

## human Cannabinoid CB1 Valiscreen Cell Line

Product No.: ES-110-C

Lot No.: 2996830

### Material Provided

Cells:	2 x 1 mL frozen aliquot (ES-110-CV-Clone C2 Lot No.: 2431783) 2 x 1 mL frozen aliquot (ES-110-CV-Clone C3 Lot No.: 2130614)
Format:	~2.5 x 10 <sup>6</sup> cells /mL in freezing medium

### Product Information

Cellular Background:	CHO-K1
Cell Line Development:	Our proprietary bicistronic expression plasmid containing the sequence coding for the human Cannabinoid CB <sub>1</sub> receptor was transfected in CHO-K1 cells. Geneticin-resistant clones were obtained by limit dilution and compared for receptor expression levels by radioligand binding assay. A clone with the highest receptor expression level (clone C3) and another with a lower receptor expression (clone C2) were selected for characterization in binding and functional assays.
DNA Sequence:	Identical to coding sequence of GenBank NM_001160260.1
Corresponding Protein Sequence:	Identical to GenBank P21554.1
Receptor expression level (B <sub>max</sub> ):	Clone C2: undetectable, using [ <sup>3</sup> H]SR141716A Clone C3: 57 pmol/mg protein, using [ <sup>3</sup> H]SR141716A
K <sub>d</sub> for the above radioligand:	Clone C2: undetectable Clone C3: 1.1 nM
Shipping Conditions:	Shipped on dry ice. Please ensure dry ice is still present in the package upon receipt or contact customer support.
Storage Conditions:	Store in liquid nitrogen (vapor phase) immediately upon receipt.



## Quality Control

Clone C2: The EC<sub>50</sub> for a reference agonist was determined in LANCE® *Ultra* cAMP assay performed on EnVision®. A mycoplasma test was performed using MycoAlert® (Lonza) mycoplasma detection kit. We certify that these results meet our quality release criteria.

Clone C3: The EC<sub>50</sub> for a reference agonist was determined in GTPγS assay. A mycoplasma test was performed using MycoAlert® (Lonza) mycoplasma detection kit. We certify that these results meet our quality release criteria.

C2: (R)-(+)-WIN 55,212-2 (EC<sub>50</sub>): 73 nM

C3: (R)-(+)-WIN 55,212-2 (EC<sub>50</sub>): 41 nM

Stability: Cells were kept in continuous culture for at least 60 days and showed no decrease in receptor expression level in a saturation binding assay for clone C3 (stable B<sub>max</sub> and K<sub>d</sub>). C2: N/A.

Mycoplasma: These cell lines tested negative for mycoplasma.

## Assay Procedures

We have shown for many of our GPCR cell lines that freshly thawed cells respond with the same pharmacology as cultured cells. All of our products validated in this way are available as frozen ready-to-use cells in our catalogue. This demonstrates that cells can be prepared and frozen in advance of a screening campaign simplifying assay logistics.



## Recommended Cell Culture Conditions (CHO-K1)

- The recommended media catalogue number and supplier reference information are listed in this Product Technical Data Sheet (last page). Media composition is specifically defined for each cell type and receptor expression selection. The use of incorrect media or component substitutions can lead to reduced cell viability, growth issues and/or altered receptor expression.
- Cells undergo major stress upon thawing, and need to adapt to their new environment which may initially affect cell adherence and growth rates. The initial recovery of the cells, and initial doubling time, will vary from laboratory to laboratory, reflecting differences in the origin of culture media and serum, and differences in methodology used within each laboratory.
- For the initial period of cell growth (i.e. until cells have reached Log-phase, typically 4-10 days), we strongly recommend removal of the antibiotics (G418, Zeocin™, Puromycin, Blastidicin, Hygromycin, Penicillin and Streptomycin) from the culture media. Immediately after thawing, cells may be more permeable to antibiotics, and a higher intracellular antibiotic concentration may result as a consequence. Antibiotics should be re-introduced when cells have recovered from the thawing stress.

Growth Medium: Ham's F-12, 10% FBS, 0.4 mg/mL G418 (receptor expression selection)  
Freezing Medium: Ham's F-12, 10% FBS with 10% DMSO, without selection agents.

