THE CATALASE CONTENT OF LUMINOUS AND NON-LUMINOUS INSECTS COMPARED[1]

ACCORDING to Dubois[2] and others the production of light by luminous organisms is an oxidative process. If this is true then it would seem that oxidation should be correspondingly more intense in luminous insects than in non-luminous insects. It has been shown that the catalase content of the different muscles of animals is proportional to the amount of oxidation in these muscles and that the catalase is increased or decreased under the same conditions under which oxidation is increased or decreased.[3] This and similar evidence would seem to indicate a close relationship between the catalase content of a tissue and the amount of oxidation in that tissue If oxidation is more intense in luminous than in non-luminous insects then the catalase content per unit of weight of luminous insects should be greater than that of non-luminous insects. The object of this investigation was to determine if the catalase content per unit of weight is greater in a luminous insect, such as the firefly (Photinus), than it is in non-luminous insects, such as moths, butterflies, honey-bees and bumble-bees.

Method.—After the insect was weighed it was ground up with sand in a mortar. This ground material was added to 50 c.c. of hydrogen peroxide in a bottle and as the oxygen gas was liberated from the hydrogen peroxide by the catalase it was conducted through a rubber tube into an inverted burette previously filled with water. In this way the amount of oxygen liberated in ten minutes from 50 c.c. of hydrogen peroxide was collected. The volume of oxygen was read off directly from the burette, where it had displaced the water. After this volume had been reduced to standard atmospheric pressure the resulting volume was taken as a measure of the catalase content of the insect. Knowing the weight of the insect, the amount of catalase per 30 milligrammes of material was calculated. The calculation was made on the basis of 30 milligrammes of material, because it was found that three of the fireflies used weighed approximately 30 milligrammes. The hydrogen peroxide was prepared by diluting commercial hydrogen peroxide with an equal volume of distilled water. A full description of the method may be found in a previous publication.

Experiments.—Three fireflies previously ground up in a mortar with sand were introduced into a bottle containing 50 c.c. of hydrogen peroxide and the amount of oxygen liberated in 10 minutes was determined. Ten such determinations were made with an average of 118 c.c. of oxygen per 30 milligrammes of firefly. Similarly a moth ground up in sand was introduced into 50 c.c. of hydrogen peroxide and the amount of oxygen liberated determined. The average amount of oxygen liberated by moths was 8 c.c. of oxygen per 30 milligrammes of material. Determinations were also made using honey-bees, bumble-bees, and butterflies. The amount of oxygen liberated in none of these determinations exceeded 25 c.c. of oxygen per 30 milligrams of material.

Conclusions.—The catalase content of a luminous insect where oxidation is presumably more intense is greater than that of a non-luminous insect where oxidation is less intense.

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[1] From the Physiological Laboratory of the University of Illinois. From experiments carried out at Nela Research Laboratory.

[2] Dubois, "Mécanisme intime de la production de la lumière chez les organismes vivants," *Soc. Linneenne de Lyon, Imprimerie* A. Rey.

[3] Burge, *The American Journal of Physiology*, Vol. XLI., No. 2, August, 1916.

EFFECT OF SMELTER GASES ON INSECTS[1]

IT is often claimed that the waste gases, particularly sulphur dioxide, thrown off during the process of smelting copper, lead and some other ores, have a very decided influence on the number of insects in the vicinity of the smelters. Some believe that few if any

[1] Contribution from the laboratories of the American Smelting and Refining Co., department of agricultural investigations.