Table 1. Effect of *p*-nitrophenol (pNP) on aerobic phosphorylation and lactic acid formation by guinea pig brain homogenates.

Concn.	Q_{O_2}	Q_P	$Q_{lactate}$
Expt. No. 1			
Control	18.1	− 4.0	6.8
$10^{-4}M$ pNP	20.2	4.0	8.6
$2 \times 10^{-4}M$ pNP	18.1	10.4	10.6
Expt. No. 2			
Control	17.7	− 16.8	10.7
$10^{-4}M$ pNP	20.3	− 5.8	11.0
$2 \times 10^{-4}M$ pNP	21.3	6.9	14.2
Expt. No. 3			
Control	18.0	− 11.6	13.2
$5 \times 10^{-5}M$ pNP	20.5	− 8.2	14.0
$10^{-4}M$ pNP	21.3	− 0.3	15.8
$2 \times 10^{-4}M$ pNP	20.5	9.8	18.2

enate and was corrected for the salt content of the medium. Each vessel contained 35 to 45 mg (dry weight) of tissue.

The effect of the Lipo-Adrenal Cortex, which is a cottonseed oil preparation, was determined by adding the desired volume of this material to the fluid in the vessel. Control vessels contained an equal volume of the cottonseed oil vehicle. In order to assess the significance of our results and to compare them with those of Terner, we also studied the influence of *p*-nitrophenol (pNP). This was an Eastman Kodak Company product that was recrystallized twice from water.

Q_{O_2} and $Q_{lactate}$ are the standard metabolic quotients. For purposes of convenience, aerobic phosphorylation has been expressed as Q_P. This represents microliters of H_3PO_4/mg (dry weight)/hr, according to which 1 μmole of P represents 22.4 μl. A negative value in Q_P represents disappearance of inorganic P from the medium, and a positive value, liberation of inorganic P from organic substrate.

Table 2. Effect of Lipo-Adrenal Cortex on aerobic phosphorylation and lactic acid formation by guinea pig brain homogenates.

Lipo-adrenal cortex (ml/4 ml)	Q_{O_2}	Q_P	$Q_{lactate}$
Expt. No. 1			
0	17.0	− 8.6	11.3
0.05	15.4	− 8.7	11.1
0.1	14.5	− 4.1	11.6
Expt. No. 2			
0	19.9	− 6.4	13.1
0.05	17.0	− 3.1	12.7
0.1	14.6	0.9	14.7
Expt. No. 3			
0	15.9	1.3	6.6
0.1	13.9	3.5	6.8
Expt. No. 4			
0	17.3	− 10.1	13.2
0.1	15.2	− 2.4	15.1
0.2	13.2	1.5	15.2
Expt. No. 5			
0	15.6	− 11.0	10.7
0.2	11.5	0	12.7
Expt. No. 6			
0	15.8	− 1.2	6.8
0.2	11.6	5.5	8.8

In confirmation of the results reported by Terner (*6*), Table 1 shows that pNP stimulates respiration and inhibits aerobic phosphorylations. Effective concentrations range from $5 \times 10^{-5}M$ to $2 \times 10^{-4}M$. Aerobic glycolysis is stimulated by $2 \times 10^{-4}M$ pNP, and in 2 of 3 experiments by $10^{-4}M$ pNP. The degree of stimulation is, roughly, a function of the inhibition of aerobic phosphorylation. It is apparent from experiment 2, however, that aerobic phosphorylation can be markedly inhibited without significant change in aerobic glycolysis. In most of our experiments, the controls showed higher phosphorylation and glycolysis than Terner reported. The reason for these discrepancies is not apparent; they may be due to the size or strain of guinea pig used.

The effect of Lipo-Adrenal Cortex is indicated in Table 2. Concentrations as low as 0.05 ml of the cottonseed oil preparation in a final volume of 4 ml may inhibit aerobic phosphorylation. The inhibition is considerably more marked with 0.1 and 0.2 ml, and, in most experiments, is accompanied by small but significant increases in aerobic glycolysis, 12 to 30 percent. As with pNP, inhibition of aerobic phosphorylation is not always accompanied by increased glycolysis. By comparison of Tables 1 and 2, it can be seen that the degree of stimulation of glycolysis by pNP and Lipo-Adrenal Cortex is essentially the same for the same degree of inhibition of aerobic phosphorylation. This suggests a very direct relationship between these two phenomena.