Thawing Cells: Using appropriate personal protective equipment, rapidly place the frozen aliquot in a 37°C water bath (do not submerge) and agitate until its content is thawed completely. Immediately remove from water bath, spray aliquot with 70% ethanol and wipe excess. Under aseptic conditions using a sterile pipette, transfer content to a sterile centrifuge tube containing 10 mL growth medium without antibiotics, pre-warmed at 37°C, and centrifuge (150 x g, 5 min). Discard supernatant using a sterile pipette. Resuspend cell pellet in 10 mL of pre-warmed growth medium without antibiotics by pipetting up and down to break up any clumps, and transfer to an appropriate culture flask (e.g. T-25, T-75 or T-175, see recommended seeding density below). Cells are cultured as a monolayer at 37°C in a humidified atmosphere with 5% CO<sub>2</sub>.

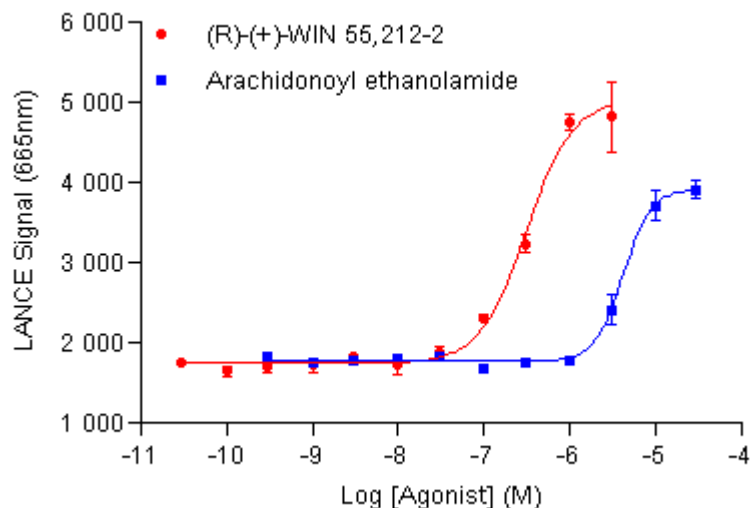
Recommended Seeding Density: Thawing: 15,000 – 33,000 cells/cm<sup>2</sup>  
Log-phase: 11,000 – 15,000 cells/cm<sup>2</sup>

Troubleshooting: Initial doubling time can vary between 18 and 96 hours (Average = 25 hours). If cells are still not adhering after 48 hours or grow very slowly, we recommend maintaining the cells in culture and not replacing the media before 5-6 days (cells secrete factors that can help with adherence and growth). If confluence is still <50% after 5-6 days, it is recommended that you replace the media with fresh media (without antibiotics). Do not passage the cells until they reach 80-90% confluence (Log-phase). If cells have not recovered after 10-12 days, please contact our Technical Support.

Culture Protocol: Under aseptic conditions, cells are grown to 80% confluence (Log-phase) and trypsinized (0.05% trypsin / 0.5 mM EDTA in calcium and magnesium-free PBS). See recommended seeding density for Log-phase above.

Banking Protocol: Cells are grown to 70-80% confluence (Log-phase). Under aseptic conditions, remove medium and rinse the flask with an appropriate volume of calcium and magnesium-free PBS (example 10 mL for T-175). Trypsinize (0.05% trypsin / 0.5 mM EDTA in calcium and magnesium-free PBS) to detach cells (example 5 mL for T-175), let stand 5-10 min at 37°C. Add fresh, room temperature growth medium (without antibiotics) to stop trypsinization and dilute EDTA (example 10 mL for T-175). Transfer cells to a sterile centrifuge tube and centrifuge (150 x g, 5 min). Discard supernatant using a sterile pipette. Resuspend cell pellet in ice-cold freezing medium by pipetting up and down to break up any clumps. Count cells and rapidly aliquot at the selected cell density (e.g. 2.5 x 10<sup>6</sup> cells/mL) in sterile polypropylene cryovials. Use appropriate material to ensure slow cooling (about -1°C/min) until -70°C. Transfer vials into a liquid nitrogen tank (vapor phase) for storage.

