

**Rat Pregnane X Receptor
(nr1i2, PXR, SXR)
Reporter Assay System**

96-well Format Assays
Product # R07001

▪

Technical Manual
(version 7.2i)

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Rat PXR Reporter Assay System 96-well Format Assays

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I. Description

▪ The Assay System ▪

This assay system utilizes proprietary human cells engineered to provide constitutive, high-level expression of the **Rat Pregnane X Receptor** (nr1i2), a ligand-dependent transcription factor commonly referred to as **PXR**. PXR is also known as the Steroid and Xenobiotic sensing nuclear Receptor (**SXR**).

INDIGO's Reporter Cells express a hybrid form of the rat PXR. The N-terminal sequence encoding the PXR DNA binding domain (DBD) has been substituted with that of the yeast GAL4-DBD. The native PXR ligand binding domain (LBD) and other C-terminal domains remain intact and functional. Ligand interaction activates the receptor, causing it to bind to the GAL4 DNA binding sequence, which is functionally linked to a resident luciferase reporter gene. Thus, quantifying changes in luciferase activity in the treated reporter cells provides a sensitive surrogate measure of the changes in PXR activity. The principal application of this assay kit is in the screening of test samples to quantify any functional activity, either agonist or antagonist, that they may exert against rat PXR.

PXR Reporter Cells are prepared using INDIGO's proprietary **CryoMite™** process. This cryo-preservation method yields exceptional cell viability post-thaw, and provides the convenience of immediately dispensing healthy, division-competent reporter cells into assay plates. There is no need for cumbersome intermediate treatment steps such as spin-and-rinse of cells or viability determinations prior to assay setup.

INDIGO's Nuclear Receptor Assays are all-inclusive cell-based assay systems. In addition to PXR Reporter Cells, this kit provides two optimized media for use during cell culture and in diluting the user's test samples, a reference agonist, Luciferase Detection Reagent, and a cell culture-ready assay plate.

▪ The Assay Chemistry ▪

INDIGO's nuclear receptor assay kits capitalize on the extremely low background, high-sensitivity, and broad linear dynamic range of bio-luminescence reporter gene technology.

Reporter Cells incorporate the cDNA encoding beetle luciferase, a 62 kD protein originating from the North American firefly (*Photinus pyralis*). Luciferase catalyzes the mono-oxidation of D-luciferin in a Mg⁺²-dependent reaction that consumes O₂ and ATP as co-substrates, and yields as products oxyluciferin, AMP, PP_i, CO₂, and photon emission. Luminescence intensity of the reaction is quantified using a luminometer, and is reported in terms of Relative Light Units (RLU's).

INDIGO's Nuclear Receptor Assay kits feature a luciferase detection reagent specially formulated to provide stable light emission between 5 and 90+ minutes after initiating the luciferase reaction. Incorporating a 5 minute reaction-rest period ensures that light emission profiles attain maximal stability, thereby allowing assay plates to be processed in batch. By doing so, the signal output from all sample wells, from one plate to the next, may be directly compared within an experimental set.

▪ **Preparation of Test Compounds** ▪

Test compounds are typically solvated at high-concentration in DMSO and stored frozen as master stocks. Immediately prior to setting up an assay, the master stocks are serially diluted using **Compound Screening Medium (CSM)** as described in *Step 7* to achieve the desired assay concentrations. Do not use DMSO to further dilute test compound solutions. This method of dilution avoids the significant adverse effects of introducing high concentrations of DMSO into the assay. The final concentration of total DMSO carried over into assay reactions should *never* exceed 0.4%.

NOTE: CSM is formulated to help stabilize hydrophobic test compounds in the aqueous environment of the assay mixture. Nonetheless, high concentrations of extremely hydrophobic test compounds diluted in CSM may lack long-term stability and/or solubility, especially if further stored at low temperatures. Hence, it is recommended that test compound dilutions are prepared in CSM immediately prior to assay setup, and are considered to be 'single-use' reagents

▪ **Considerations for Automated Dispensing** ▪

When processing a small number of assay plates, first carefully consider the dead volume requirement of your dispensing instrument before committing assay reagents to its setup. In essence, "dead volume" is the volume of reagent that is dedicated to the instrument; it will *not* be available for final dispensing into assay wells. The following Table provides information on reagent volume requirements, and available excesses.