Unlike pNP, Lipo-Adrenal Cortex inhibits respiration. This inhibition did not exceed 26 percent in any of the experiments reported here. With whole cell preparations, where smaller amounts of tissue and lower concentrations of Lipo-Adrenal Cortex were effective, stimulation of glycolysis was observed without any inhibition of respiration (*4*). This suggests that the factor affecting glycolysis may be different from that which influences respiration. Unpublished experiments (*11*) on the fractionation of Lipo-Adrenal Cortex indicate that these factors can be separated.

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Tergal and Cercal Secretion of Blatta orientalis L.

A greyish viscous secretion (Fig. 1, bottom) accumulates on the terminal abdominal segments of adult females and nymphs of both sexes of *Blatta orientalis* (*1*) and nymphs of *Nyctibora lutzi* Rehn and Hebard (*2*), and on the cerci of nymphs of *Blattella germanica* (L.) (*3*).

We and George Riser, formerly of this laboratory, observed that this mucouslike secretion accumulated on the cerci and terminal abdominal segments of both sexes of nymphs of the following oviparous species of cockroaches, particularly when the insects were isolated or when small numbers were kept together in a large container: *Blattella germanica, B. vaga* Heb., *Periplaneta americana* (L.), *P. brunnea* Burm., *P. australasiae* (Fab.), *Supella supellectilium* (Serv.), *B. orientalis, Parcoblatta pensylvanica* (Deg.), *Neostylopyga rhombifolia* (Stoll), *Eurycotis floridana* (Walk.), and *Ectobius livens* (Turt.) (*4*). We have not found the secretion on isolated nymphs of the viviparous species *Diploptera dytiscoides* (Serv.) or on the following false ovoviviparous species: *Blaberus craniifer* Burm., *Pycnoscelus surinamensis* (L.), *Leucophaea maderae* (Fab.), and *Nauphoeta cinerea* (Oliv.).

In *Blatta orientalis,* the material is secreted by the cerci and by glandular cells in tergites 6 and 7. We removed the cerci of oriental cockroach nymphs, and the secretion built up quickly on the tergites.

We collected secretion weekly from isolated nymphs and, after several months, had accumulated enough for analysis. The dried secretion was tan-colored and amorphous. It became soft and moist at 166°C and began to decompose by charring at approximately 205°C. It

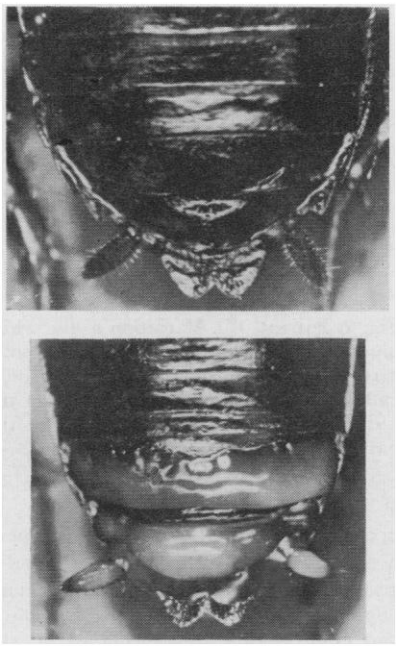

Fig. 1. Terminal, dorsal abdominal segments of adult females of *Blatta orientalis* (×4.6). (Top) Specimen from crowded culture has very little secretion on the tergites and cerci. (Bottom) Isolated virgin 2 weeks old accumulated a large amount of cloudy secretion on the sixth and seventh tergites and the cerci. The clear fluid on the supra-anal plate and around the bases of the cerci was probably exuded from the anus when the insect was anesthetized with CO_2. [Photographs by E. R. Willis]

was soluble in water and insoluble in petroleum ether.

The analysis of this material was as follows: An estimated 10 percent by weight of the dry sample was combined carbohydrate as detected by the anthrone reaction. A negative test for free sugars as reducing sugars was obtained using triphenyltetrazolium chloride. No reducing sugar was present after hydrolysis, but a polysaccharide was indicated by its reaction with aniline phthalate reagent. Chlorides and phosphorous were present qualitatively in trace amounts, further indicating the inhomogeneity of the sample. There was an average of 1.90 percent ash. Averages of duplicate elemental analyses gave the following: 14.30 percent nitrogen, 45.85 percent carbon, 7.21 percent hydrogen, and 0.45 percent sulfur.