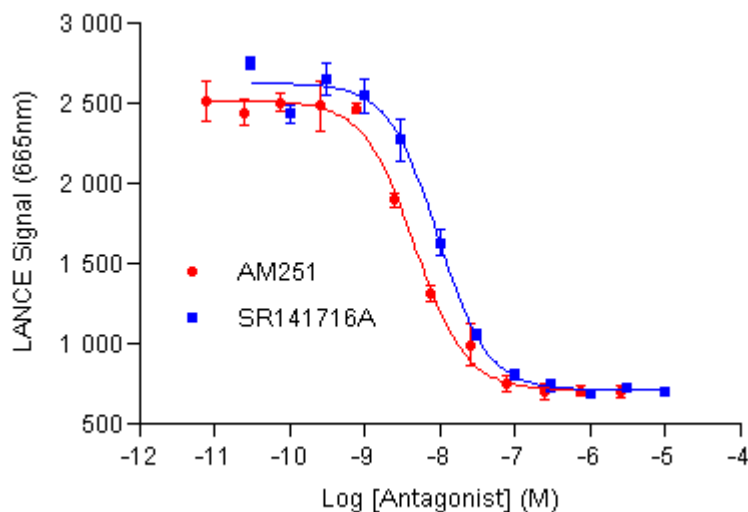
Typical Product Data -LANCE® *Ultra* cAMP Assay



Agonist	EC <sub>50</sub> (M)
(R)-(+)-WIN 55,212-2	3.1 x 10 <sup>-7</sup>
Arachidonoyl ethanolamide	4.2 x 10 <sup>-6</sup>

Figure 1. Agonist Response in LANCE® *Ultra* cAMP assay

An agonist dose-response experiment was performed in 384-well format using 2500 cells/well. Frozen cells made from the clone C2 were thawed and incubated for 30-min with 10 μM Forskolin (Fsk) and the indicated agonist concentrations. Time-resolved fluorescence was measured on an EnVision® instrument. Data from a representative experiment are shown.

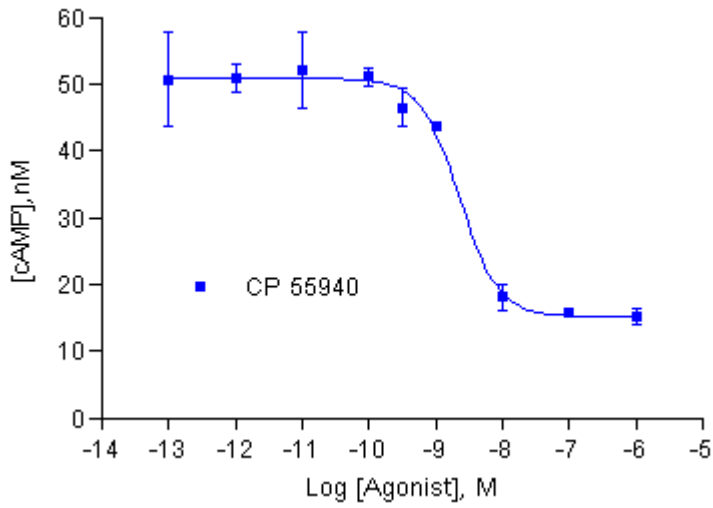


Antagonist	IC <sub>50</sub> (M)
AM251	4.6 x 10 <sup>-9</sup>
SR141716A	9.5 x 10 <sup>-9</sup>

Figure 2. Antagonist Response in LANCE® *Ultra* cAMP assay

An antagonist dose-response experiment was performed in 384-well format using 2500 cells/well. Cells were incubated for 30-min in the presence of 10 μM Forskolin (Fsk), a final concentration of 525 nM (R)-(+)-WIN 55,212-2, (corresponding to the EC<sub>80</sub>), and the indicated antagonist concentrations. Time-resolved fluorescence was measured on an EnVision® instrument. Data from a representative experiment are shown.

Typical Product Data - cAMP Assay (TR-FRET)



Agonist	EC <sub>50</sub> (M)
CP 55940	2.3 x 10 <sup>-9</sup>

Figure 3. Agonist Response in TR-FRET cAMP assay

An agonist dose-response experiment was performed in 96-well format with clone C2 using 5000 cells/well. Forskolin at a final concentration of 10 μM was used. Time-resolved fluorescence was measured on a RUBYstar (BMG Labtech) instrument. Data from a representative experiment are shown.

