actually crossed the curve of the exposed culture and in the end an extension of the lag phase was induced by the radiation. The total number of viable bacteria of the exposed culture had increased during the lag phase. These increases were so pronounced that in the time during which the control culture showed a change in number of not more than 10 to 15%, the exposed culture had increased up to, or more than, 100%.

Tests have shown that the increased growth in the lag phase of the exposed culture was not produced by the decomposition products of the dead bacteria or by the excretion of any substance by the irradiated organisms. Stimulation is suggested, but the possibility of recovery of the irradiated bacteria is not entirely excluded.

The observed phenomena do not refer to the effects of very small amounts of energy, but only to energy values which kill some of the bacteria and allow the rest of the organisms to survive.

A detailed description of the experiments will be published later. The authors wish to thank Prof. B. M. Duggar for the help and advice he has given them in the course of this investigation.

8249 P

Effect of Infrared on Tissue Temperature Gradient as Influenced by Pigment.

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Determinations of the temperature gradients[1] from the surface of the skin to a depth of 16 mm. in 7 subjects with skin pigment types ranging from blond to negro, before, during and after exposure to varying quantities and wave bands of infrared radiation, indicate that the rise in temperature on the surface is proportional to the quantity of radiant energy and independent of wave length, between 0.75μ and longer than 5.0μ, and the amount of natural skin pigment.[2] The wave lengths of infrared used were broad bands 0.75μ to 3.0μ, 1.4μ to 5.0μ, 1.4μ to longer than 5.0μ, 3.0μ to longer than

[1] Temperature gradients determined by a method similar to that of Bazett, H. C., and McGlone, B., *Am. J. Physiol.*, 1927, **82**, 415.

[2] Our present knowledge of the function of skin pigment is reviewed by Laurens, H., 1933, The Physiological Effects of Radiant Energy. Chemical Catalog Co., New York, p. 122.

5.0μ and the quantities varied from 0.25 to 1.6 gm. cal. per sq. cm. per min.[3]

That there is no relation between the degree of natural pigmentation and the tissue temperatures during infrared irradiation is illustrated by experiments summarized in Table I, which shows tissue temperatures after 5-minute exposures to 1.0 gm. cal. per sq. cm. per min. of infrared (wave length 1.4 to longer than 5.0μ). The differences between these various skin types are no greater than those in a single individual on different days. Other wave bands gave similar results.

TABLE I.

Depth	Negro	Blond White	Japanese	Brunet White
Surface	44° C	45.0° C	44.0° C	43.5° C
2 mm.	40	40.5	40.0	39.0
6-8 mm.	38	38.0	38.0	37.4
15 mm.	37	36.5	36.8	36.8

On the other hand, when skin areas, artificially pigmented by exposure to a carbon arc, are exposed to the same amount of infrared they show somewhat smaller rises in temperature on the surface and at sub-surface levels than do corresponding non-pigmented areas. A typical experiment using 1.0 gm. cal. of long infrared (1.4μ to longer than 5.0μ) is summarized in Table II. We do not believe that the artificial pigment necessarily serves a protective function, but that an increased blood flow (note the higher initial temperatures in the pigmented skin) is responsible. This conception is more

TABLE II.

	Non-Pigmented Skin		Artificially Pigmented Skin	
Depth	Before	End of 5 min. irradiation	Before	End of 5 min. irradiation
Surface	32.5° C	46.5° C	34.0° C	43.2° C
2 mm.	33.3	42.2	34.9	38.6
7 mm.	34.5	38.0	35.1	37.5
16 mm.	35.5	36.7	35.6	36.6

TABLE III.

	Normal Skin		Erythematous Skin	
Depth	Before	End of 5 min. irradiation	Before	End of 5 min. irradiation
Surface	32.0° C	46.0° C	35.5° C	43.2° C
2 mm.	33.0	42.0	36.2	39.8
5-6 mm.	34.5	40.5	36.7	39.0
15 mm.	36.0	37.2	36.9	37.3

[3] Physical methods used are described by Laurens, *op. cit.*, p. 16.

strikingly supported by experiments on markedly inflamed skin (produced with a carbon arc), a typical example, using 1.0 gm. cal. doses of long infrared (1.4μ to longer than 5.0μ) being summarized in Table III.

Other means of altering the rate of blood flow through skin influence the temperature changes due to irradiation. When the circulation of the leg is occluded by a tourniquet irradiation results in higher temperatures at all depths to 16 mm. than in a leg with normal circulation. On reestablishing the circulation of the leg after 30 or more minutes of occlusion, a reactive hyperemia occurs (indicated by higher than normal initial tissue temperatures) and then irradiation is found to result in temperature rises at all depths which are less than normally observed.

Conclusions. Pigment, natural or artificial, does not appear to protect deeper regions of the skin from excessive heating due to infrared. The slight diminution in heating in heavily artificially pigmented skin is probably due to increased blood flow.

8250 C

Hepatoflavin and Pernicious Anemia.

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The following reasons led to the idea that hepatoflavin might be related to the hematopoietic factor used in treating pernicious anemia. Liver and liver concentrates of therapeutic value are rich sources of flavin. Flavin appears to be one of the components of vitamin B_2, which has been regarded as concerned with the extrinsic factor of Castle. West and Howe[1] reported that the hematopoietic activity of their most potent liver concentrate was precipitated from alcoholic solution by $Ba(OH)_2$; we find that the flavin in liver extracts is similarly precipitated. It seemed desirable to test whether flavin might be effective in pernicious anemia therapy.

Incubation of liver with pig stomach, which appears to increase the hematopoietic activity, does not increase the flavin content.

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[1] West, R., and Howe, M., *J. Clin. Invest.*, 1930, **9**, 1.