**BIOLOGICAL ACTIVITY:**

Staurosporine is a very potent universal inhibitor of protein kinases but showing little selectivity, with IC\textsubscript{50} of 6 nM, 15 nM, 2 nM, and 3 nM for PKC, PKA, c-Fgr, and Phosphorylase kinase, respectively.

**In Vitro:** Staurosporine, widely used as a protein kinase C (PKC) inhibitor with a broad spectrum of activity, is an alkaloid isolated from the culture broth of *Streptomyces staurospores*. MC3T3E–1 osteoblasts, exposed to Staurosporine (100 nM) for 12 h, release an amount of LDH (12.4±3.1%) that is similar to that released by the control cells (10.0±2.4%), indicating the relative absence of lytic death, which occurs in necrosis. In addition, treatment with Staurosporine (100 nM) results in morphological changes, characteristic of apoptosis: a bright blue fluorescent condensed nuclei seen through a fluorescence microscope after Hoechst 33258–staining, and a reduction of cell volume.

**In Vivo:** The inhibitory effect of Staurosporine is statistically significant at around Wk 10 of tumor promotion. Although statistically significant inhibition is not obtained with 10 ng of Staurosporine in later weeks of the experiment, a decreasing tendency in the percentages of tumor bearing mice and in average numbers of tumors per mouse is apparent. Thus, Staurosporine slightly inhibits tumor promotion of Teleocidin, even at the dose at which Staurosporine itself induced tumors. Staurosponne (0.05 and 0.1 mg/kg intraperitoneal) attenuates the impaired performance of water maze and passive avoidance tasks, even though the drug administration began 2 weeks after the lesion. Moreover, Staurosporine (0.1 mg/kg) partially reversed the decrease of choline acetyltransferase activity in the fronto–parietal cortex induced by basal forebrain–lesion. These results suggest that Staurosporine attenuates impairment of learning through reversal of damage to cholinergic neurons induced by basal forebrain–lesion.

**PROTOCOL** (Extracted from published papers and Only for reference)

**Kinase Assay:**

MC3T3E–1 cells (2×10\textsuperscript{6} cells/group) are treated with 100 nM Staurosporine for various time periods and lysed in a lysis buffer (EB buffer: 1% Triton X–100, 10 mM Tris, pH 7.6, 50 mM NaCl, 1 mg/mL Aprotinin, 5 mM EDTA, 50 mM NaF, 0.1% 2–mercaptoethanol, and 100 μM sodium orthovanadate). The lysate of the cells is subjected to centrifugation at 12 000 g at 4°C for 30 min. Soluble fraction is collected and incubated with anti–JNK1 antibodies. After incubation on ice for 3 h, 100 μL of a 10% solution of formalin–fixed Staphylococcus aureus is added to the anti–JNK1 immunoprecipitates and further incubated on ice for 1 h. The absorbed immune complex is washed twice with EB buffer and PAN buffer (10 mM PIPES buffer, pH 7.0, 1% aprotinin, 100 mM NaCl). The immune complex is mixed with 2 μg of GST–c–Jun NT\textsubscript{1–79} proteins as a substrate in 30 μL of the reaction buffer containing 2 μM cold ATP, 2 mM DTT, 20 mM MgCl\textsubscript{2}, 2 μCi [γ\textsuperscript{33}–P]–ATP, and 20 mM Tris–HCl, pH 7.5 at 30°C for 20 min. The reaction is terminated by adding 15 μL of 3× SDS–PAGE sample buffer and boiling at 98°C for 5 min. The proteins are separated on 12% SDS–PAGE and transferred onto a nitrocellulose membrane via the semi–dry electrotransfer system. The membrane is immunoblotted with rabbit anti–JNK1 antibodies and horseradish peroxidase conjugated anti–rabbit antibodies to visualize the signals measured by an enhanced chemiluminescence system. The gel is dried under a vacuum, and the phosphotransferase activity...
is visualized by autoradiography and quantified by a PhosphoImager analyzer\(^2\).

**Animal Administration:** Staurosporine is suspended in 0.3% of sodium carboxymethyl cellulose (Rat)\(^4\) [Mice\(^3\)]. Female CD–I mice are used. Various amounts of Staurosporine in 10 μL of acetone are applied to the ears of 8–wk–old CD–I mice. The extent of irritation is expressed as the minimum dose of the compound causing irritation. Induction of HOC in Mouse Skin: Staurosporine in 0.1 mL of acetone is applied to the skin of the backs of CD–I mice, and a crude enzyme extract is obtained from the skin 18 h later. HDC activity is expressed as pmol of CO\(_2\) released per mg of protein per 1 h of incubation. Induction of ODC in Mouse Skin: Staurosporine in 0.2 mL of acetone is applied to the skin of the backs of CD–I mice. After 4 h, a crude enzyme extract is prepared from the epidermis, and its ODC activity is measured. Enzyme activity is expressed as nmol of CO\(_2\) per mg of protein per 30 min of incubation.

**Rats\(^4\)**

Male Kbl Wistar rats (weighing 270 to 310 g) are used. In the group which is given Staurosporine for 2 weeks, the water maze task and Staurosporine administration are started 2 weeks after the BF–lesion, and the passive avoidance task is carried out 4 weeks after the BF–lesion. The rat received Staurosporine at doses of 0.01, 0.03, 0.1, and 0.3 mg/kg (i.p., N=10 in each group for 2 weeks) 30 mm prior to the water maze training sessions and the passive avoidance task acquisition trial. In the group which is given Staurosporine for 4 weeks, the drug is first given 2 weeks after the BF–lesion. The water maze task is carried out 4 weeks after the BF–lesion. The passive avoidance task is carried out 6 weeks after the BF–lesion. The rat received Staurosporine at 0.05, 0.1, and 0.2 mg/kg (i.p., N=10 in each group) once a day for 2 weeks before training, and for 2 weeks after the water maze training sessions and the passive avoidance task acquisition trial. Staurosporine is suspended in 0.3% of sodium carboxymethyl cellulose. The vehicle is administered to the non–lesioned controls and the lesioned controls on the same schedule as the Staurosporine–treated animals.

**References:**


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

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