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Kinin-like substances in saliva of larvae of wasps and hornets

A wasp or hornet larva touched on the head emits a drop of saliva which is a gland secretion and is known to contain organic nutrients, particularly carbohydrates (Maschwitz, 1965; Ikan & Ishay, 1966; Ishay & Ikan, 1968). A drop ranged in volume from 0·001–0·010 ml.

Saliva from 2500 larvae of *Vespa orientalis* was collected in a cold atmosphere and stored at −20° until added (0·05 ml) to guinea-pig isolated ileum or rat uterus (0·5 ml) preparations maintained in a 10 ml organ bath filled with either Tyrode solution at 35° or de Jalon solution at 28° respectively. Contractions were recorded with a transducer connected to a polygraph. Saliva was allowed in contact for 1 min and then the preparation was washed twice.

The saliva evoked contraction of both preparations (Fig. 1). Activity was not depressed after pretreatment with lysergic acid, mepyramine maleate or atropine, in quantities sufficient to render the tissues insensitive to 5-hydroxytryptamine, histamine or acetylcholine respectively. There were no signs of change in the level of muscular contraction, even after repetitive injection of saliva into the bath.

The effects of the saliva on microcirculation vessel permeability were examined in non-anaesthetized rabbits (Edery & Grunfeld, 1969). Three animals were injected intravenously via the vena marginales, with 60 mg/kg pontamine sky-blue. 15 min later saliva (max. vol. 0·01 ml) was injected into the depilated skin of the back. Animals were killed 30 min after injection and the inner skin was examined. A dark blue spot appeared at the site of injection of saliva, indicating increasing microcircular vessel permeability. This response was slightly weakened by the above antagonists. Spot diameter varied from 15–25 mm; saline (0·1 ml) caused blueing at the needle site only.

The arterial blood pressure of 6 cats was measured with a Statham physiological pressure transducer connected to a Grass polygraph. Injections of 0·1–0·5 ml saliva in the femoral vein produced a transient fall in arterial blood pressure of 25–50 mm/Hg lasting for 10–120 s and a rise in pulse pressure (10–15 mm/Hg). The fall was little depressed by prior injection of antihistamine.

The activity of the saliva did not change after incubation at 37° for 30 min or after boiling for 5 min but it disappeared after dialysis for 24 h at 4° and after incubation with chymotrypsin, papain or pancreatin, but not trypsin. It was not diminished on the ileum in the presence of morphine sulphate (0·03–0·3 mg/ml) suggesting that prostaglandins E_1 and E_2 were not present.

Saliva from larvae of several hornet and wasp species (*Vespa crabro, Paravespula vulgaris, P. germanica, Dolichovespula saxonica, D. media* and *Polistes gallicus*) was examined in the same way. All samples had similar effects on smooth muscle contraction, microcircular vessel permeability, and blood pressure.

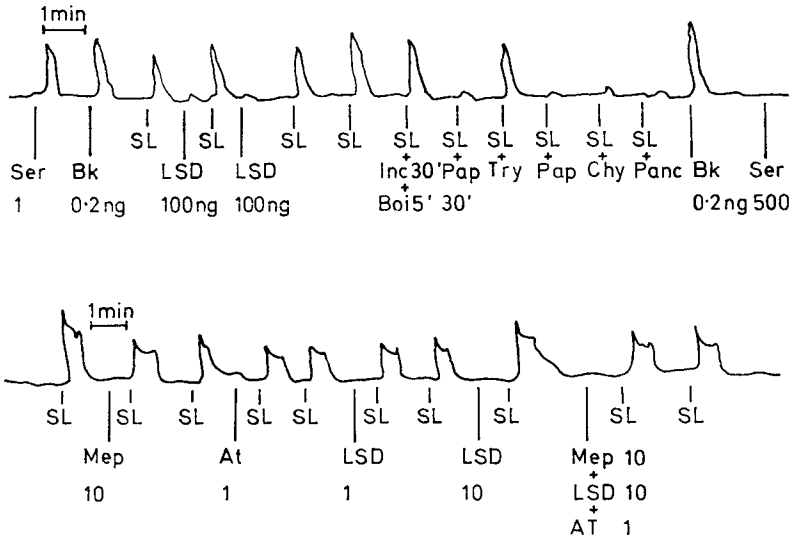

FIG. 1. Upper trace: Effects of larval saliva (0·5 ml) on rat uterus suspended in an organ bath with atropinized de Jalon solution before and after incubation with 5-HT, bradykinin and LSD and proteolytic enzymes. Saliva (SL) was incubated for 30 min at 37° with papain (Pap), trypsin (Try), chymotrypsin (Chy) or pancreatin (Panc) and subsequently boiled for 5 min and tested. All incubations were made at a pH adequate for enzyme activity. Lower trace: Contractions of guinea-pig ileum produced by saliva (0·05 ml) before and after treatment with antagonists of histamine (mepyramine malate), acetylcholine (atropine), and 5-hydroxytryptamine (lysergic acid diethylamide).

Ser = 5-hydroxytryptamine, Bk = bradykinin, LSD = lysergic acid diethylamide, At = atropine, Mep = mepyramine maleate. Drug doses in lower trace and 5-HT in upper trace all in μg.

The above evidence suggests the larval saliva contains kinin-like substances. The venom of adult hornets, *Vespa orientalis*, contains active substances that are attributed to kinins (Edery & Ishay, 1965; Edery, Ishay & others, 1971). Larval saliva and adult venom of the same species produce similar physiological effects. Kinins, that are potent smooth muscle stimulants, occur in venom of several wasp species (Jaques & Schachter, 1954; Bhoola, Calle & Schachter, 1961; Prado, Tamura & others, 1966). Similar substances occur in larvae faeces (Bergmann, Ishay & Kidron, 1966).

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