

varies in the same way as the calcium peak, this indicating a relationship between the 2 elements.

**Discussion.** The results reported above show that orally given non-steroid anti-inflammatory drugs can reduce the lesion induced by potassium permanganate. In fact, both the diameter and weight of granulomas resulting from the s.c. injection of potassium permanganate are reduced in treated rats in comparison to the controls. Indomethacin appears to be more effective than diflunisal under these

experimental conditions. Interestingly, both drugs greatly reduce the calcium deposit in the granuloma. The decrease in calcium content is more pronounced than weight decrease. Furthermore, the use of X-ray fluorescence as a tool for the study of element contents in normal and pathological tissue appears promising since it gives a lot of information about many elements at the same time without loss of material. In this context a detailed distribution study of metabolically related elements like calcium and phosphorus would be of particular relevance.

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## Toxicity of some insecticides for crowded and isolated nymphs of *Grylloides sigillatus* Wlk. (Orthoptera: Gryllidae)

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**Summary.** 6 insecticides; chlordane, malathion, fenitrothion, pyrethrum, rotenone and sevin, were screened against *Grylloides sigillatus* Wlk. reared under crowded and isolated conditions. Chlordane was found to be most toxic, followed by malathion, fenitrothion, pyrethrum, rotenone and sevin. Insects reared under crowded conditions were more susceptible to insecticides than insects reared under isolated conditions.

Several entomologists have contributed a great deal to studies on the effects of population density upon fecundity, fertility, nymphal duration and adult emergence. Khan and Aziz<sup>2</sup> noted that the rate of development of male and female hoppers of *Oedaleus abruptus* under crowded conditions was slower than in individuals in isolation. Singh et al.<sup>3</sup> recorded similar observations on the nymphal duration of *Atractomorpha crenulata* Fabr. Rizvi et al.<sup>4</sup>, on the contrary reported that the nymphs of *Hieroglyphus nigroripletus* developed at a faster rate under crowded conditions. Not much information is, however, available on the effects of insecticides on nymphs of *Grylloides sigillatus* when reared under crowded conditions. The only reference is that

of Hartman<sup>5</sup> on the insecticidal action of carbamates on the eggs of the house cricket. In view of this the present investigation was conducted.

**Materials and methods.** The laboratory culture was raised from 50 adults collected in big muslin-topped glass jars (75 × 25 cm) at a temperature 28 ± 2 °C. Some moist soil and twigs were provided at the bottom of the jar to give the insects natural surroundings for laying eggs. The insects were provided daily with wheat soaked in milk and sugar as food.

For the experiments, 60 freshly hatched nymphs were placed individually in glass jars (18 × 8 cm). The open end of each glass jar was covered with a muslin cloth and tied

Effect of insecticides when nymphs were reared under isolated (i) and crowded (c) conditions

Insecticide	Concentration (%)	Mortality (%)		Survival (%)		No. fledged into adult		Male	Female
		i	c	i	c	i	i	c	c
Chlordane	0.005	100	100	Nil	Nil	–	–	–	–
Malathion	0.005	80	100	20	Nil	3	3	–	–
Fenitrothion	0.005	70	90	30	10	10	8	4	2
Pyrethrum	0.005	20	40	80	60	26	22	16	20
Rotenone	0.005	10	30	90	70	29	25	20	22
Sevin	0.005	Nil	20	100	80	32	28	23	25



with a rubber band. Similarly, at the same temperature, 1st instar nymphs were kept in 6 glass jars (30 × 10 cm) in batches of 40. The crickets were supplied with fresh food daily. The 6th instar nymphs were taken out of the jars for testing.

6 insecticides, namely chlordane, malathion, fenitrothion, pyrethrum, rotenone and sevin were tested (using technical grades). For each insecticide a solution at 1 concentration (0.005%) was prepared with acetone as solvent. Using one ml. of solution, a film of each insecticide was prepared on a round filter paper placed on the bottom of a 500 ml. glass beaker.

After the filter papers had been dried under a ceiling fan for 15 min, 10 nymphs were released in each beaker for 24 h at  $28 \pm 2^\circ\text{C}$ .

