

# Poly-ubiquitin (Ub n2-7; K63-linked) [untagged]

Ubiquitin/Ubiquitin-Like Protein Polymer



Cat. No. 60-0109-100

Lot. No. 30096

Quantity: 100 µg

Storage: -70°C

FOR RESEARCH USE ONLY

NOT FOR USE IN HUMANS

CERTIFICATE OF ANALYSIS Page 1 of 2

## Background

Ubiquitin (Ub) is a highly conserved 76 amino-acid protein found throughout eukaryotic cells. A vast number of cellular processes, including targeted protein degradation, cell cycle progression, DNA repair, protein trafficking, inflammatory response, virus budding, and receptor endocytosis, are regulated by Ub-mediated signalling; where the target protein is tagged by single or multi-monomeric Ub (monomeric Ub attached to multiple sites on the substrate) or a polymeric chain of Ubs (Fushman *et al.*, 2010). This post-translational modification is tightly controlled by an enzymatic cascade involving several enzymes (E1, E2, and E3) and occurs through either an isopeptide bond between the C-terminal Glycyl residue of Ub and the epsilon amino group of a Lysyl residue on a target protein or through a peptide bond between the C-terminal Glycyl residue of Ub and the N-terminal amine on a further Ub. In the former (isopeptide bond-linked) case the substrate protein may either be ubiquitin itself – thus leading to the generation of poly-ubiquitin chains – or another target protein (Fushman *et al.*, 2010). Thus, ubiquitin can be attached to a substrate either as a monomer or as a poly-ubiquitin chain. Further – depending on their linkage type (M1, K6, K11, K27, K29, K33, K48 and K63 linked) – the Ub chains can take different structural forms. Chains containing all eight possible Ub linkages have been found in living cells and different ubiquitin chain types may encode different biological signals, allowing this single protein to mediate many diverse functions (Komander 2009; Weeks *et al.*, 2009; Walczak *et al.*, 2012). The functionality of Ub chains is most commonly associated with their attachment to substrate proteins but there is also evidence that they may also play a role in cellular signalling as free chains (Braten *et al.*, 2012).

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## Physical Characteristics

**Protein Sequences:** Please see page 2

**Species:** human

**Source:** enzyme catalysed

**Quantity:** 100 µg

**Concentration:** 5 mg/ml

**Formulation:** 50 mM HEPES pH 7.5, 150 mM NaCl<sub>2</sub>, 2 mM DTT, 10% Glycerol

**Molecular Weight:** various

**Purity:** >98% by InstantBlue™ SDS-PAGE

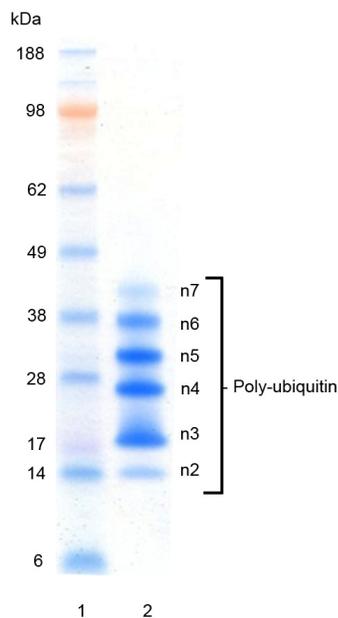
**Stability/Storage:** 12 months at -70°C; aliquot as required

**Accession Number:** P62987

## Quality Assurance

### Purity:

4-12% gradient SDS-PAGE  
InstantBlue™ staining  
Lane 1: MW markers  
Lane 2: 4 µg Poly-ubiquitin (K63-linked)

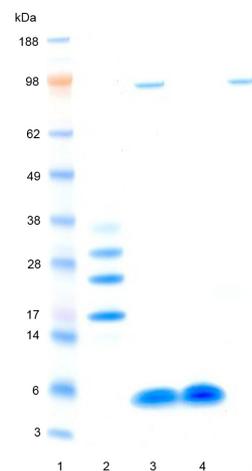


### Purity of the linkage type:

The linkage type (K63) was confirmed by tandem mass spectrometry.

### Di-ubiquitin cleavage assay:

The capacity of the poly-ubiquitin substrate to be cleaved was tested using a promiscuous – with respect to ubiquitin linkage specificity – deubiquitylase (GST-USP2). Incubation of the poly-ubiquitin for 1 hour at 37°C was compared either in the absence (Lane 2) or presence (Lane 3) of GST-USP2. The reaction products were compared alongside two control samples containing either mono-ubiquitin (Lane 4) or GST-USP2 (Lane 5) only. Cleavage of the poly-ubiquitin and generation of mono-ubiquitin was determined by running reactions on a 4-12% SDS-PAGE gel and staining with InstantBlue™ (Lane 1; molecular weight markers).



