The leaf sizes, when compared with carnauba, were found to be relatively small, having a dry weight ranging from 35 to 58 g, which is considerably smaller than the 150-g average for the Brazilian palm. In a group of selected leaves, the free-flaking yields ranged from 1.44 to 2.7 g of wax based on 100 g of leaf. Solvent stripping of these leaves indicated an average total wax yield of 5.81 g/100 g of leaf. The average yield for all leaves on the basis of total solvent extractables was about 4.9 g/100 g of leaf, a surprisingly high yield, almost equivalent to carnauba. However, carnauba wax is nearly totally free-flaking, while the palmetto is only partly so. The only present commercial processes for harvesting wax from this type of palm leaf utilize mechanical methods requiring a free-flaking leaf. The yields by solvent stripping may be of little practical interest at present.

Although this wax could represent a new valuable raw material for some wax-consuming industries, the polish manufacturers would most likely find it of less value than the principal hard vegetable waxes now on the market.

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11 February 1954.

Relationship of Adrenalin to Tissue Sulfhydryl Compounds

U. D. Register and R. G. Bartlett, Jr.

Departments of Biochemistry and Physiology, College of Medical Evangelists, Loma Linda, California

Such treatments as restraint (*1*), exposure to cold (*2*), and exposure to cold and restraint (*3*) have been shown to cause a lowering of the total nonprotein sulfhydryl concentration (TSH) of the liver. Since these several physiological stresses cause a drop in liver TSH, the possibility exists that the stresses elicit a general response which is the more immediate cause of the changes in the concentration of the sulfhydryl compounds. It is known that the sympatho-adrenal mechanism is activated by such stresses as these. To test the possibility of such a mechanism, rats were injected with adrenalin, and the effect on tissue TSH was compared with saline-injected controls (*4, 5*).

Healthy adult female Sprague-Dawley rats were used. The 60 animals were divided into two groups—30 control animals injected with isotonic saline and 30 animals injected with adrenalin. A 1 : 10,000 solution of adrenalin hydrochloride was injected subcutaneously—1.0 ml initially and 0.5 ml each half-hour over a period of 4½ hr. The control animals were similarly injected with isotonic saline. All the animals were stunned with a blow on the head; blood was obtained by cardiac puncture, and the tissues were excised immediately and frozen with dry ice. Ergothioneine (ESH) was determined by a modified method of Hunter (*6*), and TSH was determined by amperometric titration, using a modification of the method of Benesch and Benesch (7).

As is shown in Table 1, subcutaneous injections of adrenalin produced no significant change in the ESH of the blood or the liver or in the TSH of the blood or muscle. However, there was a significant drop in the TSH of the liver and the kidney. The fall in TSH in each of these organs were approximately 35 percent of the control value. It should be noted that, since there was no change in liver ESH, changes in glutathione (GSH) levels must largely account for the changes observed in TSH. These results add credibility to the hypothesis that sympathetic stimulation with adrenal medullary activation is the active agent in the lowering of the concentrations of these compounds in the afore-mentioned general physiological stresses.

The data showing no change in muscle TSH with adrenalin injection are in agreement with the work of Ilín (*8, 9*), who used cats and measured GSH rather than TSH. Zunz and Vesselousky (*10*) obtained an increase in blood GSH concentration after intravenous injections of adrenalin in cats. However, in the present study, no measurable change in erythro-

Table 1. The effect of injection of adrenalin on tissue nonprotein sulfhydryl compounds.

Organ	Sulfhydryl analyzed	Sulfhydryl (μM %)	
		Controls (saline injected)	Adrenalin injected
Whole blood*	TSH†	107 ± 4.4‡ (8)§	112 ± 4.4 (8)
	ESH‖	31 ± 1.6 (8)	34 ± 2.3 (7)
Liver	TSH	799 ± 10.3 (30)	506 ± 8.5 (30)
	ESH	63 ± 1.3 (10)	62 ± 2.1 (10)
Kidney	TSH	444 ± 19.7 (10)	280 ± 11.1 (10)
Muscle	TSH	106 ± 5.1 (10)	101 ± 3.1 (10)

* No significant difference in hematocrits; average, 43.9 percent.
† Total nonprotein sulfhydryl.
‡ Standard error of the mean.
§ The number in parentheses represents the number of animals in each group.
‖ Ergothioneine.

cyte GSH was observed with subcutaneous injections of adrenalin in rats.

