Description

The Cereblon Intrachain TR-FRET Assay Kit is a sensitive high-throughput screening (HTS) TR-FRET (Time Resolved Fluorescence Resonance Energy Transfer) assay kit, designed to measure Cereblon auto-ubiquitination activity in a homogeneous 384 reaction format. It utilizes a Europium cryptate-labeled Ub (donor) as well as Cy5-labeled Ub (acceptor) to complete the TR-FRET pairing. Since both the TR-FRET donor and acceptor are incorporated into poly-ubiquitin chains formed on Cereblon, this FRET-based assay requires no time-consuming washing steps, making it especially suitable for HTS applications as well as real-time kinetics analyses of polyubiquitination.

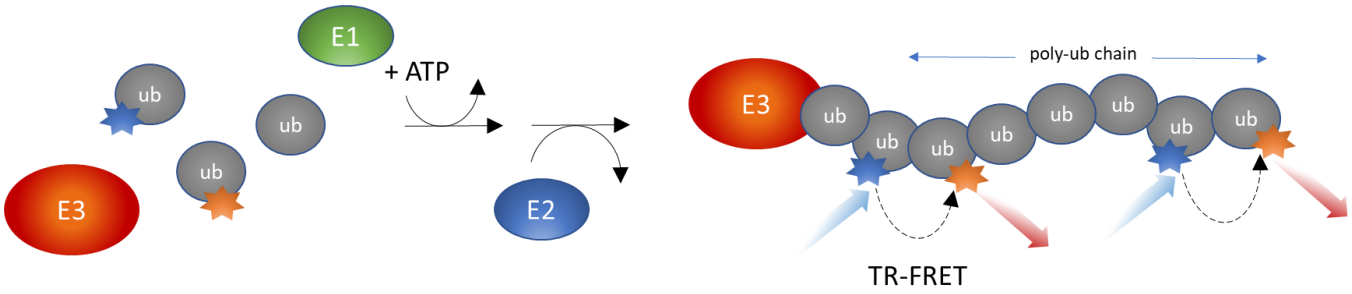

Figure 1. Cereblon Intrachain TR-FRET Assay Kit schematic.

Background

Covalent conjugation to ubiquitin (Ub) is one of the major post-translational modifications that regulates protein stability, function, and localization. Ubiquitination is the concerted action of three enzymes: a Ub-activating enzyme (E1), a Ub-conjugating enzyme (E2), and a Ub ligase (E3). The specificity and efficiency of ubiquitination are largely determined by the E3 enzyme, which directs the last step of the Ub-conjugating cascade by binding to both an E2~Ub conjugate and a substrate protein. This step ensures the transfer of Ub from E2~Ub to the substrate, leading to its mono- or poly-ubiquitination.

The Cereblon (CRBN) protein via its interaction with the DNA damage-binding protein-1 (DDB1), Cullin 4 (Cul4A or Cul4B), and regulator of Cullins 1 (RoC1) forms the functional E3 Ub ligase complex. In this complex, Cereblon functions as a substrate receptor that mediates the ubiquitination and subsequent proteasomal degradation of target proteins. Like most E3 ligases, Cereblon complex ubiquitinates itself and its auto-ubiquitination promotes its Ub ligase activity. Cereblon complex is involved in many biological processes including cell proliferation and apoptosis, and it has been targeted protein degradation in the treatment of cancer.

Applications

- Screen molecules that inhibit Cereblon Ub ligase activity in drug discovery HTS applications
- Determine compound IC_{50}.
- Perform Cereblon real-time kinetics analyses.

Supplied Materials

Catalog #	Name	Amount	Storage	
80301	UBE1 (UBA1), FLAG-Tag*	50 µg	-80°C	***Avoid multiple freeze/ thaw cycles***
80314	UbcH5b, His-Tag*	60 µg	-80°C	
100329	Cereblon/DDB1/Cul4A/Rbx1 Complex*	60 µg	-80°C	
78307	TRF Ubiquitin Mix (200x)	40 µl	-80°C	
	ATP (4 mM)	2 x 1 ml	-80°C	
	U2 Assay Buffer	2 x 10 ml	-80°C	
79969	White, nonbinding, low volume microtiter plate	1	Room Temp	

**The initial concentration of enzyme is lot-specific and will be indicated on the tube containing the protein.*

The Ubiquitin Mix is sourced from South Bay Bio LLC.

