

## Product Data Sheet

Product Name: Substance P

Cat. No.: GC15649

### Chemical Properties

Cas. No. 33507-63-0

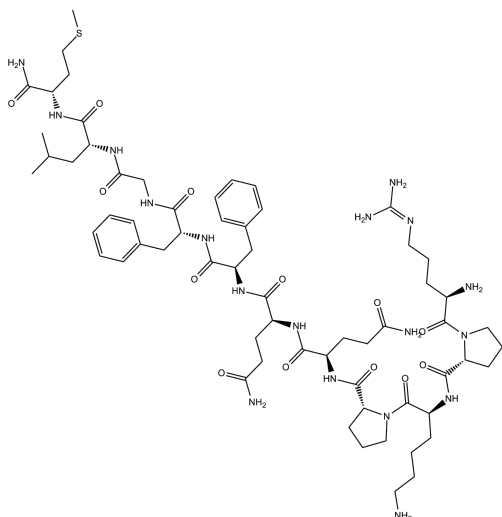
Formula  $C_{63}H_{98}N_{18}O_{13}S$  M.Wt 1347.6

Solubility Soluble to 1 mg/ml in sterile water Storage Desiccate at -20°C

General tips For obtaining a higher solubility, please warm the tube at 37 °C and shake it in the ultrasonic bath for a while. Stock solution can be stored below -20°C for several months.

Shipping Condition Evaluation sample solution : ship with blue ice All other available size: ship with RT, or blue ice upon request.

Structure



### Protocol

#### Cell experiment [1]:

Cell lines NCM460-NK-1R cells

**Caution: Product has not been fully validated for medical applications. For research use only.**

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**Preparation Method** NCM460-NK-1R cells were plated on chamber slides and grown to 50% confluence. Cells were pretreated with Akt inhibitor V (40μM) for 30min and then treated with tamoxifen (10μM) in the presence or absence of Substance P (10nM) for 8h at 37°C. Cells were fixed in 4% paraformaldehyde for 25min and then permeabilized with 0.2% Triton X-100 solution in PBS for 5min. Slides were processed for TUNEL assay.

**Reaction Conditions** 10μM; 8h

**Applications** Substance P treatment inhibited tamoxifen-induced cell death and apoptosis of NCM460-NK-1R cells.

### Animal experiment [2]:

**Animal models** C57BL/6J WT mice

**Preparation Method** 8 mice were injected with streptozotocin (50mg/kg in 0.1 mol/L citrate buffer) by i.p. route once daily for 5 consecutive days to induce diabetes. Blood glucose level of >250mg/dL was used as an inclusion criteria for diabetic mice. Wound experiments were done 8 weeks after diabetes induction. NPH insulin (0.1 to 0.2 units) was administered as needed to prevent weight loss. Animals were anesthetized with i.p. ketamine (100mg/kg) and i.p. Xylazine (10mg/kg). The hair from the back of the mice was shaved, and two, 6-mm full-thickness excisional wounds were biopsied. Tracing of the wound area was done on acetate paper every day to monitor the rate of wound closure up to 10 days after wounding. The wound size was analyzed with ImageJ version 1.46r. Data are presented as percentage of the original wound (day 0). One wound was treated with Substance P (32μg per wound in saline) daily and the other wound was treated with saline daily until day of euthanasia. Animals were sacrificed at day 10 after wounding.

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|              |                                                                                                |
|--------------|------------------------------------------------------------------------------------------------|
| Dosage form  | 32µg/day per wound dissolved in saline for 10 days; topical application                        |
| Applications | Substance P treatment improved wound healing and reduced wound size in a diabetic mouse model. |

### References:

- [1] Koon H W, Zhao D, Zhan Y, et al. Substance P mediates antiapoptotic responses in human colonocytes by Akt activation[J]. Proceedings of the National Academy of Sciences, 2007, 104(6): 2013-2018.
- [2] Leal E C, Carvalho E, Tellechea A, et al. Substance P promotes wound healing in diabetes by modulating inflammation and macrophage phenotype[J]. The American journal of pathology, 2015, 185(6): 1638-1648.

### Background

Substance P, an important neuropeptide neurotransmitter, stimulates phosphatidylinositol turnover with an EC<sub>50</sub> value of 0.36nM<sup>[1]</sup>. Substance P has been widely used in the research of pain regulation, emotion regulation and bone metabolism regulation<sup>[2-3]</sup>.

In vitro, Substance P (10nM) treatment induced Akt phosphorylation at Ser-473 in a time-dependent manner and persisted over the 60-minute incubation period in colonic epithelial NCM460 colonocytes<sup>[4]</sup>. Treatment with 10nM Substance P for 8 hours inhibited tamoxifen (10µM; 8h) induced cell death of NCM460 colonocytes, and cell proliferation was stimulated by treatment with 10nM Substance P for 8h in the absence of tamoxifen<sup>[4]</sup>. Treatment of buffalo fetal fibroblasts (10nM) with Substance P alone resulted in significant cell proliferation and migration in both horizontal and vertical directions within 24 hours<sup>[5]</sup>.

In vivo, topical application of Substance P (32µg/day per wound dissolved in saline) for 10 days improved wound healing and reduced wound size in a diabetic mouse model<sup>[6]</sup>. A single dose of topical Substance P treatment (0.5µg/wound) promoted wound closure and epithelial regeneration within 14 days, thereby enhancing wound healing in a skin full-thickness wound model of mouse<sup>[7]</sup>.

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### References:

- [1] Torrens Y, Beaujouan J C, Saffroy M, et al. Substance P receptors in primary cultures of cortical astrocytes from the mouse[J]. Proceedings of the National Academy of Sciences, 1986, 83(23): 9216-9220.
- [2] Li F X Z, Xu F, Lin X, et al. The role of substance P in the regulation of bone and cartilage metabolic activity[J]. Frontiers in Endocrinology, 2020, 11: 77.
- [3] Humes C, Sic A, Knezevic N N. Substance P's impact on chronic pain and psychiatric conditions —a narrative review[J]. International journal of molecular sciences, 2024, 25(11): 5905.
- [4] Koon H W, Zhao D, Zhan Y, et al. Substance P mediates antiapoptotic responses in human colonocytes by Akt activation[J]. Proceedings of the National Academy of Sciences, 2007, 104(6): 2013-2018.
- [5] Kant V, Mahapatra P S, Gupta V, et al. Substance P, a neuropeptide, promotes wound healing via neurokinin-1 receptor[J]. The International Journal of Lower Extremity Wounds, 2023, 22(2): 291-297.
- [6] Leal E C, Carvalho E, Tellechea A, et al. Substance P promotes wound healing in diabetes by modulating inflammation and macrophage phenotype[J]. The American journal of pathology, 2015, 185(6): 1638-1648.
- [7] Kumar S, Tan Y, Berthiaume F. Neuropeptide substance p enhances skin wound healing in vitro and in vivo under hypoxia[J]. Biomedicines, 2021, 9(2): 222.

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