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**MATERIAL DATA SHEET**

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**SUMO1 Conjugation Kit****Cat. # K-710**

The ubiquitin-like SUMO1 is conjugated to a variety of proteins in the presence of Ubc9 and the SUMO E1 activating enzyme (SAE1/SAE2 in human, or Aos1/Uba2p in yeast). Unlike SUMO2 and SUMO3, SUMO1 does not readily form poly-SUMO chains on substrates *in vitro*, though there is growing evidence that SUMO1 may “cap” or terminate poly-SUMO2/3 chains. The heterodimeric SAE1/SAE2 complex (38 and 70 kDa respectively) uses ATP to adenylate the C-terminal glycine residue of a SUMO protein; in a second step a thioester bond is formed between SUMO and a cysteine residue within the SAE2 subunit. Following this activation, SUMO is transferred to Cys93 of Ubc9. Ubc9 (also known as UBE2I) is a member of the E2 family and is specific for the conjugation of SUMO to a variety of target proteins. This E2 is unusual in that it sometimes interacts directly with protein substrates that are SUMOylated, and can play a role in substrate recognition. SUMOylated substrates are often localized to the nucleus (RanGAP-1, RANBP2, PML, p53, Sp100, HIPK2) but there are also cytosolic substrates (IκBα, GLUT1, GLUT4). SUMO modification has been implicated in functions such as nuclear transport, chromosome segregation and transcriptional regulation, apoptosis and protein function and stability.

NOTE: Kit contains reagents sufficient for 10 x 20 µl reactions.

**Reagents Provided in Kit**

<u>Component</u>	<u>Volume</u>
1. 10X SUMO E1 enzyme	20 µl
2. 10X SUMO1	20 µl
3. 10X Ubc9 (UBE2I)	20 µl
4. 10X Reaction Buffer	20 µl
5. 10X Mg <sup>2+</sup> -ATP Solution	20 µl

**Storage:** Store protein components at -80°C. Avoid multiple freeze/thaw cycles.

## Reagents to be Provided by Investigator

The following reagents and materials need to be obtained by the investigator prior to using this kit.

Waterbath or heating block	37°C
Reaction tubes	0.5 ml or 1.5 ml polypropylene, microcentrifuge compatible
dH <sub>2</sub> O	Sterile
Sentrin-specific Protease (SENP) Inhibitor	SUMO-aldehyde ( <b>UL-701</b> ) or SUMO-VS ( <b>UL-769</b> ) (optional)
EDTA	0.5 M solution (optional)
Dithiothreitol (DTT)	1M in dH <sub>2</sub> O (Pierce #20290) or similar (optional)
SDS-PAGE Sample Buffer	(optional)

## Assay Considerations

The included protocol is provided as a general guideline for a 20 µl volume reaction. The recommended substrate volume of 5 µl may be altered to accommodate experimental design, and the total reaction size may be scaled up or down depending on individual requirements. Individual results may vary with different conditions and substrates—it is up to the end-user to optimize the reaction. Available controls for SUMOylation reactions include biotinylated negative control peptides (SP-300) or (SP-305), positive control peptide (SP-200) or biotinylated positive control peptide (SP-205) or E2-25K protein (E2-603). See data below. The kit protocol suggests that reactions be terminated with SDS-PAGE Sample Buffer; therefore, proteins are denatured and typically not suitable for further enzymatic. If SUMOylated samples are to be used in downstream applications the reactions may be terminated by adding EDTA and DTT (10-20 mM final) if compatible with experimental design.

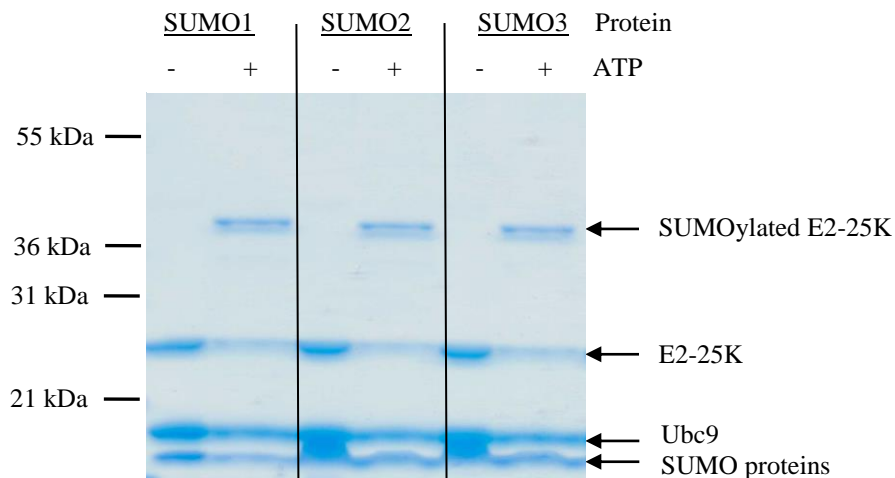
When complex samples (such as lysates or partially purified proteins from eukaryotic cells) are used as a source of substrate, the user may want to consider adding SUMO-aldehyde or SUMO-Vinyl Sulfone (UL-701, UL-769) to reactions to counteract the presence of Sentrin proteases that may be present. In such instances the suggested starting concentration of SENP inhibitor is 1-5 µM final, and the volume of water in the reactions should be adjusted to compensate for the added inhibitors.

