NICOTINAMIDE CONTENT OF INSECTS*

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Surprisingly little is known of the vitamin content of insects and consequently, as part of an investigation of the function and metabolism of insect tissues, we have determined the nicotinamide content of a wide range of adult insects collected locally in the Wellington district.

Nicotinamide was extracted by acid hydrolysis and concentrations determined by the *Lactobacillus arabinosus* assay method (Snell and Wright 1941). Growth of the microorganism was measured by both optical density and acid production.

Table 1

Nicotinamide* content of healthy adult specimens of whole insects

Insect	Nicotinamide Content (μg/g fresh wt.)	Insect	Nicotinamide Content (μg/g fresh wt.)
Aedes aegypti (mosquito)	55	*Hemideina thoracica* (tree weta)	28
Apis mellifera (honey bee)	40	*Melampsalta rugiceps* (cicada)	22
Argosarchus horridus (stick insect)	36	*Orthodera ministralis* (praying mantis)	17
Artystona rugiceps (beetle)	72	*Oxycaenus* sp. (ghost moth)	19
Bombus terrestris (bumble-bee)	71	*Persectania compositor* (army-worm moth	
Caedicia simplex (katydid)	49		81
Cilibes otagoensis (compost beetle)	48	*Prionoplus reticularis* (huhu beetle)	60
Cutelia sedilotti (cockroach)	36	*Uropetala carovei* (dragon-fly)	130

* Results actually give nicotinamide+nicotinic acid content of the sample, but it is known that very little nicotinic acid occurs in animal tissues (Sebrell and Harris 1954).

The results of these experiments are given in Table 1. For comparative purposes we have listed the results of other workers in Table 2. Table 3 indicates the nicotinamide contents of various tissues isolated from the insects.

Nicotinamide is a constituent of the pyridine nucleotide coenzymes and the acid hydrolysis method employed in this investigation cleaves such coenzymes resulting in the release of nicotinamide. It has been noted by Schlenk (1951) that

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microbiological assays for nicotinamide have given values which go very little beyond that which can be accounted for by the nicotinamide constituent of the coenzymes. In consequence, the values for nicotinamide content reported here give an insight into the pyridine nucleotide levels of these insects.

TABLE 2

PREVIOUSLY REPORTED NICOTINAMIDE CONTENTS OF INSECTS

Insect	Nicotinamide Content		Reference
Aedes aegypti (mosquito)	52	(μg/g fresh wt.)	Kozloff and Pijoan (1946)
Apis mellifera (adult hive bees)	40·8		Haydak and Vivino (1943)
Corcyra cephalonica (rice moth)	60–100		Sundaram and Sarma (1953)
Dolichoderus sp. (red ant)	4·7	(mg/100 g dry wt.)	Spector (1956)
Drosophila virilis (fruit-fly larvae)	21·0		Spector (1956)
Periplaneta americana (cockroach)	12·0		Spector (1956)
Zootermopsis sp.	17·5		Spector (1956)

As can be seen from Table 1 there is a considerable variation in nicotinamide content among the insects studied. The highest value recorded is for the dragon-fly which has a high proportion of metabolically active wing muscle in relation to its total weight, while the lowest value is that for the normally relatively immobile praying mantis which is a poor flyer. Similarly, while the values for the mandible and leg muscles of insects shown in Table 3 are similar on a molar basis to those quoted by Glock and McLean (1955) for rat heart muscle, bumble-bee wing muscle, a much more active tissue, has almost twice this concentration. These findings are consistent with the reported structural and metabolic differences between different

TABLE 3

NICOTINAMIDE CONTENT OF VARIOUS INSECT TISSUES

Insect	Tissue	Nicotinamide Content (μg/g fresh wt.)
Bombus terrestris (bumble-bee)	Wing muscles	161
Caedicia simplex (katydid)	Leg muscles	40
Gymnoplectron edwardsii (cave weta)	Leg muscles	89
Hemideina thoracica (tree weta)	Mandibular muscles	61
	Ileum	55
Orthodera ministralis (praying mantis)	Ovary and eggs	48
	Fat-body	9

insect tissues and between insects which rely to differing extents on flight as a means of locomotion (Kitto and Briggs 1962*a*, 1962*b*,1962*c*; Ramsay and Kitto 1965; Zebe and McShan 1959).

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