from the blood drawn by heart puncture before castration, and in 2 instances after castration. Castration failed to induce significant changes in the blood picture of 23 adult male hamsters.

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Hemoglobin and Glycemia Levels of the Adult White Mouse, Effect of Starvation and Central Depressants.

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A survey of the literature available has disclosed a dearth of published material on glycemia levels in mice. One group of workers[1] lists the blood sugar levels of hereditary dwarf mice as averaging 135 mg % (26 mice) and 139 mg % (16 mice). Others[2] give normal values between 76 and 86 mg %. Favour[3] has found values between 80 and 100 mg. Blood sugar levels of the commonly used albino rat seem to be no better known. One report[4] states that the blood sugar of (starved) rats is affected by age, season, and sex. These investigators determined blood sugar levels in 85 male albino rats averaging 114 g body weight, all of which were starved 17 hours previous to bleeding. The range of blood sugar levels extended from 100 to 148 mg %, the average being 113 mg. Myers and Bailey modification[5] of the Lewis and Benedict method was used for which 1 ml of blood was obtained by decapitation. Others[6] using the Folin-Wu method found an average of 122.2 mg % in 17 normal rats, the average of males being 4.7 mg higher than that of females.

Hemoglobin determinations in mice are likewise rare. In the chapter on histology[7] Fekete quotes from Hamm in Jaffé[8] stating that the hemoglobin content of mouse blood (based on the average of observations of 9 investigators) is 97% Sahli. Allowing 13 g hemoglobin per 100 ml of blood as 100% Sahli[9] this would be an average hemoglobin content of mouse blood of 12.6 g %.

Experimental. Adult albino mice of the Purdue Swiss strain were used. These were fed Purina Laboratory Chow in abundance such that extra pellets always remained in the cages. In this manner the mice were unstarved up to the time of bleeding. However, a more uniform level of glycemia can be obtained by starving the animals for a given period of time. Therefore our results of blood sugar determination in the non-starved mouse appear higher than those reported elsewhere. Unless a standard procedure is followed by all, the results are not comparable.

Blood was obtained by sudden decapitation with a razor blade. We tried also bleeding from the tail with the mice wrapped in towelling to minimize struggling but with no apparent advantage. Blood hemoglobin was

[1] Marshak, A., Fernald, A. T., and Marble, A., *Am. J. Physiol.*, 1939, **125**, 457.

[2] Cammidge, P. J., and Howard, H. A. H., *J. Gen.*, 1926, **16**, 387.

[3] Favour, C. B., personal communication.

[4] Voegtlin, C., Dunn, E. R., and Thompson, J. W., *Pub. Health Rpts.*, 1924, **39**, 1935, Gov't. Prtg. Off. Wash. Rep. 943.

[5] Myers, V. C., and Bailey, C. V., *J. Biol. Chem.*, 1916, **24**, 147.

[6] Anderson, A. K., Honeywell, H. E., Santy, A. C., and Pedersen, S., *J. Biol. Chem.*, 1930, **86**, 157.

[7] *Biology of the Laboratory Mouse*, Blakiston, Phila., 1941, p. 92.

[8] Jaffé, R., *Anatomie und Pathologie der Spontanerkrankungen der kleinen Laboratoriumstiere*, Julius Springer, Berlin, 1931.

[9] Best, C. H., and Taylor, N. B., *The Physiological Basis of Medical Practice*, Williams & Wilkins, Balt., 4th ed., p. 43.

determined by the Sheard-Sanford method[10] using a photelometer[11] which was standardized by Wong's iron method.[12] The Sheard-Sanford method employs sodium carbonate to prevent acid hematin formation and thus eliminates a time factor correction. Blood sugar was determined by the Folin-Wu micro method[13] using 0.1 ml of blood, the photelometer being carefully calibrated with freshly prepared glucose solutions.

Because the control blood sugar readings seemed abnormally high we suspected a factor of excitement causing sympatheticomimetic hyperglycemia. In order to produce sedation we tried exposing mice to chloroform vapor until quiet. This resulted in no lowering of glycemia so next we administered sodium pentobarbital (nembutal) intraperitoneally. Because of the reduction of blood sugar to less than half that of the controls we suspected an abnormal hypoglycemia and compared the effects of other central depressants namely: diallyl barbituric acid (dial), sodium ethyl (*l*-methyl-butyl) thiobarbiturate (pentothal), and chloral hydrate, all of which were administered intraperitoneally. Other groups of mice were subjected to fasting and blood sugar determined at periods of 12, 18 and 24 hours.

Results and Discussion. Results are shown in Tables I, II, and III. Our findings for hemoglobin in mice were somewhat higher than those reported by Jaffé. According to the Sahli scale ours would average 107% where Jaffé listed 97% Sahli. Environmental and strain differences would be significant in causing differences in blood chemistry. By way of comparison we have listed in Table I hemoglobin values from 48 white rats used in another study. A close similarity can be seen in the 2 species. Table II shows the effect of fasting on the glycemia level.