Typical Product Data -Radioligand Binding Assay (Filtration)

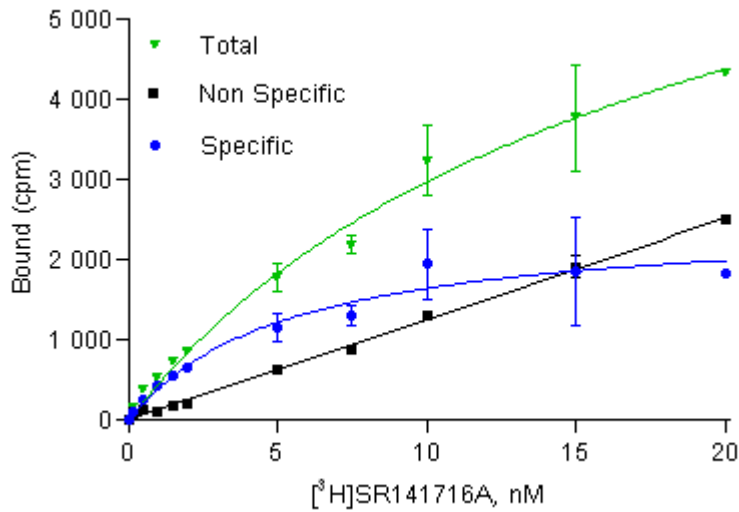
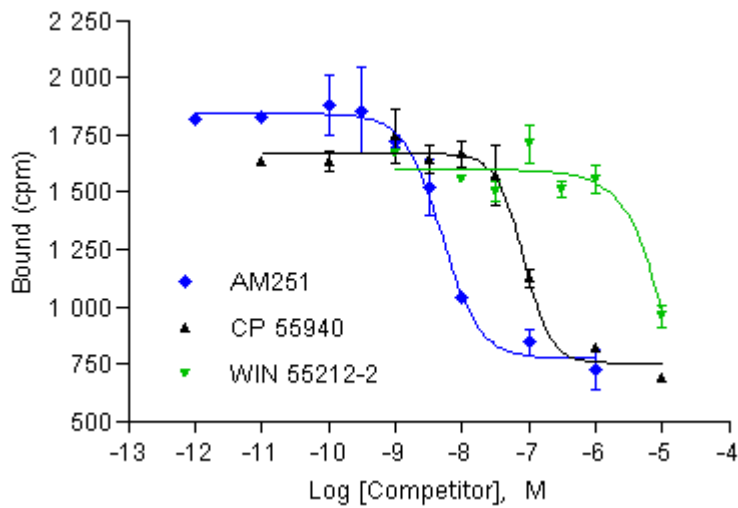


Figure 4: Saturation Binding Assay Curve (Filtration)

A saturation binding assay was performed in 96-well format using 5 µg membranes of clone C3/well. Counts per minute (cpm) were measured on a TopCount® instrument. Data from a representative experiment are shown.

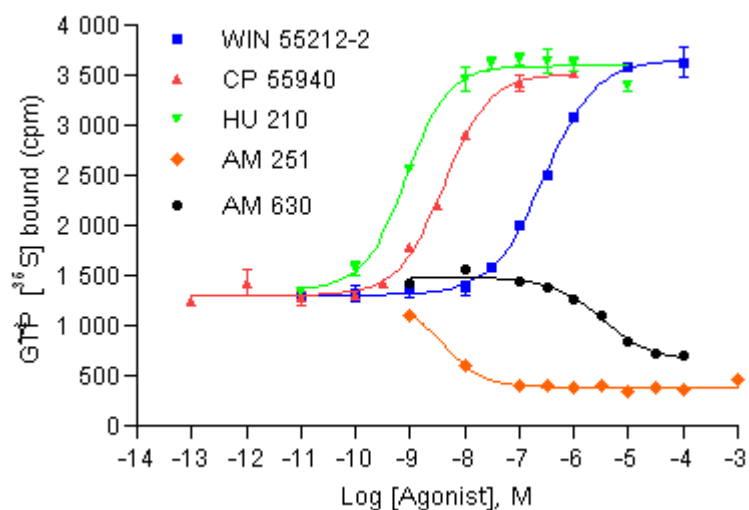


Agonist / Antagonist	IC <sub>50</sub> (M)
AM251	5.1 x 10 <sup>-9</sup>
CP 55940	8.4 x 10 <sup>-8</sup>
WIN 55212-2	>10 <sup>-6</sup>

Figure 5: Competition Binding Assay Curve (Filtration)

A competition binding assay was performed in 96-well format using 5 µg membranes of clone C3/well. Displacement of 5 nM [3H]SR171416A was used. Counts per minute (cpm) were measured on a TopCount® instrument. Data from a representative experiment are shown.

