

Irritating substance extracted from the *Thaumetopoea pityocampa* caterpillar; mechanism of action

M. Lamy, Ph. Vincendeau, G. Ducombs and M. H. Pastureaud

Université de Bordeaux I, Laboratoire de Neuroendocrinologie – ERA 850 CNRS, Avenue des Facultés, F-33405 Talence (France), and Clinique dermatologique, Hôpital Saint-André, F-33075 Bordeaux (France), May 24, 1982

Summary. Hairs of the *Thaumetopoea pityocampa* caterpillar (Lepidoptera) cause cutaneous reactions in men and animals. A soluble substance extracted from the hairs has been shown to cause a reaction in guinea-pig skin, probably caused by mediators released by mast cells. A direct effect of this substance on mast cells has been shown. Degranulation of mast cells was found to be dose-dependant. Heating of this substance greatly reduced its effects. Proteins fractions are currently being extracted and will be submitted to the same tests.

Hairs of the pine processionary caterpillar (*Thaumetopoea pityocampa* Schiff. Lepidoptera) cause cutaneous reactions in men and animals by discharge of a toxic substance¹. The hair is hollow on the inside, with spikes sloping towards its distal end. There are no holes or pores on the hair. The irritating substance can only be obtained by crushing the hair. This suggests that when stinging occurs, the hair is broken in the skin and the substance released^{2,3}. This substance increases the histamine content of various tissues^{4,5}. To investigate the mechanism involved in the cutaneous reaction, we tested the effect of a substance extracted from hairs on the local release of vaso-actives amines and the degranulation of mast cells.

Hairs were prepared from *Thaumetopoea* caterpillars at the last larval stage with an apparatus described elsewhere^{2,6} which is approximatively the same as that used by De Jong for collecting hairs of *Euproctis chrysorrhoea*⁷. Hairs were crushed in physiological saline. The protein content of the resulting solution was measured according to the method of Lowry⁸. Dilutions were made in physiological saline.

The local release of vaso-actives amines was evaluated according to the method of Ovary⁹. Control (physiological saline and spinach extract) and test substances were injected intra-dermally into 6 male albino guinea-pigs. 20 min later, Evans Blue, which is normally retained in the blood stream, was injected i.v. It gave rise to blue areas in places where the vessels were abnormally permeable. The diameters of the blue spots at the site of injection were proportional to the quantity of irritating substance injected.

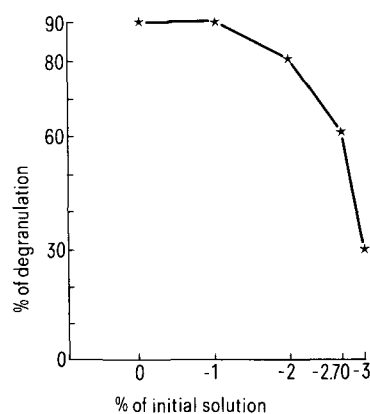
Mouse peritoneal cells – containing mast cells – were collected and washed by centrifugation¹⁰. 0.5 ml of this cell suspension was distributed in test tubes and 0.1 ml of control (physiological saline) or test substance added to each tube. After 20 min incubation at 37 °C, tubes were placed in an ice bath and toluidine blue was added. Unaltered mast cells could be easily distinguished from altered cells which showed a disrupted membrane or granules extruding through the membrane. Degranulation of mast cells was dose-dependent (fig.). Heat inactivation of the extract greatly reduced its effects.

As is shown by the appearance of blue spots, this substance provoked an increase in vessel permeability notably of the

venules of the dermis. This suggested an action of mediators such as histamine, kinins or prostaglandins which are released by mast cells. A direct effect of the tested substance on mouse mast cells was established. This effect was dose-dependent. Similar results have been obtained on *Euproctis chrysorrhoea*¹¹ with other methods.

Chemical analysis of the poisonous hairs of a related caterpillar, *Thaumetopoea wilkinsoni*, reveals the presence of inorganic compounds, carbohydrates, a volatile toxic component, and toxically-active proteins, including enzymes^{12,13}. It is presumed that the composition of the extract of poisonous hairs is similar to that of *Thaumetopoea pityocampa*. This last extract solution is inactivated by heat which suggests that the active element is of a protein nature.

Separation of the proteins extracted from hairs of *Thaumetopoea pityocampa* caterpillars is in progress³. The effect of each protein fraction will be assessed on guinea-pig skin and mouse mast cells. These studies should show whether nonspecific mast cell degranulation is caused by one or several of the proteins.



Percentage of mast cell degranulation by irritating substance of *Thaumetopoea pityocampa* hairs. (Protein content of initial solution = 600 µg/ml).

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