 %
- 11-epi-PGF\(_{2\alpha}\) < 0.01 %
- o-hydroxy-hippuric acid+ < 0.01 %
- + main urinary metabolite of acetyl-salicylic acid

Reproducibility of the assay

Plasma

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean</th>
<th>% CVintra</th>
<th>% CVinter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1179</td>
<td>4.36</td>
<td>16.5</td>
</tr>
<tr>
<td>B</td>
<td>2953</td>
<td>3.78</td>
<td>11.1</td>
</tr>
<tr>
<td>C</td>
<td>2889</td>
<td>5.74</td>
<td>3.2</td>
</tr>
<tr>
<td>D</td>
<td>5382</td>
<td>3.63</td>
<td>9.4</td>
</tr>
<tr>
<td>E</td>
<td>2650</td>
<td>5.37</td>
<td>8.9</td>
</tr>
</tbody>
</table>

Table IV.
Reproducibility obtained with plasma sample after solid-phase extraction.
5 samples were measured in 5 separate assays with triplicates. Mean values in pg/ml are indicated.

Urine

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean</th>
<th>% CVintra</th>
<th>% CVinter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>979</td>
<td>3.43</td>
<td>12.0</td>
</tr>
<tr>
<td>B</td>
<td>4565</td>
<td>4.20</td>
<td>8.0</td>
</tr>
<tr>
<td>C</td>
<td>1162</td>
<td>3.26</td>
<td>9.0</td>
</tr>
<tr>
<td>D</td>
<td>1022</td>
<td>3.87</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Table V.
Reproducibility obtained with unextracted urine.
4 samples were measured in 5 separate assays with triplicates. Mean values in pg/ml are indicated.
Recovery of standard materia

Figure 2.

Recovery of known amount of PGE_2 with direct assay of human urine.

Samples were spiked with different amounts of PGE_2 and assayed in 1-10 dilution. For measured (y) vs added (x) amount y = 1.053x + 9.185 regression line with an highly significant correlation (correlation coefficient 0.9992) was obtained. Standard curve set-up with prostaglandin-free urine as matrix was used.

Linearity with dilution

Figure 3.

Linearity of dilution of plasma samples after extraction. Plasma sample spiked with PGE_2 was extracted according to suggested method on Amprep C_2 and assayed at a number of dilutions.
Sample values

<table>
<thead>
<tr>
<th>Sample</th>
<th>Direct</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>SD</td>
</tr>
<tr>
<td>A</td>
<td>978</td>
<td>117</td>
</tr>
<tr>
<td>B</td>
<td>4565</td>
<td>367</td>
</tr>
<tr>
<td>C</td>
<td>1162</td>
<td>105</td>
</tr>
<tr>
<td>D</td>
<td>1022</td>
<td>100</td>
</tr>
</tbody>
</table>

Table VI.
Comparison of PGE$_2$ concentrations of human urine measured with and without extraction.
4 samples were measured in 5 separate assays with triplicates. Extraction was carried out on Amprep C$_2$ according to suggested method.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Amprep C$_2$</th>
<th>Sep-Pak C$_{18}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>2953</td>
<td>2889</td>
</tr>
<tr>
<td>SD</td>
<td>329</td>
<td>94</td>
</tr>
</tbody>
</table>

Table VII.
Comparison of solid-phase materials.
Aliquots of the same plasma sample were extracted on different column materials and assayed in 5 separate assays with triplicates. Concentrations in pg/ml are indicated.

Evaluation of immunoreactive purity by immunochromatography

Figure 4.
Immunoreactivity profiles obtained with urine and plasma after solid-phase extraction.
Pooled human plasma and normal 24-hours urine of healthy male volunteer, both containing tritiated PGE$_2$ were subjected to solid-phase extraction on Amprep C$_2$ and the extracts separated on Kieselgel-60 silica plate using ethyl-acetate: acetic acid:iso-octane:water (110:20:50:100,v/v/v/v, upper phase) as solvent system. Fractions were eluted and measured in PGE$_2$ assay. Homogenous immunoreactivity, co-migrating with tritiated PGE$_2$ in both urine (open bars) and plasma (solid bars), was obtained.
Additional information

Storage
Store this kit between 2 and 8°C.

Availability
From stock.

Shelf life
The shelf life of kit reagents is 8 weeks from the date of manufacturing. The actual expiry date is given on package label and in the quality certificate. Components from various lots or from kits of different manufacturers should not be mixed or interchanged.

Precautions and warnings

This kit should only be used for research purposes.

Radioactivity
This kit contains radioactive material. Receipt, acquisition, possession, or use of radioactive materials are subject to regulations, and a licence of (inter)national authorizing bodies. It is the responsibility of the user to ensure that local regulations or codes of practice are satisfied.

Chemical and other hazard
Magnetic immunosorbent contains sodium azide (0.1% w/v) as an Antimicrobial Agent. Dispose the waste by flushing it with copious amounts of water to avoid build up of explosive metallic azides in copper and lead plumbing. The total azide present in each pack is 55 mg.

Related products

Radioimmunoassay systems
Prostaglandin F_{2α}[^{125}I] RIA kit RK-15M
6-keto-PGF_{1α}/2,3-dinor-6-keto-PGF_{1α}[^{125}I] RIA kit RK-16M
Thromboxane B_{2}/2,3-dinor-TXB_{2}[^{125}I] RIA kit RK-17M
Bicyclo-prostaglandin E_{2}[^{125}I] RIA kit RK-28
13,14-Dihydro-15-keto-PGF_{2α}[^{125}I] RIA kit RK-29
11-Dehydrothromboxane B_{2}[^{125}I] RIA kit RK-67M
Prostaglandin F_{2α}[^{3}H] RIA kit HTK-2
Prostaglandin D_{2}[^{3}H] RIA kit HTK-3