Materials Required but Not Supplied

- Fluorescent microplate reader capable of measuring Time Resolved Fluorescence Resonance Energy Transfer (TR-FRET)
- Adjustable micropipettor and sterile tips
- Rotating or rocker platform

Storage Conditions

This assay kit will perform optimally for up to **6 months** from date of receipt when the materials are stored as directed. ***Avoid multiple freeze/ thaw cycles!***

Safety

This product is for research purposes only and not for human or therapeutic use. This product should be considered hazardous and is harmful by inhalation, in contact with skin, eyes, clothing, and if swallowed. If contact occurs, wash thoroughly.

Contraindications

The Cereblon Intrachain TR-FRET Assay Kit is compatible with up to 1% final DMSO concentration. We recommend preparing the inhibitor in a solution containing no higher than 5% DMSO and using 4 µl per well.

Assay Protocol

- All samples and controls should be performed in triplicate.
- The assay should include “Blank”, “Positive Control”, “Negative Control” and “Test Compound” conditions.
- If the assay plate is going to be used more than once, prepare enough of each protein and buffer and aliquot the remaining undiluted proteins into single-use aliquots depending on how many times the assay plate will be used. Store the aliquots at -80°C.

1) Thaw **UBE1**, **UbcH5b**, **Cereblon complex**, **TRF Ubiquitin Mix**, **U2 Assay Buffer**, and **ATP** on ice. Briefly spin the tubes to recover their full content.

2) Prepare a 5x TRF Ubiquitin Mix in U2 Assay Buffer by making a 40-fold dilution of TRF Ubiquitin Mix (200x).

3) Calculate the amount of protein required for the assay and prepare the appropriate amounts of diluted proteins. The concentration of each protein is lot-specific and is indicated on the tube. Verify the initial concentration and dilute accordingly.

    a) Dilute UBE1 in U2 Assay Buffer to 800 nM (96 ng/µl) (final concentration in reaction 40 nM) (1 µl/well).

    b) Dilute UbcH5b in U2 Assay Buffer to 8 µM (144 ng/µl) (final concentration in reaction 400 nM) (1 µl/well).

    c) Dilute Cereblon complex in U2 Assay Buffer to 100 nM (25 ng/µl) (final concentration in reaction 25 nM) (5 µl/well).

    Note: UBE1, UbcH5b, Cereblon complex, TRF Ubiquitin Mix, and U2 Assay Buffer are sensitive to freeze/thaw cycles. Avoid multiple freeze-thaw cycles. Keep all diluted proteins on ice until use.

4) Prepare the test compound solution (4 µl/ well): for a titration prepare serial dilutions at concentrations 5-fold higher than the desired final concentrations. The final volume of the reaction is 20 µl.

    a) If the compound is soluble in water, prepare a solution of the compound in U2 Assay Buffer that is 5-fold higher than the final assay concentration. For the positive and negative controls, use U2 Assay Buffer (Diluent Solution).

    OR

    b) If the Test Compound is soluble in DMSO, prepare the test compound at a concentration 100-fold higher than the highest desired concentration in DMSO, then dilute the compound 20-fold in U2 Assay Buffer to prepare the highest concentration of the 5-fold intermediate dilutions. The concentration of DMSO is now 5%.

    Prepare serial dilutions of the Test Compound at 5-fold the desired final concentrations using 5% DMSO in U2 Assay Buffer to keep the concentration of DMSO constant.

    For positive and negative controls, prepare 5% DMSO in U2 Assay Buffer (vol/vol) so that all wells contain the same amount of DMSO (Diluent Solution).

    Note: The final concentration of DMSO should not exceed 1%.

5) For the "Blank" wells prepare the following mix: N wells x (4 µl of 5x TRF Ubiquitin Mix + 1 µl of diluted UBE1 + 1 µl of diluted UbcH5b + 4 µl of Diluent Solution + 5 µl of U2 Assay Buffer).

6) Add 15 µl of mix to the "Blank" wells.

	Blank
TRF Ubiquitin Mix (5x)	4 µl
Diluted UBE1	1 µl
Diluted UbcH5b	1 µl
Diluted Cereblon complex	-
Test Compound	-
Diluent Solution	4 µl
U2 Assay Buffer	5 µl
ATP (4 mM)	5 µl
Total	**20 µl**

7) Prepare a Master Mix: N wells × (4 µl 5x TRF Ubiquitin Mix + 1 µl diluted UBE1 + 1 µl diluted UbcH5b + 5 µl diluted Cereblon complex).

8) Add 11 µl of Master Mix to each well designated for the "Negative Control", "Positive Control" and "Test Compound".