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Lot-specific COA version tracker: v1.0.1

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CERTIFICATE OF ANALYSIS Page 2 of 2

## Physical Characteristics

Continued from page 1

### Protein Sequences:

MQIFVKTLTGKTTITLEVEPSDTIENVKAKIQDKEGIPPDQORLIFAGKQLEDGRTLSDYNIQKESTLHLVLRRLGG

n2 MQIFVKTLTGKTTITLEVEPSDTIENVKAKIQDKEGIPPDQORLIFAGKQLEDGRTLSDYNIQKESTLHLVLRRLGG  
K63

n3 MQIFVKTLTGKTTITLEVEPSDTIENVKAKIQDKEGIPPDQORLIFAGKQLEDGRTLSDYNIQKESTLHLVLRRLGG  
K63

n4 MQIFVKTLTGKTTITLEVEPSDTIENVKAKIQDKEGIPPDQORLIFAGKQLEDGRTLSDYNIQKESTLHLVLRRLGG  
K63

n5 MQIFVKTLTGKTTITLEVEPSDTIENVKAKIQDKEGIPPDQORLIFAGKQLEDGRTLSDYNIQKESTLHLVLRRLGG  
K63

n6 MQIFVKTLTGKTTITLEVEPSDTIENVKAKIQDKEGIPPDQORLIFAGKQLEDGRTLSDYNIQKESTLHLVLRRLGG  
K63

n7 MQIFVKTLTGKTTITLEVEPSDTIENVKAKIQDKEGIPPDQORLIFAGKQLEDGRTLSDYNIQKESTLHLVLRRLGG  
K63

## Background

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A mass spectrometry-based study found that K63 linkages account for 16% of all yeast ubiquitin-ubiquitin linkages. The relative abundance of the other linkages were K6 (11%), K11 (28%), K27 (9%), K29 (3%), K33 (4%) and K48 (29%) (Xu *et al.*, 2009). Ubiquitin chains form distinct structures based on their linkage: K63-linked chains adopt an extended conformation with little interaction between adjacent ubiquitins. In contrast, K11- and K48-linked chains form compact, globular structures with significant ubiquitin-ubiquitin contact (Schaefer *et al.*, 2011). Polyubiquitin chains of different linkage types have distinct biological functions. The best understood among these are the K48-linked ubiquitin chains, which target proteins for degradation by the 26S proteasome. K63-linked ubiquitin chains, on the other hand, play non-degradative roles in different signalling pathways, notably NFκB transcription activation and the DNA damage response (Datta *et al.*, 2009). Although this type of ubiquitin chain exerts its effects at different stages of

the NFκB pathway, its key regulatory functions are in influencing the assembly and stability of IKK-activating complexes and in kinase activation (Schmukle *et al.*, 2012). NEMO (NFκB Essential Modifier) is the prototypic member of a family of proteins that interact with K63-linked and linear polyubiquitin chains (Ordureau *et al.*, 2008; Nanda *et al.*, 2011). It is an integral component of the canonical IκB kinase (IKK) complex and is essential for the activation of IKKα and IKKβ, the protein kinase components of the complex. NEMO is a powerful reagent for capturing the K63-linked and linear polyubiquitin chains and their binding partners present in cell extracts.

### References:

- Braten O, Shabek N, Kravtsova-Ivantsiy Y, Ciechanover A (2012) Generation of free ubiquitin chains is upregulated in stress, and facilitated by the HECT domain ubiquitin ligases UFD4 and HUL5. *Biochem J* **444**, 611-617.
- Datta AB, Hura GL, Wolberger C (2009) The structure and conformation of Lys63-linked tetraubiquitin. *Journal of Molecular Biology* **392**, 1117-1124.

Fushman D, Walker O (2010) Exploring the linkage dependence of polyubiquitin conformations using molecular modeling. *Journal of Molecular Biology* **395**, 803-814.

Komander D (2009) The emerging complexity of protein ubiquitination. *Biochem Soc Trans* **37**, 937-953.

Nanda SK, Venigalla RK, Ordureau A, Patterson-Kane JC, Powell DW, *et al.*, (2011) Polyubiquitin binding to ABIN1 is required to prevent autoimmunity. *J Exp Med* **208**, 1215-1228.

Ordureau A, Smith H, Windheim M, Peggie M, Carrick E, *et al.*, (2008) The IRAK-catalysed activation of the E3 ligase function of Pellino isoforms induces the Lys63-linked polyubiquitination of IRAK1. *Biochem J* **409**, 43-52.

Schaefer JB, Morgan DO (2011) Protein-linked ubiquitin chain structure restricts activity of deubiquitinating enzymes. *J Biol Chem* **286**, 45186-45196.

Schmukle AC, Walczak H (2012) No one can whistle a symphony alone - how different ubiquitin linkages cooperate to orchestrate NF-κappaB activity. *Journal of Cell Science* **125**, 549-559.

Walczak H, Iwai K, Dikic I (2012) Generation and physiological roles of linear ubiquitin chains. *BMC Biol* **10**, 23.

Weeks SD, Grasty KC, Hernandez-Cuebas L, Loll PJ (2009) Crystal structures of Lys-63-linked tri- and di-ubiquitin reveal a highly extended chain architecture. *Proteins* **77**, 753-759.

Xu P, Duong DM, Seyfried NT, Cheng D, Xie Y, *et al.*, (2009) Quantitative proteomics reveals the function of unconventional ubiquitin chains in proteasomal degradation. *Cell* **137**, 133-145.



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