Fasting causes a fall in glycemia level as would be expected, a greater drop occurring in the first 12-hour period than in the second. A rise in blood sugar occurs after 18 hours which is probably due to gluconeogenesis at this period. We have noted in other studies with rats that fasting causes the greatest drop in blood sugar level during the first 10 hours with a slower falling subsequently.

TABLE I.
Comparison of Hemoglobin in White Rats (Wistar) and White Mice (Purdue Swiss).

No. animals used	Hb g % (avg)	S.E.
48 rats	13.1	0.7
86 mice	13.9	0.26

TABLE II.
Effect of Starvation up to 24 Hours on Blood Sugar Level of White Mice (Purdue Swiss).

	No. mice used	Blood sugar mg % avg	S.E.
Controls (unstarved)	61	173.8	5.9
Starved 12 hr	12	125.6	7.7
" 18 "	12	102.8	7.6
" 24 "	22	108.9	3.6

Table III shows the effects of depressant substances on the blood sugar level of nonfasted mice. The nonfasting level of glycemia seems high but possibly is characteristic for mice in the presence of abundance of food. Hyperglycemia has been shown to be a recessive character in mice;[2] hypoglycemia as a hereditary condition is also known.[14] The hyperglycemia we obtained after injection of dial and chloral hydrate may possibly have been due to excitement and the lack of anticonvulsive action of the drugs. Evidence for this lies in the fact that when the mice became prostrate, sounds like snapping of the fingers would startle them excessively. Possibly the loss of voluntary action occurred simultaneously with increased afferent excitability. Recently[15] it has been shown that different members of the barbiturates vary in hypnotic and anticonvulsive activity even in doses causing sedation and ataxia. That

[10] Sheard, C., and Sanford, A. H., *J. Lab. and Clin. Med.*, 1929, **14**, 558.

[11] Sanford, A. H., Sheard, C., and Osterberg, A. E., *Am. J. Clin. Path.*, 1933, **3**, 405.

[12] Wong, S. Y., *J. Biol. Chem.*, 1928, **77**, 409.

[13] Folin, O., and Wu, H., *J. Biol. Chem.*, 1928, **77**, 421.

[14] Cammidge, P. J., and Howard, H. A. H., *Proc. Roy. Soc. Med.*, 1930, **23**, 1341.

[15] Everett, G. M., and Richards, R. K., *Fed Proc.*, 1945, **4**, 20.

TABLE III.
Effect of Depressant Drugs on Blood Sugar Level of White Mice (Purdue Swiss).

	No. mice used	Dosage mg/kg	Blood sugar mg % (avg)	S.E.
Controls	61	—	173.8	5.9
Chloroform	12	vapor	172.9	4.8
Nembutal	24	100	70.1	3.5
Dial	12	50	208.0	3.6
Chloral hydrate	11	200	195.3	6.6
Na-pentothal	12	75	172.8	4.2

nembutal caused such a marked hypoglycemia is difficult to explain with our present knowledge. First one group of 12 mice was injected with nembutal and when the hypoglycemic action was noted a second group of 12 (at a later date) was injected in a similar fashion. The 2 groups showed identical responses. The effect of nembutal on glycemia level has been noted by others[16] in mice and rats, and even in fasted rats.

Summary. Hemoglobin in 86 and blood sugar levels in 61 nonstarved albino mice of the Swiss strain were determined. The average hemoglobin for the mice is 13.9 g per 100 ml of blood. Blood sugar averaged 173.8 mg per 100 ml of blood in nonfasted mice falling to 108.9 mg in 24 hours. A slight rise occurred between 18 and 24 hours. The effects of 5 central depressants were investigated, the only one of which causing a drop in blood sugar being nembutal.

[16] Long, C. N. H., personal communication.

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Antibacterial Lipids from *Tetrahymena geleii.*

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It is well known that many species of protozoa ingest and destroy myriads of bacteria. Metchnikoff[1] was probably the first to point out the similarity between phagocytosis in higher animals and intracellular digestion by protozoa, although in neither case is the mechanism clearly understood. Opie[2] has demonstrated the presence of proteolytic enzymes in phagocytes but that they are responsible for the killing of bacteria has not been shown. The presence of antibacterial substances within the phagocyte has been postulated but attempts to extract such substances have, in general, yielded preparations of only weak bactericidal or bacteriostatic properties.[3,*] It seems possible that the bactericidal effect of the living phagocyte may be due to conditions within the cell unfavorable to bacteria such as low pH rather than to the presence of a specific antibacterial agent. Although the same may also be true for the protozoa it was decided to test this point by attempting the isolation of sub-

[1] Metchnikoff, E., *L'immunité dans les maladies infectieuses*, Paris, 1901.

[2] Opie, E. L., *J. Exp. Med.*, 1945, **8**, 410.

[3] Rich, A. R., *The Pathogenesis of Tuberculosis*, p. 289, Chas. C. Thomas, Springfield, Ill., 1944.

[*] Nutini and Kreke (*J. Bact.*, 1942, **44**, 661), and Nutini and Lynch (*J. Exp. Med.*, 1946, **84**, 247), have prepared from various animal tissues, especially spleen and brain, substances having antibacterial properties active both *in vitro* and *in vivo*.