

SUMO3-CHOP-Reporter Kit



MANUAL

SUMO3-CHOP2-Reporter DeSUMOylation Assay Kit
Catalog Number PR1102

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BACKGROUND

Ubiquitin and Ubiquitin Like Proteins

In cells, proteins are tagged for degradation by ubiquitin and sent to the proteasome. In contrast, covalent modification of cellular proteins by the ubiquitin-like modifier SUMO (small ubiquitin-like modifier) regulates various cellular processes, such as nuclear transport and signal transduction. The ubiquitin family of proteins fall into two classes: the first class, ubiquitin-like proteins (UBLs) function as modifiers in a manner analogous to that of ubiquitin. Examples of UBLs are SUMO, Nedd8 (also called Rub1), ISG15, Apg8, Apg12, and Fat10. Proteins of the second class include parkin, RAD23 and DSK2, are designated ubiquitin-domain proteins (UDPs). These proteins contain domains that are related to ubiquitin but are otherwise unrelated.

Conjugation Machinery

The conjugation of Ub/UBLs to target proteins requires an orchestrated addition of Ub/UBLs to lysine residues in the target protein by E1 (activating enzyme), E2 (conjugating enzyme), and E3 (ligase) in an ATP dependent manner. The enzymes form an isopeptide bond between the carboxy-terminus of the UBL and the ϵ -amino group of the lysine residue of target proteins.

DeSUMOylating Enzymes

SUMOylation is a reversible process in which deconjugation is performed in cells by deSUMOylating enzymes, otherwise known as isopeptidases. Isopeptidases are cysteine proteases that can be divided into multiple families. The roles of isopeptidases include recycling of fused ubiquitin/UBL and processing pro-ubiquitin/UBL by cleavage to the mature form. Removal of ubiquitin or UBL moieties can affect cellular physiology in a number of ways, and several isopeptidases have been linked to pathologies such as cancer and cardiovascular disease.

ABOUT THE ASSAY

The SUMO3-CHOP2-Reporter DeSUMOylation Assay consists of human SUMO3 fused to a reporter enzyme, as well as a separate substrate for the reporter enzyme. When fused to SUMO3, the reporter is rendered catalytically inactive. Following cleavage of the SUMO3-reporter system by the isopeptidase, free (and now active) reporter subsequently acts upon its substrate. Thus, in the coupled assay, the signal generated by cleavage of the reporter enzyme's substrate is a quantitative measure of isopeptidase activity.

BENEFITS

1. Rapid and robust readout for deSUMOylating activity within 30 minutes; signal to background ratio >10.
2. Reporter substrates are non-radioactive.
3. Amenable to high throughput screening (HTS) and miniaturization.
4. Assay tests deconjugating activity between SUMO3 and a physiologically relevant protein.

SUGGESTED USES

SUMO3-CHOP-Reporter Kit

1. Demonstration of novel isopeptidase activity.
2. High throughput screening (HTS) for antagonists or agonists of isopeptidase activity.

COMPONENTS

1. SUMO3-CHOP2-Reporter (Reporter System)

Size: 1 x 375 μ l (4 μ M)

Buffer: 20 mM Tris (pH 8.0), 150 mM NaCl, 10% glycerol

Storage: -80° C, avoid cycles of freezing and thawing

2. SENP2core (Control Isopeptidase)

Size: 2 x 10 μ l (2 μ M)

Buffer: 20 mM Tris (pH 8.0), 150 mM NaCl, 10% glycerol, 200 μ g/ml BSA, 2 mM β -mercaptoethanol

Storage: -80° C, avoid cycles of freezing and thawing

3. Reporter Substrate 2

Size: 1 x 30 μ l (25 μ M)

Buffer: DMSO

Storage: -80° C

Misc.: light sensitive

excitation/emission wavelength maxima are 485/531 nm

4. Control Fluorophore 2 (Please refer to Fluorophore Control section, Pg 11 for information concerning the use of this reagent for plate reader validation)