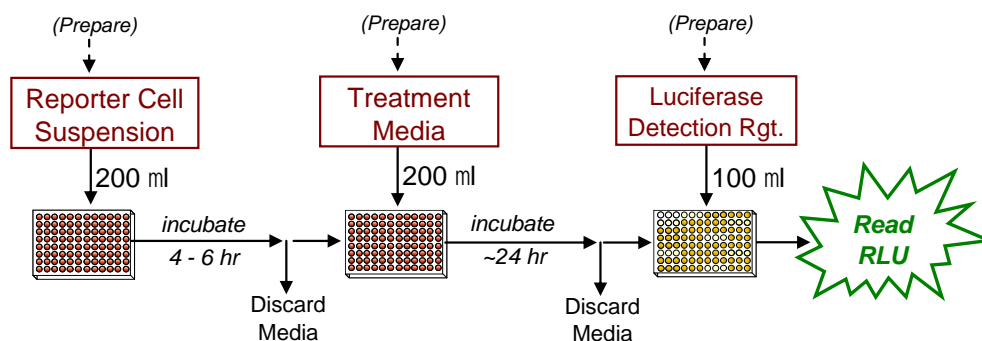
| Stock Reagent & Volume provided | Volume to be Dispensed (96-well plate) | Excess rgt. volume available for instrument dead volume |
|---|---|--|
| Reporter Cell Suspension 21 ml <i>(prepared from kit components)</i> | 200 µl / well 19.2 ml / plate | ~ 1.8 ml |
| LDR 12 ml <i>(prepared from kit components)</i> | 100 µl / well 9.6 ml / plate | ~ 2.4 ml |

▪ **Assay Scheme** ▪

Figure 1. Assay workflow.

NOTE: This PXR assay protocol includes Day 1 steps and dispensed volumes that differ from the historical protocol that some users may be accustomed to; please review the assay workflow, below.

In brief, 200 µl of Reporter Cells is dispensed into wells of the assay plate and pre-incubated for 4-6 hours. Following the pre-incubation period, culture media are discarded and 200 µl/well of the prepared 1x-concentration treatment media are added. Following 22-24 hr incubation, treatment media are discarded and Luciferase Detection Reagent is added. The intensity of light emission (in units of 'Relative Light Units'; RLU) from each assay well is quantified using a plate-reading luminometer.



▪ Assay Performance ▪

Rat PXR (nr1i2) Agonist Assays

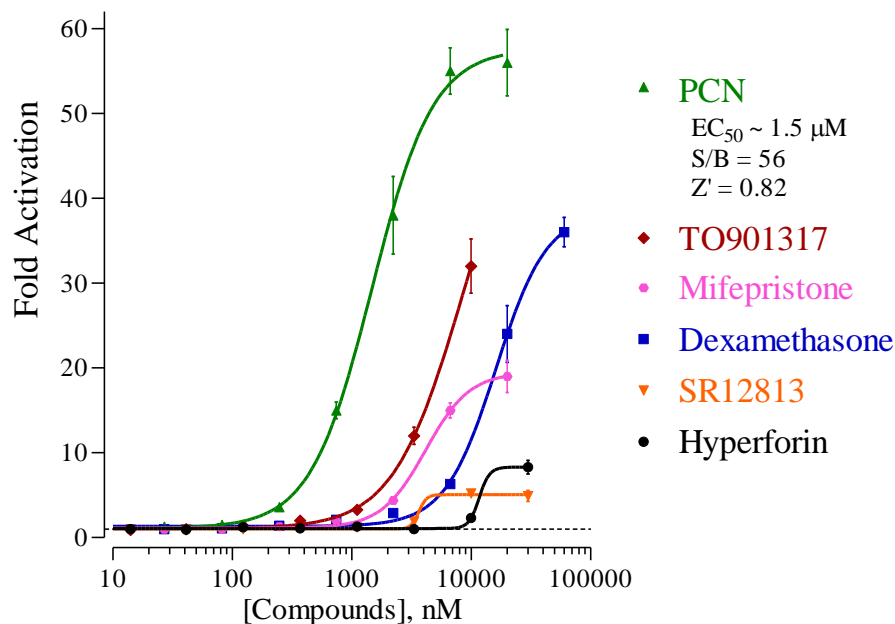


Figure 2. Agonist dose-response analyses of Rat PXR.

