The quantity of radium bromide used in these experiments may have been insufficient to affect *P. lophuræ*. The amount used, however, was sufficient to produce severe degeneration in the tissues of the chick and duck.[4] The variation in the type of irradiation from radium and the roentgen rays also must be recalled in considering the differences observed in their effect on *P. lophuræ*.

The clinical observation that irradiation reduces the size of the spleen and improves the general health of the patient with malaria is of interest, however, the number of cases treated is small and the method of evaluating the results is unsatisfactory. If different stages of the plasmodium or different plasmodia vary in their susceptibility to irradiation, then irradiation of the spleeen in chronic malaria might be of some value.

Summary. *P. lophuræ* are injured by roentgen irradiation *in vivo* and *in vitro* as indicated by the development of the parasitemia in the chick. The amount of irradiation necessary to produce a significant effect *in vivo* is near the lethal dose of radiation for the chick.

Radium bromide as used in these experiments has no effect on *P. lophuræ*. Severe degenerative changes occur in the birds given radium bromide.

Since this paper was completed Bennison and Coatney have published their results of the effect of radiation on *P. gallinaceum*. (*Public Health Rep.*, 1945, **60**, 127.)

[4] Rigdon, R. H., and Fletcher, D. C., to be published.

15019 P

Effect of Glycine on Peripheral Blood Flow.

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Peripheral blood flow is an important mechanism for the regulation of heat loss from the body. Under conditions of increased heat production as in fever[1] or hyperthyroidism[2] the blood flow to the periphery is greatly augmented. A linear correlation has been found to exist between the metabolic rate and peripheral blood flow over a wide range of metabolic levels in subjects with hyperthyroidism[2] and myxedema.[3]

In the present investigation, utilization has been made of specific dynamic action to increase heat production in the body. The increase in metabolic rate following a protein meal is due almost entirely to a few amino acids, notably, glycine, alanine, phenylalanine, and tyrosine; the increased heat production occurring chiefly in the liver.[4] A study was carried out to determine to what degree the dissipation of this excess heat might be attended by changes in the blood flow to the extremities.

Twenty grams of glycine* dissolved in 200 cc of water were administered to 15 subjects in the basal state. Observation was made of oxygen consumption, skin temperature of toes, fingers, and forehead, and oscillometric pulsation in the calf and forearm. Readings were made in the basal state and over a period of 4 hours following administration of glycine. Skin temperature was measured with the Leeds-Northrup potentiometer. Observations on the skin temperature were carried out under conditions of approximately constant environmental temperature (22°C ± 1.3°), and with the extremities exposed for a period

[1] Bierman, W., *J. A. M. A.*, 1936, **106**, 1158.

[2] Stewart, H. J., and Evans, W. F., *Am. Heart J.*, 1940, **20**, 715.

[3] Stewart, H. J., and Evans, W. F., *Arch. Int. Med.*, 1942, **69**, 808.

[4] Wilhelmj, C. M., *Physiol. Rev.*, 1935, **15**, 202.

* A preparation of glycine supplied by Sharp and Dohme was employed.

TABLE I.
Average Changes in Oxygen Consumption and Skin Temperature Following Glycine (20 g).

	Cases studied (9)	Normal subjects (11)	Peripheral vascular disease (4)
Oxygen Consumption	+23.5%		
Skin Temp.: Toe		+4.0°C	+2.3°C
Finger		+2.8	+2.2
Forehead		+1.7	+0.8

TABLE II.
Comparison of Skin Temperature Changes Following Glycine, Posterior Tibial Nerve Block, and Alcohol.

	6 cases		4 cases	
	Glycine	Nerve block	Glycine	Alcohol
Toe	+5.7°C	+4.5°C	+3.8°C	+1.2°C
Finger			+2.3	—0.2
Forehead			+2.4	+1.2

of 20 minutes before readings were made. Skin temperature was recorded before determination of oxygen consumption. Comparison was made with the effect on skin temperature of post-tibial nerve block in 6 cases, and of 2 ounces of whiskey in 4 cases. The observations on nerve block and alcohol were carried out on different days than the glycine experiment.

Oxygen Consumption. The average maximal increase in oxygen consumption above the basal level in 9 cases studied was 23.5%. There was considerable individual variation. Only 1 subject failed to exhibit a rise in oxygen consumption following ingestion of glycine. In another subject no significant change occurred when first tested, but when glycine was given again on another day the oxygen consumption increased 26%. The maximal increase in oxygen consumption was 52%.