Size: 1 x 20 μ l (1mM)

Buffer: DMSO

Storage: -80° C

ADDITIONAL ITEMS REQUIRED

1. Assay Buffer (for use in Step 1 of Protocol)

20 mM Tris-HCl (pH 8.0), 2 mM CaCl₂, 2 mM β -mercaptoethanol, 0.05% CHAPS

Prepare fresh assay buffer on a daily basis

2. Fluorescence plate reader

Appropriate filters required for excitation and emission wavelengths

Excitation: 485 nm

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Emission: 531 nm

3. Black 96 well plate, (or desired template)
4. 15 ml tube
5. 1.5 ml snap cap tubes

SOLUTIONS

SEN2 (Control Isopeptidase) (for use in Step 2 of Protocol)

1. Add 990 μ l of assay buffer to one of the tubes labeled SEN2.
2. Mix thoroughly by vortexing.
3. You are now ready to add 50 μ l aliquots (20nM SEN2) into the wells of a black 96 well plate.

Reporter Substrate Solution (for use in Step 4 of Protocol)

1. Perform this step in a timely manner as to minimize exposure of the reporter substrate to light.
2. Dilute Reporter Substrate 2 in a 1:10 ratio with DMSO: Add 10 μ l reporter substrate 2 to 90 μ l of DMSO.
3. Combine 3.2 μ l of diluted reporter substrate 2, and 196.8 μ l of assay buffer in a 1.5 ml snap cap tube.
4. Mix thoroughly by vortexing.
5. You are now ready to add 50 μ l aliquots (40nM reporter substrate) into the black 96 well plate.

SUMO3-CHOP2-Reporter (Reporter System) and Reporter Substrate Solution (for use in Step 5 of Protocol)

1. Perform this step in a timely manner as to minimize exposure of the reporter substrate 2 to light.
2. Combine 150 μ l of SUMO3-CHOP2-Reporter, 9.6 μ l reporter substrate 2, and 5.86 ml of assay buffer in a 15 ml tube.
3. Mix thoroughly by vortexing.
4. You are now ready to add 50 μ l aliquots into the black 96 well plate
5. Each 50 μ l aliquot contains 100nM of SUMO3-CHOP2-Reporter and 40nM of reporter substrate 2.

Test Isopeptidase (For Use In Step 3 of Protocol)

We suggest an initial dilution series of your test isopeptidase to optimize its concentration/activity. As a positive control, the kit includes the catalytic core domain of the enzyme SEN2, to be used at a concentration of 20nM in the final reaction. Make the dilutions of your test isopeptidase in assay buffer such that a final volume of 50 μ l is added to each well. A suggested protocol is listed below.

1. Label seven 1.5 ml snap cap tubes T1 through T7.
2. Place 200 μ l of assay buffer in tubes T2 through T7.

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3. Dilute the test isopeptidase to a concentration of 800nM in 400µl of Assay Buffer in Tube T1.
4. Vortex Tube T1 and perform a 2-fold dilution by transferring 200 µl of solution from Tube T1 into Tube T2.
5. Perform another 2 fold dilution by taking 200 µl from Tube T2 and placing it into Tube T3.
6. Repeat for Tubes T4 through T7.

tube	Concentration of test isopeptidase in 50 µl (nM)	Concentration of test isopeptidase in 100 µl (nM)
T1	800	400
T2	400	200
T3	200	100
T4	100	50
T5	50	25
T6	25	12.5
T7	12.5	6.25

PROTOCOL

Optimization of Your Test Isopeptidase, Suggested Protocol

1. Add 50 µl of Assay Buffer in triplicate to columns 1 and 2.
2. Add 50 µl of SENP2 (control isopeptidase) in triplicate to column 3.
3. Add 50 µl of Tubes T1-T7 of your test isopeptidase in triplicate to columns 4 through 10.
4. Add 50 µl of reporter substrate solution in triplicate to column 1.
5. Add 50 µl of reporter and reporter substrate solution in triplicate to columns 2 through 10.
6. Below gives a representation of the 96 well plate layout.