Performance of the rat PXR assay using the reference agonists Pregnenolone-16 α -carbonitrile (PCN; provided), hyperforin dicyclohexylammonium (Enzo Life Sciences), SR12813 (Tocris), mifepristone, dexamethasone, and TO901317 (Cayman Chemical). Luminescence was quantified using a GloMax-Multi+ luminometer (Promega). Average relative light units (RLU) and corresponding standard deviation (SD) values were determined for each treatment concentration ($n \geq 6$). Fold-activation and Z' values were calculated as described by Zhang, *et al.* (1999)¹. Non-linear regression and EC_{50} analyses were performed using GraphPad Prism software. High Z' scores confirm the robust performance of this assay.

¹ Zhang JH, Chung TD, Oldenburg KR. (1999) A Simple Statistical Parameter for Use in Evaluation and Validation of High Throughput Screening Assays. *J Biomol Screen.*:4(2), 67-73.

$$Z' = 1 - [3 * (SD^{\text{Control}} + SD^{\text{Background}}) / (RLU^{\text{Control}} - RLU^{\text{Background}})]$$

II. Product Components & Storage Conditions

This Rat PXR Assay kit contains materials to perform assays in a single collagen-coated 96-well assay plate.

The aliquot of PXR Reporter Cells is provided as a single-use reagent. Once thawed, reporter cells can NOT be refrozen or maintained in extended culture with any hope of retaining downstream assay performance. Therefore, extra volumes of these reagents should be discarded after assay setup.

Assay kits are shipped on dry ice. Upon receipt, individual kit components may be stored at the temperatures indicated on their respective labels. Alternatively, the entire kit may be further stored at -80°C.

To ensure maximal viability, "Reporter Cells" must be maintained at -80°C until immediately prior to use.

The date of product expiration is printed on the Product Qualification Insert (PQI) enclosed with each kit.

| <u>Kit Components</u> | <u>Amount</u> | <u>Storage Temp.</u> |
|--|----------------|----------------------|
| ▪ Rat PXR Reporter Cells | 1 x 2.0 mL | -80°C |
| ▪ Cell Recovery Medium (CRM) | 2 x 10.5 mL | -20°C |
| ▪ Compound Screening Medium (CSM) | 1 x 45 mL | -20°C |
| ▪ Pregnenolone-16 α -carbonitrile (PCN), 30 mM (in DMSO; reference agonist) | 1 x 30 μ L | -20°C |
| ▪ Detection Substrate | 1 x 6.0 mL | -80°C |
| ▪ Detection Buffer | 1 x 6.0 mL | -20°C |
| ▪ 96-well, <i>collagen-coated</i> assay plate white, sterile, cell-culture ready) | 1 | -20°C |

NOTE: This Assay kit contains one 96-well assay plate in which the assay wells have been collagen-coated and dried; the assay plate should be stored frozen (-20°C or colder) until use.

III. Materials to be Supplied by the User

The following materials must be provided by the user, and should be made ready prior to initiating the assay procedure:

DAY 1

- cell culture-rated laminar flow hood.
- 37°C, humidified 5% CO₂ incubator for mammalian cell culture.
- 37°C water bath.
- 70% alcohol wipes
- 8- or 12-channel electronic, repeat-dispensing pipettes & sterile tips
- disposable media basins, sterile.
- sterile multi-channel media basins (such as the Heathrow Scientific "Dual-Function Solution Basin"), or deep-well plates, or appropriate similar vessel for generating dilution series of reference compound(s) and test compound(s).
- *Optional:* antagonist reference compound.
- *Optional:* clear 96-well assay plate, sterile, cell culture treated, for viewing cells on Day 2.

DAY 2 plate-reading luminometer.

IV. Assay Protocol

Review the entire Assay Protocol before starting. Completing the assay requires an overnight incubation. *Steps 1-11* are performed on **Day 1**, requiring less than 2 hours of bench work and a 4 hr incubation step to complete. *Steps 12-17* are performed on **Day 2**, and require less than 1 hour to complete.

▪ A word about Antagonist-mode assay setup ▪

Receptor inhibition assays expose the Reporter Cells to a constant, sub-maximal concentration (typically between EC₅₀ – EC₈₅) of a known agonist AND the test compound(s) to be evaluated for antagonist activity. This rat PXR Assay kit includes a 30 mM stock solution of **Pregnenolone-16 α -carbonitrile (PCN)**, an agonist of rat PXR that may be used to setup antagonist-mode assays. 3 μ M PCN typically approximates EC₇₀₋₈₀ in this cell-based assay. Hence, it presents a reasonable assay concentration of agonist to be used when screening test compounds for inhibitory activity.