Further information is available via [techsupport@bostonbiochem.com](mailto:techsupport@bostonbiochem.com)

## Recommended Assay Protocol (20 $\mu$ l volume)

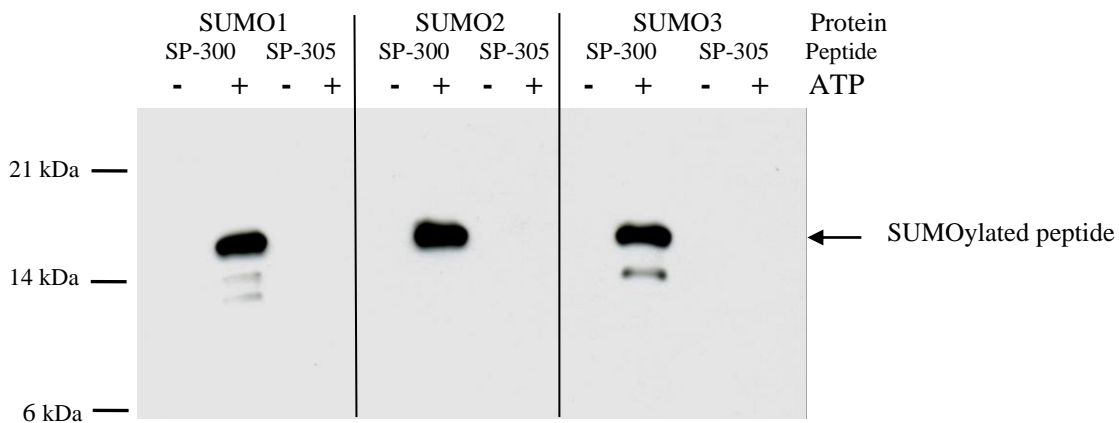
1. Reagent Preparation
  - a. Quickly thaw all protein reagents and buffers by gently and continuously swirling tubes in a lukewarm water bath ( $\leq 30^{\circ}\text{C}$ ). Alternatively, tubes may be thawed with a rapid back-and-forth rolling motion between palms of hands. Do not heat tubes for an extended period of time. Do not vortex or shake vigorously.
  - b. When completely thawed, *gently* tap tubes to make sure components are well mixed and then briefly spin in a microcentrifuge (5 seconds) to collect contents in bottom of tubes.
  - c. Immediately ice components. Entire process from steps 1a-1b should be accomplished in  $\leq 5$  minutes.
  - d. It is ***strongly recommended*** that each reagent be divided into smaller aliquots to minimize the number of freeze-thaw cycles of kit components. Avoid multiple freeze-thaw cycles to maximize kit performance. Rapidly re-freeze any aliquoted materials in dry ice bath.
2. Reaction Assembly
  - a. Prepare reactions on ice in 0.5 or 1.5 ml polypropylene tubes using the following volumes and order of addition:
    - i. 5  $\mu$ l dH<sub>2</sub>O
    - ii. 2  $\mu$ l 10X Reaction Buffer. Mix gently following addition.
    - iii. 5  $\mu$ l Substrate protein at 10-40  $\mu$ M stock (provided by user, suggested final concentration of 2.5-10  $\mu$ M substrate)
    - iv. 2  $\mu$ l 10X SUMO E1 enzyme
    - v. 2  $\mu$ l 10X Ubc9/UBE2I (E2) enzyme
    - vi. 2  $\mu$ l 10X SUMO1
  - b. Any pre-reaction incubations may be done at this point (e.g. treatment of complex lysates with SENP inhibitors). Addition of Mg<sup>2+</sup>-ATP in the next step will start the reaction.
  - c. Add 2  $\mu$ l of 10X Mg<sup>2+</sup>-ATP solution. Mix by gently pipetting up and down 2-3 times. For negative control reactions, omit ATP addition and replace with 2  $\mu$ l dH<sub>2</sub>O.
  - d. Spin tubes to collect contents and place reactions in 37 $^{\circ}$ C water bath.
  - e. After 30-60 minutes, terminate reactions with addition of 5  $\mu$ l 5X Loading Buffer (SDS-PAGE sample buffer) and 1  $\mu$ l 1M DTT. (An initial time course is recommended to determine the optimal incubation time for efficient substrate conjugation.)
  - f. Heat reactions to 90 $^{\circ}$ C for 5 minutes.

## Sample Data



**Figure 1. Modification of E2-25K (SP-200) by SUMO1, SUMO2, and SUMO3 proteins.**

20  $\mu$ l reactions were assembled as described in the protocol using 5  $\mu$ M E2-25K as a substrate. Reactions were incubated at 37°C for 60 minutes then terminated with SDS-PAGE Sample Buffer + 10 mM DTT. Proteins were separated by reducing 4-20% SDS-PAGE and visualized with Coomassie Blue stain.



**Figure 2. Western blot detection of consensus peptide (SP-300) modification by SUMO proteins.**

20  $\mu$ l reactions were assembled as described in the protocol using 50  $\mu$ M peptide as a substrate. Reactions were incubated at 37°C for 60 minutes then terminated with SDS-PAGE Sample Buffer + 10 mM DTT. Peptide SP-300 contains a SUMO consensus motif and SP-305 is a scrambled version. SUMOylated peptides were detected with avidin-HRP and ECL substrate.

## Literature

- References:**
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For help with this kit, e-mail: [techsupport@bostonbiochem.com](mailto:techsupport@bostonbiochem.com)

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