Typical Product Data - GTP $\gamma$ S - SPA<sup>®</sup> Assay



Agonist	EC <sub>50</sub> (M)
WIN 55,212-2	2.9 x 10 <sup>-7</sup>
CP 55940	4.2 x 10 <sup>-9</sup>
HU-210	8.5 x 10 <sup>-10</sup>
AM251	3.9 x 10 <sup>-9</sup>
AM630	3.3 x 10 <sup>-6</sup>

Figure 6. Agonist and Inverse Agonist Response in GTP $\gamma$ S - SPA<sup>®</sup> assay

An agonist dose-response scintillation proximity assay (SPA) was performed in 96-well format using 5  $\mu$ g membranes of clone C3/well. The same assay conditions allowed detecting inverse agonism activity as well. Counts per minute (cpm) were measured on a TopCount<sup>®</sup> instrument. Data from a representative experiment are shown.



## LANCE® Ultra cAMP Assay Procedure

Stimulation Buffer: HBSS, 5 mM HEPES, 0.1 % Protease-free BSA, 0.5 mM IBMX, pH 7.4.

Cells/well: 2500. For compounds not tested herein we recommend titrating the cells for optimal performance, i.e. 500-3000 cells per assay point.

cAMP measurements were performed with the LANCE® Ultra cAMP 384 Kit (Revvity # TRF0262), according to the manufacturer instructions. Briefly:

Protocols for a 384-well white Optiplate (total assay volume of 20 µL):

cAMP Standard curve	G <sub>s</sub> Agonist	G <sub>s</sub> Antagonist	G <sub>i</sub> Forskolin titration	G <sub>i</sub> Agonist	G <sub>i</sub> Antagonist
5 µL cAMP Standard	5 µL cell suspension	5 µL cell suspension	5 µL cell suspension	5 µL cell suspension	5 µL cell suspension
5 µL Stimulation Buffer	5 µL Agonist	2.5 µL Agonist	5 µL Forskolin	2.5 µL Forskolin	2.5 µL Forskolin/Agonist
-	-	2.5 µL Antagonist	-	2.5 µL Agonist	2.5 µL Antagonist
Incubate 30 min at room temperature (optional step for cAMP Standard curve)					
5 µL 4X Eu-cAMP Tracer Working Solution					
5 µL 4X ULight-anti-cAMP Working Solution					
Incubate 1 h at room temperature					
Read on an EnVision® instrument. Remove microplate seal prior to reading					

1. Cells in mid-log phase, grown in media without antibiotics for 18 hours prior to the experiment, were detached by gentle flushing with PBS-EDTA, recovered by centrifugation and resuspended in stimulation Assay Buffer to the concentration of  $6.0 \times 10^5$  cells/mL.
2. Prepare the 4X Tracer Working Solution by making a 1/50 dilution of the Eu-cAMP stock solution in the cAMP Detection Buffer.
3. Prepare an ULight-anti-cAMP Intermediate Solution by making a 1/10 dilution of the ULight-anti-cAMP stock solution in cAMP Detection Buffer. Prepare the 4X ULight-anti-cAMP Working Solution by making a 1/30 dilution of the ULight-anti-cAMP intermediate solution in the cAMP Detection Buffer.

### Notes:

For 96- and 1536-well formats, adjust proportionally the volume of each assay component in order to maintain the volume ratios for the 384-well format. Do not modify the Eu-cAMP and/or the ULight-anti-cAMP concentrations.