Add the challenge agonist PCN to a bulk volume of **CSM** at an EC₅₀ – EC₈₅ concentration. This medium is then used to prepare serial dilutions of test compounds to achieve the desired respective final assay concentrations. This is an efficient and precise method of setting up PXR antagonist assays, and it is the method presented in *Step 7b* of this protocol.

DAY 1 Assay Protocol: All steps must be performed using aseptic technique.

1.) Remove the **2 tubes** of **Cell Recovery Medium (CRM)** from freezer storage, thaw and equilibrate to 37°C using a water bath.

2.) Rapid Thaw of the Reporter Cells: *First*, retrieve the two tubes of **CRM** from the 37°C water bath and sanitize their outside surfaces with a 70% ethanol swab.

Second, retrieve the tube of **Reporter Cells** from -80°C storage and, *without delay*, perform a rapid thaw of the frozen cells by transferring 9.5 ml from *each of the 2 tubes* of 37°C CRM into the tube of frozen cells. Place the tube of Reporter Cells in a 37°C water bath for 5 - 10 minutes. The resulting volume of cell suspension will be **21 ml**.

3.) Retrieve the tube of Reporter Cell Suspension from the water bath and sanitize the outside surface with a 70% alcohol swab.

4.) Gently invert the tube of Reporter Cells several times to disperse cell aggregates and gain a homogenous cell suspension. Transfer the cell suspension into a reservoir. Using an 8-channel pipette, dispense **200 μ l / well** of cell suspension into the assay plate.

NOTE 4.1: Increased well-to-well variation (= increased standard deviation!) *will occur* if care is not taken to prevent cells from settling during the dispensing period. Likewise, take care to dispense uniform volumes across the assay plate.

NOTE 4.2: Users sometimes wish to examine the reporter cells using a microscope. If so, the extra volume of cell suspension provided with each kit may be dispensed into a clear 96-well cell culture treated assay plate. Continue to process the assay plate in identical manner to the white assay plate.

5.) Pre-incubate reporter cells: Place the assay plate into a 37°C, \geq 85% humidity, 5% CO₂ incubator for 4 - 6 hours.

Near the end of the 4-6 hour pre-incubation period:

6.) Remove **Compound Screening Medium (CSM)** from freezer storage and thaw in a 37°C water bath.

7.) **Prepare the Test Compound and Reference Compound treatment media at the desired final assay concentrations:** Use **CSM** to prepare an appropriate dilution series of the reference and test compound stocks. Prepare all treatment media at the desired final assay concentrations. In *Step 9*, the prepared treatment media will be dispensed at 200 µl / well into the assay plate. Manage dilution volumes carefully; this assay kit provides **45 ml** of CSM.

NOTE: Total DMSO carried over into assay reactions should never exceed 0.4%.

a. **Agonist-mode assays.** This PXR Assay kit includes a 30 mM stock solution of **Pregnenolone-16 α -carbonitrile (PCN)**, a low-potency reference agonist of rat PXR. We find that the following 7-point treatment series, prepared in serial 3-fold decrements, provides a suitable dose-response: 30.0, 10.0, 3.33, 1.11, 0.370, 0.123 and 0.0412 µM and including a 'no treatment' control. **APPENDIX 1** provides an example for generating such a dilution series.

~ or ~

b. **Antagonist-mode assays.** When setting antagonist assays, first supplement a bulk volume of CSM with the challenge agonist (PCN) to achieve the desired final assay-concentration (refer to "*A word about antagonist-mode assay setup*", pg. 7). The agonist-supplemented CSM is then used to generate dilutions of test compound stocks to achieve their final assay concentrations.

8.) At the end of the cell pre-incubation period, **discard the culture media** by ejecting it into an appropriate waste container. *Gently* tap the inverted plate onto a clean absorbent paper towel to remove residual droplets. Cells will remain tightly adhered to well bottoms.

9.) Dispense **200 µl** of each treatment media into appropriate wells of the assay plate.

10.) Transfer the assay plate into a 37°C, humidified 5% CO₂ incubator for 22 - 24 hours.