	1	2	3	4	5	6	7	8	9	10	11	12
A	50 µl Assay Buffer + 50 µl Reporter Substrate	50 µl Assay Buffer + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl SENP2 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T1 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T2 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T3 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T4 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T5 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T6 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T7 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate		
B	50 µl Assay Buffer + 50 µl Reporter Substrate	50 µl Assay Buffer + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl SENP2 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T1 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T2 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T3 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T4 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T5 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T6 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T7 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate		
C	50 µl Assay Buffer + 50 µl Reporter Substrate	50 µl Assay Buffer + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl SENP2 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T1 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T2 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T3 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T4 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T5 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T6 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate	50 µl Tube T7 + 50 µl SUMO3-CHOP2-Reporter & Reporter Substrate		

7. There are two options for fluorescence detection. First, the plate can be incubated at room temperature for 30 minutes, protected from light, and a single time point reading can be measured using the appropriate excitation and emission filters, 485 and 531 nm, respectively. Alternatively, an in-plate kinetic reading can be performed by measuring the change in fluorescence over time.
8. Determine the mean plate blank value (column 1 in the representative example) and subtract from each data point to give a true representation of the change in fluorescence intensity. It is recommended that each experimental condition is measured in triplicate.

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FLUOROPHORE CONTROL

Validation of fluorometric plate reader settings with fluorophore control (if desired)

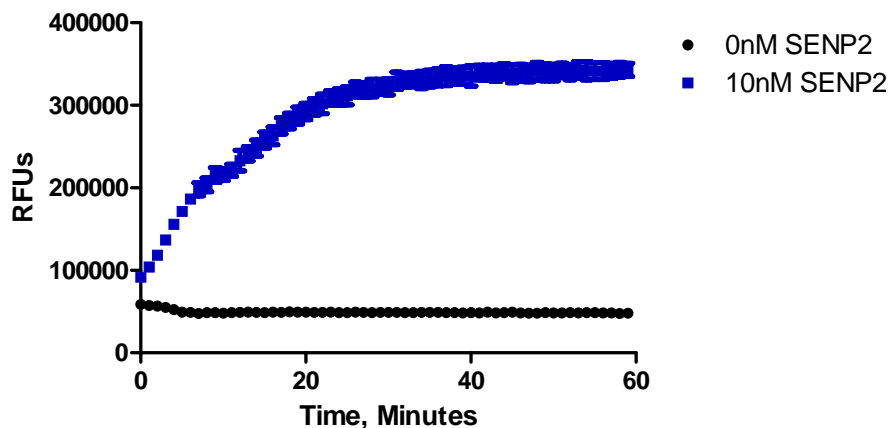
1. Combine 2 μ l of Control Fluorophore 2 with 4mL of Assay Buffer. (Final concentration of 500nM for fluorophore solution)
2. Prepare a set of two-fold serial dilutions by combining 500 μ l of diluted fluorophore with 500 μ l of assay buffer. (This will result in concentrations of 250, 125, 62.5, 31.2, 15.6, 7.81, and 0nM).
3. Place 100 μ l of each dilution into the wells of 96-well plate in triplicate.
4. Read plate on fluorescent plate reader with excitation and emission filters compatible with measurements of 485 nm and 531 nm, respectively.

QUALITY CONTROL

Quality Control

In a 96 well plate, 50nM SUMO3-CHOP2-Reporter and 20nM reporter substrate were incubated in the presence and absence of 10nM SENP2. Liberation of the fluorescent reporter substrate was monitored on a fluorescence plate reader using an excitation wavelength of 485 nm and an emission wavelength of 531 nm. Net RFU was determined by subtracting the blank (reporter substrate alone) from each data point. Results are shown in the figure below.

Representative experiment. Data = mean \pm standard deviation



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