## Membrane Radioligand Binding Assay Procedure (Filtration)

*Note: The following are recommended assay conditions and may differ from the conditions used to generate the typical data shown in the above section.*

Assay Buffer: 50 mM Tris-HCl pH 7.4, 2.5 mM EDTA, 5 mM MgCl<sub>2</sub>, 0.5 mg/ml BSA

Wash Buffer: 50 mM Tris-HCl pH 7.4 (ice cold)

Radioligand: [<sup>3</sup>H]SR171416A (Revvity # NET1158)

Filters: Unifilter 96 GF/C (Revvity # 6055690)

### Membrane Binding Protocol:

Binding assays were performed in 550 µL total volume according to the following conditions. All dilutions are performed in assay buffer:

1. Membrane dilution:	2 µg of membranes per well, diluted in order to dispense 500µL/well. Keep on ice.
2. Assembly on ice (in 96 Deep well plate)	<ul style="list-style-type: none"><li>• 25 µL of assay buffer or of unlabeled ligand ((R)-(+)-WIN 55,212-2, 4 µM final) for determination of non specific binding</li><li>• 25 µL of radioligand at increasing concentrations (see figure 3)</li><li>• 500 µL of diluted membranes</li></ul>
Saturation Binding:	<ul style="list-style-type: none"><li>• 25 µL competitor ligand at increasing concentrations (see figure 4)</li><li>• 25 µL of radioligand (0.4 nM final)</li><li>• 500 µL of diluted membranes</li></ul>
Competition Binding:	
3. Incubation:	90 min at 30°C.
4. Filters preparation:	GF/C filters were presoaked in 0.05 % PEI at room temperature for at least 30 min.
5. Filtration:	Aspirate and wash 9 x 500 µL with ice cold wash buffer using a FilterMate Harvester.
6. Counting:	Add 30 µL/well of MicroScint™-O (Revvity # 6013611), cover filter with a TopSeal-A PLUS (Revvity # 6050185) and read on a TopCount®.



## GTP $\gamma$ S - SPA<sup>®</sup> Assay Procedure

Assay Buffer:	20 mM HEPES pH 7.4, 200 mM NaCl, 10 $\mu$ g/ml saponin, 3 mM MgCl <sub>2</sub> , 0.1% protease- free BSA
GDP concentration:	3 $\mu$ M GDP (final)
SPA Beads:	PVT-WGA (Revvity # RPNQ0001), 0.5 mg/well
Radioligand:	GTP $\gamma$ S, [ <sup>35</sup> S] - (Revvity # NEG030H)
Membranes:	5 $\mu$ g/well
Format:	96-well
Final volume:	100 $\mu$ L/well

GTP $\gamma$ S-SPA assays were performed in 100  $\mu$ L total volume according to the following conditions. All dilutions are performed in assay buffer:

1. Membrane Dilution:	5 $\mu$ g of membranes per well, diluted in order to dispense 10 $\mu$ L/well. Keep on ice.
2. GDP saturation:	Mix a 10-fold concentrated GDP solution (i.e. 30 $\mu$ M) with the membranes dilution. Incubate " <i>membranes : GDP mix</i> " on ice for 15 min.
3. GTP $\gamma$ S, [ <sup>35</sup> S] - dilution:	Dilute GTP $\gamma$ S, [ <sup>35</sup> S] - to give ~25,000 dpm/10 $\mu$ L
4. Beads:	Dilute beads to 50 mg/mL (0.5 mg/10 $\mu$ L). Premix beads with the GTP $\gamma$ S, [ <sup>35</sup> S] - dilution just before starting the reaction (" <i>GTP<math>\gamma</math>S, [<sup>35</sup>S] - : Beads mix</i> ").
5. Assembly (in Optiplate <sup>™</sup> ), Agonist Assay:	<ul style="list-style-type: none"> <li>• 50 <math>\mu</math>L of 2x agonist dilution at increasing concentrations</li> <li>• 20 <math>\mu</math>L of the "<i>membranes : GDP mix</i>"</li> <li>• 10 <math>\mu</math>L of assay buffer</li> <li>• 20 <math>\mu</math>L of the "<i>GTP<math>\gamma</math>S, [<sup>35</sup>S] - : Beads mix</i>"</li> </ul>
Antagonist Assay:	<ul style="list-style-type: none"> <li>• 50 <math>\mu</math>L of 2x antagonist dilution at increasing concentrations</li> <li>• 20 <math>\mu</math>L of the "<i>membranes : GDP mix</i>"</li> <li>• 10 <math>\mu</math>L of 10x reference agonist dilution to reach a final concentration corresponding to its EC<sub>80</sub></li> <li>• 20 <math>\mu</math>L of the "<i>GTP<math>\gamma</math>S, [<sup>35</sup>S] - : Beads mix</i>"</li> </ul>
6. Incubation:	<ul style="list-style-type: none"> <li>• Cover plate with a TopSeal</li> <li>• Shake on an orbital shaker for 2 min</li> <li>• Incubate for 1h at RT</li> <li>• Centrifuge the plate for 10 min at 2000 rpm</li> <li>• Incubate for 1h at RT</li> </ul>
7. Counting	Count for 1 min on a TopCount <sup>®</sup>