NOTE: Ensure a high-humidity ($\geq 85\%$) environment within the cell culture incubator. This is critical to prevent the onset of deleterious "edge-effects" in the assay plate.

11.) For greater convenience on Day 2, retrieve **Detection Substrate and Detection Buffer** from freezer storage and place them in a dark refrigerator (4°C) to thaw overnight.

DAY 2 Assay Protocol: Subsequent manipulations do *not* require special regard for aseptic technique, and may be performed on a bench top.

12.) 30 minutes before intending to quantify receptor activity, remove **Detection Substrate** and **Detection Buffer** from the refrigerator and place them in a low-light area so that they may equilibrate to room temperature. Once at room temperature, gently invert each tube several times to ensure homogenous solutions.

NOTE: Do NOT actively warm Detection Substrate above room temperature. If these solutions were not allowed to thaw overnight at 4°C, a room temperature water bath may be used to expedite thawing.

13.) Set the plate-reader to "luminescence" mode. Set the instrument to perform a single 5 second "plate shake" prior to reading the first assay well. Read time may be set to 0.5 second (500 mSec) per well, *or less*.

14.) *Immediately before proceeding to Step 15*, transfer the entire volume of Detection Buffer into the vial of Detection Substrate, thereby generating a 12 ml volume of **Luciferase Detection Reagent (LDR)**. Mix gently to avoid foaming.

15.) Following 22 - 24 hours' incubation in treatment media, discard the media contents by ejecting it into an appropriate waste container. *Gently* tap the inverted plate onto a clean absorbent paper towel to remove residual droplets. Cells will remain tightly adhered to well bottoms.

16.) Add 100 µl of **LDR** to each well of the assay plate. Allow the assay plate to rest at room temperature for at least 5 minutes following the addition of LDR. Do not shake the assay plate during this period.

17.) Quantify luminescence.

V. Related Products

| Human PXR Assay Kit Products | |
|---|--|
| <i>Product No.</i> | <i>Product Descriptions</i> |
| IB07001-32 | 3x 32 Human PXR assays; strip-wells in 96-well plate frame |
| IB07001 | 1x 96-well format Human PXR assays |
| IB07002 | 1x 384-well format Human PXR assays |
| Rat PXR Assay Kit Products | |
| R07001-32 | 3x 32 Rat PXR assays; strip-wells in 96-well plate frame |
| R07001 | 1x 96-well format Rat PXR assays |
| Mouse PXR Assay Kit Products | |
| M07001-32 | 3x 32 Mouse PXR assays; strip-wells in 96-well plate frame |
| M07001 | 1x 96-well format Mouse PXR assays |
| Dog PXR Assay Kit Products | |
| D07001-32 | 3x 32 Dog PXR assays; strip-wells in 96-well plate frame |
| D07001 | 1x 96-well format Dog PXR assays |
| Cynomolgus Monkey PXR Assay Kit Products | |
| C07001-32 | 3x 32 Cyn Monkey PXR assays; strip-wells in 96-well plate frame |
| C07001 | 1x 96-well format Cyn Monkey PXR assays |
| LIVE Cell Multiplex (LCM) Assay Products | |
| <i>Product No.</i> | <i>Product Descriptions</i> |
| LCM-01 | Reagents to perform 96 Live Cell Assays in 1x96-well, or 2x48-well, or 3x32-well assay plate formats |
| LCM-05 | Reagents in 5x-bulk volume to perform 480 Live Cell Assays in any combination of 1x96-, 2x48-, or 3x32-well assay plate formats |
| LCM-10 | Reagent in 10x-bulk volume to perform 960 Live Cell Assays in any combination of 1x96-, 2x48-, or 3x32-well assay plate formats |

Please refer to INDIGO Biosciences website for updated product offerings.

www.indigobiosciences.com

VI. Limited Use Disclosures

The method of recombinant expression of the steroid and xenobiotic sensing nuclear receptor (SXR) is the subject of U.S. Patent 6,756,491. INDIGO Biosciences, Inc. has entered into a sub-license agreement with Puracyp, Inc. (Carlsbad, CA) conferring the right to utilize SXR / PXR sequences to independently develop assay kit products and services.

Products commercialized by INDIGO Biosciences, Inc. are for RESEARCH PURPOSES ONLY – not for therapeutic or diagnostic use in humans.

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APPENDIX 1

Example scheme for the serial dilution of PCN reference agonist, and the setup of a rat PXR dose-response assay.