Skin Temperature. (Table I) An increase in the temperature of the toes occurred in 11 cases with no impairment of peripheral circulation, and in 3 of 4 cases with peripheral vascular disease. Only one subject failed to exhibit a rise in temperature of the toes. In this case there was advanced bilateral peripheral vascular disease with acute right popliteal occlusion. The temperature of the fingers similarly increased in 14 of the 15 cases. Forehead temperature increased in 6 of the 9 cases tested. Excluding the 4 cases with peripheral vascular disease, the average rise in temperature of the toes was 4.0°C, at the fingers 2.8°C, and at the forehead 1.7°C. Significant increase in the skin temperature occurred within one hour after ingestion of glycine with maximal rise between the second and third hour. The initial temperature of the forehead was higher than the extremities. Following glycine a definite trend toward equilibration of temperature of the toes, fingers, and forehead occurred. Thus, in 6 cases with no peripheral vascular disease, in whom the skin temperature changes at toes, fingers, and forehead were recorded, the average initial temperature at toes, fingers, and forehead respectively was 26.4°C, 28.8°C, and 31.4°C. Following glycine the average maximal temperature at toes, fingers, and forehead respectively was 31.7°, 33.0°C, and 33.1°C. These temperatures indicate maximal vasodilatation. According to Montgomery *et al.*, "In the normal subject when vasodilatation is complete the skin temperature of the digits will rise to a level between 31° and 34°C."[5]

The effect of glycine was compared with posterior tibial nerve block in 6 cases (Table II). In these subjects the average increase in toe temperature was 5.7°C with glycine, and 4.5°C following nerve block. Comparison was made with the effect of alcohol in 4 sub-

[5] Montgomery, H., Naide, M., and Freeman, N. E., *Am. Heart J.*, 1941, **21**, 780.

jects (Table II). In all these the increase in temperature in the toes was significantly greater with glycine than after alcohol (2 ounces of whiskey in basal state). The average change in temperature at the toes was +3.8°C with glycine, +1.2°C with alcohol; at the fingers +2.3°C with glycine, —0.2°C with alcohol; and at the forehead +2.4°C with glycine and +1.2°C with alcohol.

Oscillometric Readings. The amplitude of oscillometric pulsation in the calf increased in 8 of the 11 subjects with no peripheral vascular disease. The average change for this group of 11 subjects was an increase in pulsation of 25%. No increase in oscillometric pulsation was observed in 3 cases with peripheral vascular disease although significant rises in skin temperature occurred in 2 of these subjects. In the forearm an increase in amplitude of pulsation following glycine was noted in 6 of these 11 subjects. The average increase in this group of 11 cases was 33%.

Summary. The effect of glycine on peripheral blood flow was studied in 15 subjects by means of skin temperature and oscillometric readings. The blood flow to the extremities was augmented in 11 normal subjects and in 3 of the 4 cases with peripheral vascular disease. The increase in peripheral blood flow is an accompaniment of increased heat production resulting from the specific dynamic action of glycine. The ingestion of glycine provides a simple means to accomplish an effective and sustained increase in peripheral blood flow.

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Relationship of Antibody Content of Normal and Malignant Lymphocytes.*

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The demonstration of antibodies in normal lymphocytes[1,2] raised the question of whether lymphocytes in lymphosarcoma also could contain antibody. At the present time there are no morphological or physiological characteristics which clearly differentiate normal from malignant lymphocytes. Since one important function of lymphocytes has recently been demonstrated to be the carrying of antibodies,[1,2] it was possible to compare malignant to normal lymphocytes in this regard.

The data reported in this communication establish the presence of antibody in the lymphocytes of lymphosarcoma, the relationship of the quantity of this antibody to that of normal lymphocytes, the capacity of tumor cells to obtain antibody from normal lymphocytes, and finally, the ability of tumor cells to carry antibody into a succeeding transplant.

Materials and Methods. Male mice 60 to 80 days old of the CBA strain (Strong) were used. The animals were fed Purina Fox Chow supplemented with calf meal; food and water were available at all times. The tumor used was obtained from Dr. W. U. Gardner. This tumor arose in an estrogen-treated mouse of the C_3H strain and has been transplanted for many successive generations. The transplant of the tumor takes in 100% of CBA mice. The transplanted tumor grows rapidly and kills the host in 2 to 3 weeks. This tumor was selected for the present experiments because it does not metastasize. This was of importance for the study because it was desired to compare the antibody content of tumor and

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1 Dougherty, T. F., Chase, J. H., and White, A., PROC. SOC. EXP. BIOL. AND MED., 1944, **57**, 295; 1945, **58**, 135.

2 Harris, T. N., Grimm, E., Mertens, E., and Ehrich, W. E., *J. Exp. Med.*, 1945, **81**, 73.