B. typhosus agar-washing filtrates were injected intravenously into rabbits which 24 hours previously had received intradermal injections of *H. influenzæ* and *H. pertussis*. Three to 6 hours following the intravenous injection the areas of the skin treated with *H. influenzæ* became bluish-black, but there was no distinct change to be observed in the areas inoculated with *H. pertussis*. Conversely, living as well as dead *H. influenzæ* if injected intravenously also activate areas intradermally prepared with *B. typhosus* agar-washing filtrates.

The results of the above-mentioned experiments show that *H. influenzæ* may, under certain conditions, produce a hemorrhagic-necrotic lesion in the skin of rabbits. This ability is certainly not a specific characteristic of *H. influenzæ* alone. However, other organisms related to infections of the upper respiratory tract, such as pneumococci and streptococci, were not able to produce an identical effect under the same experimental condition as easily as did *H. influenzæ*.

8618 P

Subcutaneous Temperatures in Localized Infections.

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The mechanism of the increased production of heat at the site of a localized infection in the human body never has been definitely understood. The theory that the production of heat around an ordinary localized inflammation is due to the increased rate of flow of blood at the site has been upheld by the experimental studies of Marchand.[1] The belief that the local increase in temperature is due to heat-producing chemical processes active at the site of infection and that the hyperemia is really a compensatory phenomenon has been promoted by the work of Segale,[2] Schade,[3] Gessler[4] and others.

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1 Krehl, Ludolf, and Marchand, F., *Handbuch d. allgem. Path.*, 1924, Vol. 4, Part I, S. Hirzel.

2 Segale, M., *J. Exp. Med.*, 1919, **29**, 235.

3 Schade, H., *Die Physik. Chemie in d. inneren Medizin*, 1923, 3rd edition, Steinkopff, Dresden and Leipzig.

4 Gessler, H., *Arch. f. exp. Path. u. Pharm.*, 1921, **91**, 366.

Coincident with a study on experimental animals,[5] a series of clinical infections in human beings has been studied with regard to the variation in temperature in different areas of the same infection. The carbuncle was selected as a type of localized infection which commonly exhibits fairly constant pathologic changes. With regard to its blood supply, a carbuncle may be divided into 4 zones as shown in the accompanying diagram (see Fig. 1) as follows:

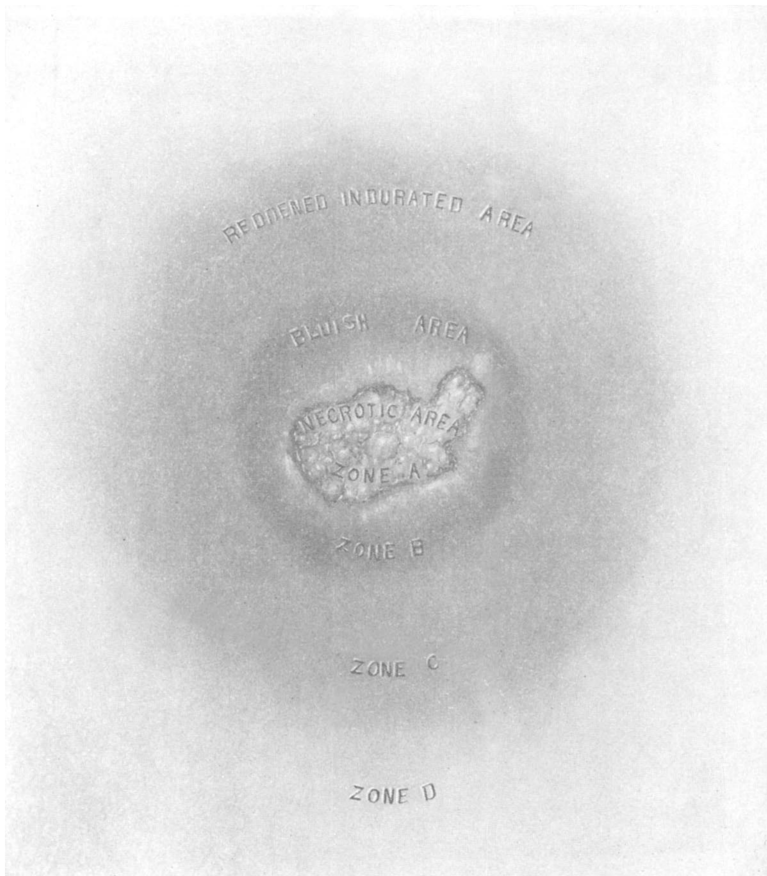

FIG. 1.
Artist's sketch of a carbuncle showing the division into zones for regional temperature observations.