About 90 percent of the sample was calculated to be protein. The following amino acids, qualitatively identified by paper chromatography, were present in the protein hydrolyzate: aspartic acid, glutamic acid, serine, glycine, tyrosine, alanine, methionine, leucine (isoleucine?), proline, and lysine. If one assumes that the entire amount of sulfur was found in methionine, since no cystine was present, then 2.1 percent methionine was present. This order of magnitude was indicated in the methionine spot on the two-dimensional paper chromatogram. Four percent of the total nitrogen existed as the free amino acid glycine and an unidentified free di- or tripeptide, as estimated by two-dimensional paper chromatography.

The function of the secretion is unknown; the significance, if any, of the absence of this material in viviparous and false ovoviviparous cockroaches is not understood. Stock and O'Farrell (*3*) suggested that in *Blattella germanica* the secretion may help keep the young nymphs together in loose aggregations; but our observations of colonies of cockroaches that secrete this material do not support this idea. Although we have seen cockroaches in aggregates, we have never seen any form of "webbing" or fibers that might tend to keep the insects together.

The fact that the material accumulates rapidly on the backs of isolated individuals (Fig. 1) indicates that in crowded cultures (where the secretion is rarely seen) the secretion is either rubbed off or perhaps eaten off by the insects. The oriental cockroach is capable of eating the material despite its viscous nature. On 9 May 1952, Edna Roth and Marc Roth observed a newly emerged adult of *Blatta orientalis*, which had been isolated for several weeks as a nymph, eat its own secretion and exuvia. If a type of trophallaxis exists among some species of cockroaches, whereby nymphs eat this material off each other, it is conceivable that the secretion, high in protein, could serve as a supplemental food.

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13 October 1955

Distribution of Alpha-Radioactivity in Certain Forest Types

It is known that various types of forests accumulate calcium and other bases in the organic matter layer at the surface of their soils (*1*). In the current study, a similar accumulation was found for alpha-emitting radioactive substances.

Table 1. Vertical distribution of alpha-radioactivity. Units are counts per hour, per square centimeter.

Vertical position in forest	Average	
	Wis.	S. Appalachians
Living leaves of dominant tree	1.74 ± 0.21	4.63 ± 0.51
A_0 layer beneath dominant tree	8.28 ± 0.79	12.68 ± 1.13
A_1 layer of soil	4.32 ± 0.68	3.31 ± 0.39
C layer of soil	1.11 ± 0.10	0.85 ± 0.08

Eighty stands of hardwood and conifer forest in Wisconsin and in the southern Appalachian region were examined in 1953 and 1954 for alpha-radioactivity by the scintillometer method of Ockerman and Daniels (*2*).

Analyses were made of leaves of the dominant trees, of the dead and decomposing litter (A_0 layer) beneath those trees, and of the topsoil (A_1 layer) and subsoil (C layer). All samples were ashed at 600°C for 8 hours, ground to pass 100 mesh, and stored for 2 to 4 weeks before testing. The results are presented as counts per hour, per square centimeter of the test surface in an "infinitely thick" layer (*3*). The results for individual samples are the averages of duplicate tests, each of which was counted to a statistical precision of ± 20 percent at the 90-percent confidence level by the accumulation of at least 70 counts above background. The background counts themselves did not exceed 0.1 to 0.2 counts/hr cm^2. The variations shown in Table 1 are standard errors.

The vertical distribution of alpha-radioactivity from subsoil to living leaves was similar in all forest types that were examined in both geographic regions, as shown by the average values in Table 1. The subsoil values were remarkably constant in all stands, but the intensity of the maximum activity in the A_0 layer varied greatly in different forest types. Hardwood forests in the prairie-forest border region of southwestern Wisconsin (*4*), which were dominated by species of *Quercus, Carya, Tilia,* or *Acer,* were uniformly low in alpha-radioactivity, while mixed conifer-hardwood or pure conifer forests in northeastern Wisconsin, the Cumberland Mountains, and the Great Smoky Mountains were usually high in activity (Table 2). The highest values in the A_0 layer were found in forests that were dominated by species of *Abies, Picea, Tsuga,* and *Fagus*. All such forests examined were characterized by a relatively low July temperature (67°F or less), a soil acidity of *p*H 5.5 or less, and an A_0 layer of the mor humus type (*1*) which weighed 1.5 kg or more per