The fact that the concentration of these compounds in the liver and the kidney is readily altered by adrenalin, which stimulates the increased metabolism of carbohydrates, suggests the labile role that sulfhydryl groups may play in intermediary metabolism. Several investigators have already shown that GSH is essential in reactions involving the metabolism of glycogen to form energy (*11, 12*). Since a rapid mobilization of glycogen from the liver occurs upon the application of a general physiological stress (which releases adrenalin) or upon the administration of adrenalin, it appears that the diminution in sulfhydryl groups under these conditions may be due partially to their utilization in glycogen breakdown.

Note added in proof: Because the notation TSH may be confused with the thyroid-stimulating hormone, it might well be replaced by NPSH.

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4. This research was supported in whole or in part by the USAF under contract No. AF 18(600)-842, monitored by Alaskan Air Command, Arctic Aeromedical Laboratory, Ladd Air Force Base, APO 731, c/o Postmaster, Seattle, Washington; by USPHS grant No. M-656; and by the Williams-Waterman Fund of the Research Corporation, New York.
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8 February 1954.

Action of T_2r^+ Bacteriophage on Host-Cell Membranes

Leonard F. Barrington* and Lloyd M. Kozloff

Department of Biochemistry, University of Chicago

Weidel has shown in studies with bacterial membrane preparations that the interaction of intact T_2r^+ bacteriophage with the host-cell membranes results in a disintegration of the membranes (*1*). However, there has been no quantitative information concerning the liberation of nonsedimentable material from the host (cell membranes).

Escherichia coli, strain B, was grown with aeration to a concentration of 1.4×10^9 cells per milliliter on a synthetic glucose-salt medium, with 7.7 atom percent excess N^{15} $(NH_4)^+$ as the nitrogen source. From this culture, a cell-membrane suspension was prepared and isolated according to the procedure of Weidel. The preparation was free of viable cells and moved as a single boundary in both the ultracentrifuge and the electrophoresis apparatus, as indicated by Weidel, but differed somewhat from his preparation. The sedimentation constant, 2300 *S*, differed from his value of 6500 *S*; the electrophoretic mobility was -7×10^{-5} cm^2/v sec at *p*H 6.72, $\Gamma/2 = 0.2$, while Weidel reported a value of -10×10^{-5} cm^2/v sec at *p*H 7.0, $\Gamma/2 = 0.1$; the elemental analysis showed an N/P ratio of 10, compared with his reported ratio of N/P of 11.

Table 1. Results of T_2r^+—*E. coli* B membrane interaction.

Expt.	T_2r^+ infective units introduced per membrane	T_2r^+ units adsorbed per membrane	Percentage of membrane N-nonsedimentable*	Percentage of T_2r^+ N-nonsedimentable†	Membrane N made nonsedimentable per T_2r^+ adsorbed (10^{-15} mg)
1	2.5	2.48	4.2	17.3	101
2	2.5	2.48	3.3	38.2	87
3‡	2.5	1.40	1.3	15.7	61
4	5.0	4.95	7.7	19.1	98
5	11.25	11.0	15.0	34.7	86
6§	187.5	185.5	73.8	13.0	29

* Based on N^{15} determinations and corrected for small amount of nonsedimentable N in original membrane suspension.

† T_2r^+ N by difference, based on total N and N^{15} determinations.

‡ System contained $9 \times 10^{-2} M$ Ca^{++}.

§ System contained $6 \times 10^{-4} M$ Ca^{++}.

Ninety-nine percent of both added T_2r^+ and added T_6r^+ were adsorbed by these membranes as determined by plaque count of free phage before and after incubation with the membranes. In the study of the release of nonsedimentable N, only T_2r^+ bacteriophage was used.

Unlabeled T_2r^+ bacteriophage and the bacterial membranes were incubated at 37°C for 150 min in an isotonic phosphate buffer, *p*H 7.0 ($\Gamma/2 = 0.16$). Samples were withdrawn for assay of free phage by plaque count, and the incubation samples were centrifuged for 2 hr in the cold at 18,000 *g*. Such conditions of centrifugation are capable of completely sedimenting the original virus particles and the membranes. The final supernatants were assayed for total nitrogen and for N^{15}.

Analyses of the samples indicated that membrane nitrogen is converted into a nonsedimentable form by virus-membrane interaction in amounts proportional to the ratio of virus particles to membranes.

Earlier findings, with intact bacterial cells, have shown that virus material is also made nonsedimentable by interaction with bacteriophage (*2–4*). Hershey

* Aided by grants from the National Foundation for Infantile Paralysis and from the Wallace C. and Clara A. Abbott Memorial Fund of the University of Chicago.