## References

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2. Fernández-López D, Pazos MR, Tolón RM, Moro MA, Romero J, Lizasoain I, Martínez-Orgado J (2007) The cannabinoid agonist WIN55212 reduces brain damage in an in vivo model of hypoxic-ischemic encephalopathy in newborn rats. *Pediatr Res.* 62:255-60
3. Felder CC, Veluz JS, Williams HL, Briley EM, Matsuda LA.(1992) Cannabinoid agonists stimulate both receptor- and non-receptor-mediated signal transduction pathways in cells transfected with and expressing cannabinoid receptor clones. *Mol Pharmacol.* 42:838-845.
4. Felder CC, Joyce KE, Briley EM, Mansouri J, Mackie K, Blond O, Lai Y, Ma AL, Mitchell RL.(1995) Comparison of the pharmacology and signal transduction of the human cannabinoid CB1 and CB2 receptors. *Mol Pharmacol.* 48:443-450.
5. Rinaldi-Carmona M, Calandra B, Shire D, Bouaboula M, Oustric D, Barth F, Casellas P, Ferrara P, Le Fur G. (1996) Characterization of two cloned human CB1 cannabinoid receptor isoforms. *J Pharmacol Exp Ther.* 278:871-878.
6. Ryberg E, Vu HK, Larsson N, Groblewski T, Hjorth S, Elebring T, Sjögren S, Greasley PJ. (2005) Identification and characterisation of a novel splice variant of the human CB1 receptor. *FEBS Lett.* 579:259-264.
7. Turu G, Hunyady L. (2010) Signal transduction of the CB1 cannabinoid receptor. *J Mol Endocrinol.* 44:75-85.
8. Bosier B, Muccioli GG, Hermans E, Lambert D (2010) Functionally-selective cannabinoid receptor signalling: therapeutic implications and opportunities. *Biochem Pharmacol.* 80:1-12.



## Materials and Instrumentation

The following tables provide the references of compounds and reagents used or recommended for the characterization of the human Cannabinoid CB<sub>1</sub> receptor ValiScreen<sup>®</sup> cell line, as well as some advice on how to use these compounds:

Table 1. References of compounds used for functional characterization and binding assays

Name	Provider	Cat no	Working Stock Solution
(R)-(+)-WIN 55,212-2	Sigma	W102	10 mM in DMSO
Arachidonoyl ethanolamide (AEA)	Cayman Chemical	90050	144 mM in Ethanol
AM 251	Tocris	1117	25 mM in DMSO
AM 630	Tocris	1120	10 mM in DMSO
SR141716A (alternative name Rimonabant)	Cayman Chemical	9000484	43 mM in DMSO
CP55940	Tocris	0949	10 mM in DMSO
HU 210	Tocris	0966	10 mM in DMSO
[ <sup>3</sup> H]SR141716A	Revvity	NET1158	N/A

Table 2. References of cell culture media and assay buffers

Name	Provider	Cat no
HAM's F-12	Hyclone	SH30026.02
DMEM	Hyclone	SH30022.02
Advanced DMEM/F12 (serotonin receptors)	Invitrogen	12634-010
EMEM	BioWitthaker	06-174G
EX-CELL DHFR <sup>®</sup> media (DHFR deficient cell lines)	Sigma	C8862
FBS	Wisent	80150
FBS dialyzed	Wisent	80950
G418 (geneticin)	Wisent	400-130-IG
Zeocin	Invitrogen	R25005
Blasticidin	Invitrogen	R210-01
Puromycin	Wisent	400-160-EM
Standard HBSS (with CaCl <sub>2</sub> and MgCl <sub>2</sub> )	GIBCO	14025
HEPES	MP Biomedicals, LLC	101926
BSA, Protease-free	Sigma	A-3059
PEI	Sigma	P3143
Trypsin-EDTA	Hyclone	SH30236.02
Sodium Pyruvate	GIBCO	11360
L-Glutamine	GIBCO	25030
NEAA (non-essential amino acids)	GIBCO	11140
Forskolin	Sigma	F6886

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