9) Add 4 µl of inhibitor solution to each well designated "Test Inhibitor".

10) Add 4 µl of the Diluent Solution to the "Positive Control" and "Negative Control".

11) Initiate the reaction by adding 5 µl of **ATP** to the wells labeled "Positive Control", "Test Compound", and "Blank".

12) Add 5 µl of **U2 Assay Buffer** to the wells designated "Negative Control".

	Test Compound	**Negative Control**	**Positive Control**
Master Mix	11 µl	11 µl	11 µl
Test Compound	4 µl	–	–
Diluent Solution	–	4 µl	4 µl
U2 Assay Buffer	–	5 µl	–
ATP (4 mM)	5 µl	–	5 µl
Total	**20 µl**	**20 µl**	**20 µl**

13) Read the fluorescence intensity in a microtiter-plate reader capable of measuring TR-FRET in kinetic mode for up to 1 hour. An end point readout can be done in 20-40 minutes.

14) "Blank" value should be subtracted from all other values.

Instrument Settings

Two sequential measurements should be conducted. Eu-donor emission should be measured at 620 nm followed by dye-acceptor emission at 665 nm. Data analysis is performed using the TR-FRET ratio (665 nm emission/ 620 nm emission).

Reading Mode	Time Resolved
Excitation Wavelength	317±20 nm
Emission Wavelength	620±10 nm
Lag Time	60 µs
Integration Time	500 µs
Excitation Wavelength	317±20 nm
Emission Wavelength	665±10 nm
Lag Time	60 µs
Integration Time	500 µs

CALCULATING RESULTS:

Data analysis is performed using the TR-FRET ratio (665 nm emission/620 nm emission). "Blank" value is subtracted from all other values.

When percentage activity is calculated, the FRET value from the Blank (it is expected that Blank and Negative Control have a similar value) can be set as zero percent activity and the FRET value from the positive control can be set as one hundred percent activity.

$$\% \text{ Activity} = \frac{FRET_s - FRET_{blank}}{FRET_p - FRET_{blank}} \times 100\%$$

Where FRETs = Sample FRET, $FRET_{blank}$ = Blank FRET, and $FRET_P$ = Positive control FRET.

Example Results

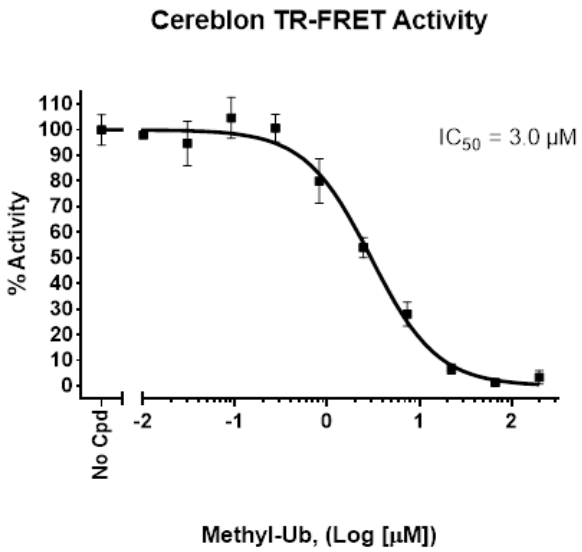

Figure 2: Inhibition of Cereblon complex auto-ubiquitination by Methylated Ubiquitin.
Auto-ubiquitination was measured in the presence of increasing concentrations of Methylated Ubiquitin. Results are expressed as percent activity, in which absence of inhibitor is set to 100%.

Data shown is representative. For lot-specific information, please contact BPS Bioscience, Inc. at support@bpsbioscience.com.

Troubleshooting Guide
Visit bpsbioscience.com/assay-kits-faq for detailed troubleshooting instructions. For all further questions, please email support@bpsbioscience.com

Related Products

Products	*Catalog #*	*Size*
Cereblon Ubiquitination Homogenous Assay Kit	79881	384 reactions
Cereblon Binding Assay Kit	79899	96 reactions
PROTAC® Optimization Kit for IRAK4-Cereblon Binding	78512	384 reactions
PROTAC® Optimization Kit for PARP1-Cereblon Binding	78441	384 reactions
PROTAC® Optimization Kit for BRD9-Cereblon Binding	78420	384 reactions
PROTAC® Optimization Kit for CDK Kinase-Cereblon Binding	79924	384 reactions
VHL Intrachain TR-FRET Assay Kit	78305	384 reactions