The beakers were covered with muslin cloth fastened by rubber bands to prevent the escape of the insects. It was ascertained that the insects were in contact with the treated surface all the time and did not crawl on the walls of the beaker. Each concentration was replicated 6 times for insects reared under crowded conditions as well as for nymphs reared in isolation. A separate check was run for each insecticide using acetone alone. For the assessment of toxic effect, mortality counts were taken 24 h after the release of insects in the beaker. The nymphs were ex-

amined individually with the naked eye; moribund insects were taken as dead. Mortality in the controls ranged from 0 to 2%. Nymphs which survived were transferred to their respective glass jars and observations were recorded on adult emergence.

**Results and discussion.** It is evident from the table that insects reared under crowded conditions were more susceptible to all the insecticides than those reared under isolated conditions. Among the insecticides chlordane was found to be the most toxic because the mortality rate was 100% with 'crowded' as well as with 'isolated-reared' insects. Sevin was found least toxic because the mortality rate was nil in insects reared in isolation, while 20% mortality was observed in insects reared under crowded conditions. The decreasing order of the toxicity of the insecticides was: chlordane > malathion > fenitrothion > pyrethrum > rotenone > sevin.

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## Diabetic syndrome in the Chinese hamster induced with monosodium glutamate<sup>1</sup>

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**Summary.** Neuronal necrosis in the arcuate and ventromedial hypothalamus regions is easily induced in 1-day-old Chinese hamsters by the administration of monosodium glutamate (MSG). New-born Chinese hamsters injected with MSG showed no sign of obesity, even when grown up, but apparently developed a diabetic syndrome.

Since the first report by Olney<sup>3</sup> on the neuropathogenic action of monosodium glutamate (MSG) in mice, this amino acid has fascinated many workers in the fields of neurology and endocrinology. There seems to be almost universal agreement that neuronal necrosis is provoked in the preoptic and arcuate nuclei and median eminence regions of MSG-treated mice with subsequent development of obesity<sup>4,5</sup>.

During our metabolic and pathological studies of the Chinese hamster treated with MSG, we confirmed occurrence of neuronal necrosis in the brain of the treated animals essentially similar to those described by Olney<sup>3</sup> in mice. In contradiction to the general agreement, however, new-born Chinese hamster injected with MSG showed no sign of obesity, even when grown up, but apparently developed a diabetic syndrome. We describe here the brain lesions and diabetic syndrome found in our experiment. To examine the acute effects of MSG on the brain, 11 litters of 1-day-old Chinese hamsters (random bred in our laboratory) were s.c. injected with the amino acid at a dose of 4 mg/g b. wt or a corresponding volume of 0.85% saline (control). 1–48 hours after the treatment, they were anesthetized and sacrificed for the study. Paraffin sections of the brain were stained with Mayer's hematoxylin and eosin and examined by light microscope.

Histological changes in the brain were observed 1 h after injection of MSG. The majority of neurons around the 3rd

ventricle showed enlargement of nuclei. After 6 h, necrotic neurons with pyknotic nuclei were frequently observed. Loss of neurons was noticeable. Almost the whole area of the arcuate nucleus was involved, and the lesion extended to the ventromedial nucleic region (figure 1). Also, many neurons in the cerebral cortex underwent necrotic change. No histological change was found in the brains of control hamsters.

For the study of chronic effects, MSG was s.c. injected to 82 new-born Chinese hamsters at a dose of 4 mg/g b. wt daily during the first 3 days of the neonatal stage, and 73 hamsters were treated with a corresponding volume of saline in a similar way. The MSG-treated (n=70) and control (n=68) hamsters were weaned at 3 weeks of age. They were housed in plastic cages, given free access to food and water, and maintained on a 16-h light schedule. Thus, we closely followed up these 138 animals from 3 weeks through 30 weeks of age. All animals were weighed weekly. Urinary glucose was examined by Tes-tape and urinary ketones by Ketostix weekly during the period of experiment.

The first occurrence of glycosuria (3–4 plus) was noticed in 6 out of 70 MSG-treated hamsters at 4 weeks of age. Then, the number of animals with glycosuria increased with age in the treated group. During the period from 13 weeks through 30 weeks of age, heavy glycosuria was demonstrated in 94.3–95.7% of the treated hamsters. However, no