Sugars with electrophoretic mobility in borate buffer of galactose, mannose, and glucose were identified in hydrolysates of wound repair tissue.

1. Kao, K. T. T., Boucek, R. J., Noble, N. L., *J. Gerontol.*, 1957, v12, 153.
2. Robertson, W. V. B., Hinds, H., *J. Biol. Chem.*, 1956, v221, 796.
3. Slack, H. G. B., *Biochem. J.*, 1958, v69, 125.
4. Schilling, J. A., Milch, L. E., PROC. SOC. EXP. BIOL. AND MED., 1955, v89, 189.
5. Dische, Z., *J. Biol. Chem.*, 1947, v167, 189.
6. Shetlar, M. R., Shetlar, C. L., *Fed. Proc.*, 1958, v17, 310.
7. Boas, N. F., *J. Biol. Chem.*, 1953, v204, 553.

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Acute Effect of Psychologic Stimuli upon Plasma Non-Esterified Fatty Acid Level.* (24676)

MORTON D. BOGDONOFF, E. HARVEY ESTES, JR. AND DAVID TROUT
(Introduced by E. A. Stead)
Dept. of Medicine, Duke University Medical Center, and Vet. Admin. Hospital, Durham, N. C.

Several recent studies have pointed up the important role of non-esterified fatty acids (NEFA) as major transport form of plasma lipid(1,2,3). This segment of plasma lipid undergoes rapid turnover (half-life of approximately 2 minutes)(3), and is promptly altered by administration of such substances as glucose(1,2,6), glucagon(5), insulin(4,6), epinephrine(1,2), and heparin(2). Lability of this lipid fraction provided an opportunity to study the relationship of fat metabolism to acute alterations in affect state within the structure of a short-term, controlled experiment. Other serum lipid fractions varied in response to changes in life-situational patterns, but these studies were usually conducted over long periods of time(7,8,9). The results herein reported clearly indicate that acute alterations in emotional arousal had a distinct effect upon fat homeostasis.

Methods and procedures. Four volunteer subjects (medical students) were each asked to report in early morning in fasting state. They were informed that only a single needle was to be inserted and that samples were to be drawn during sleeping and waking periods during the morning. #18 Cournand needle was placed in antecubital vein under procaine anaesthesia, and the first sample drawn about 10 minutes later. The room was darkened; the subject was asked to relax completely and to sleep if possible. Samples were drawn at approximately 30 minute intervals for one to 2 hours. Then the lights were turned on and a non-directed, light conversation was carried on between various persons. After 15 to 30 minutes, blood was again withdrawn, and all experimenters except one, excused themselves for various reasons. The remaining experimenter engaged the subject in casual conversation, which was quickly focused upon areas of personal conflict, anxiety, anger, and hostility, uncovered during the interview. All subjects became more or less heatedly involved in conversation, all becoming restless, showing changes in facial expression and some changes in skin color. Samples were obtained during this period by another member of the experimental team, who entered only for the period required for obtaining the sample. The conversation was terminated by reentry of other members of the team, who continued with a superficial non-directed conversation for another 15 to 30 minutes, after which the final sample was drawn and the needle withdrawn. Samples were withdrawn into heparinized syringes, which were placed in ice and immediately taken to the analytical laboratory where centrifugation was quickly carried out and the plasma measured into the extraction mixture. NEFA determinations were carried out by the

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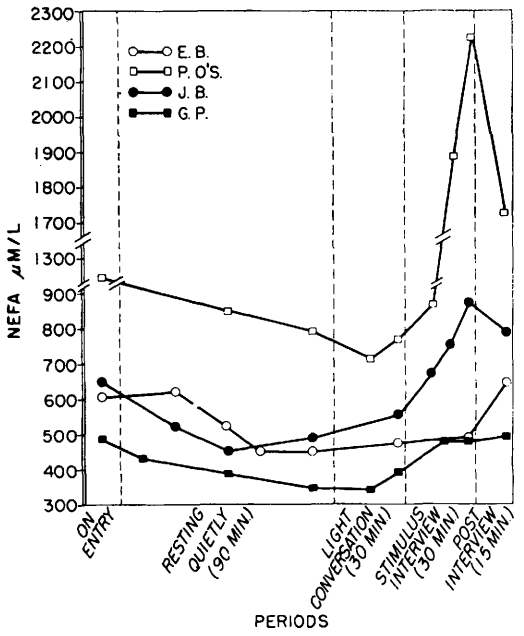

FIG. 1. Time course of serum NEFA values in 4 subjects during sequential periods of various degrees of arousal.

technic of Dole (This method is accurate to ± 20 μeq/l)(1). Triglyceride determinations were done by the technic of Van Handel and Zilversmit(10).

Results. The results are graphically presented in Fig. 1.

Comments. The experiments demonstrate a pattern of response of plasma NEFA levels which relates to degree of emotional arousal. Level of NEFA value is roughly proportional to intensity of emotional arousal and occurs promptly with a change in affect state. These results seem to indicate that fat metabolism is intimately involved in the individual's acute responses to "stressful" stimuli. NEFA is known to be an extremely active transport form of fat(1), and there is evidence that this fraction can be directly utilized by muscle and by liver(2). It is believed to derive from adipose tissue depots. Observations by Dole (1) and Gordon(2) have shown that epinephrine causes a sharp rise in NEFA level. Our observations confirm these data, and also demonstrate that norepinephrine is capable of inducing a similar rise in NEFA levels in human subjects (unpublished). It is our thesis that during emotional arousal these hormones are released and may provide the mechanism for increasing the serum NEFA level. The precise quality of affect experienced during period of emotional arousal did not appear to be the same for all subjects: P.O.'S. and J.B. reported predominant anxiety, E.B. and G.P. less anxiety and some hostility. In all subjects, meaningful topics of both qualities were discussed.

Summary. 1. Serum non-esterified fatty acids (NEFA) and triglyceride (TG) levels were measured in four normal individuals during difficult levels of emotional arousal. 2. Periods of arousal in which feelings of anxiety and/or hostility were evoked were accompanied by rises in serum NEFA levels, but not of TG levels.

1. Dole, V. P., *J. Clin. Invest.*, 1956, v35, 150.

2. Gordon, R. S., Jr., Cherkes, A., *ibid.*, 1956, v35, 206.

3. Havel, R. J., Frederickson, D. S., *ibid.*, 1956, v35, 1025.

4. Bierman, E. L., Schwartz, I. L., Dole, V. P., *Am. J. Physiol.*, 1957, v191, 359.

5. Albrink, M. J., Fitzgerald, J. R., Man. E. B., PROC. SOC. EXP. BIOL. AND MED., 1957, v95, 778.

6. Gordon, R. S., Jr., Cherkes, A., Gates, H., *J. Clin. Invest.*, 1957, v36, 810.

7. Friedman, M., Rosenman, R. H., Carroll, V., *Circulation*, 1958, v17, 852.

8. Hammarsten, J. F., Cathey, C. W., Redmond, R. F., Wolf, S., *J. Clin. Invest.*, 1957, v36, 897.

9. Groover, M. E., Presented at Meeting, Am. Coll. Physicians, Apr. 1957, Philadelphia, Pa.

10. Van Handel, E., Zilversmit, D. B., *J. Lab. and Clin. Med.*, 1957, v50, 152.

Received December 2, 1958. P.S.E.B.M., 1959, v100.