Zone A, the area of central necrosis; Zone B, the area of bluish induration immediately surrounding Zone A; Zone C, the indurated,

[5] Heuer, George J., Conway, J. Herbert, and Pickworth, M. E., Reported at a meeting of the New York Surgical Society, held at New York Hospital, May, 1933.

TABLE I.

Name of Patient	Duration of Lesion, *days*	*Site of Lesion*	Size of Lesion, *cm. diam.*	Leukocyte Count	Rectal Temp.	Normal Area	Zone A	Zone B	Zone C	Zone D
J.S.	4	Back of neck	3	14,500	37.8°C	37.4°C	36.8°C	37.4°C	37.8°C	37.4°C
A.R.	7	Over scapula	4	12,100	37.6	37.0	37.6	37.6	37.6	37.2
M.K.	4	Back of neck	5	7,900	37.9	36.7	37.6	37.3	37.6	36.7
G.H.	4	,, ,, ,,	6	19,000	37.8	37.8	36.0	37.3	37.9	37.3
C.U.	7	,, ,, ,,	4	10,100	37.8	37.4	37.4	37.7	37.7	37.4
M.K.	10	Over scapula	10	19,000	37.6	37.0	37.8	37.6	37.5	37.3
A.R.	4	Dorsal thorax	6	19,600	38.0	36.2	37.6	38.1	38.2	37.8
H.R.	2	,, ,,	4	11,400	37.8	37.0	37.0	37.6	37.6	37.4
J.W.	8	Back of neck	4	9,800	38.0	36.9	36.8	37.6	37.6	37.4
B.T.	8	,, ,, ,,	6	13,000	37.6	36.8	37.0	37.4	37.4	37.0
J.H.	14	Face	4	32,000	37.6	36.8	37.1	37.4	37.6	37.4
L.P.	7	Back of neck	6	10,900	38.1	37.0	36.6	37.8	38.1	37.8
A.B.	4	Forearm	6	10,600	38.4	37.2	37.2	38.2	38.2	37.8
A.H.	14	Face	6	17,000	38.8	37.4	36.8	38.2	38.6	37.0
A.T.	7	Back of neck	4	15,000	38.4	37.6	37.2	38.0	38.2	37.4
M.R.	14	Mastoid region	4	9,200	37.8	37.2	37.0	37.6	37.8	37.2
G.O.	10	Back of neck	6	19,000	38.0	37.2	37.0	37.6	37.9	37.4
J.C.	14	Wrist	6	10,300	37.8	36.8	36.5	37.4	37.4	37.0
J.S.	4	Chin	3	10,800	38.0	36.8	36.8	37.6	37.7	37.4
A.M.	14	Back of neck	4	12,800	38.0	37.7	37.2	38.0	38.0	37.7

acutely inflamed area surrounding Zone B (over this area the skin is usually markedly reddened and there is obvious increase in local heat); Zone D, the apparently normal area surrounding the carbuncle. In Zone D, there is no change in the color of the skin, no induration and no palpable increase in temperature.

From a consideration of the pathologic changes occurring in a carbuncle during the acute stage of the staphylococcus infection, the volume of blood should approximate normal in Zone D; should be maximal in Zone C; increased above normal in Zone B; and minimal or absent in Zone A. In the study of the 20 cases of carbuncle here recorded (Table I), temperatures were taken in each of the 4 zones referred to above, as well as in the subcutaneous tissue of a distant area of the body and in the rectum. Rectal temperatures were taken with mercury thermometers graduated to one-tenth degree centigrade and previously standardized with the needle-style thermocouple used for this study.* In each case the age of the patient, the duration of the carbuncle and the size and location of the lesion were noted. The room-temperatures were recorded; these showed slight variations which apparently had no effect on the relative temperatures in the different zones of the infected area.

A study of the table shows that the rectal temperature of the patient was consistently as high as or higher than any of the temperatures within the carbuncle itself. This finding would speak against the theory of Segale,[2] Schade[3] and Gessler.[4] In favor of Marchand's[1] belief there is the fact that, of the temperatures in Zones A, B, C and D, those in Zone C (where the hyperemia is maximal) regularly have been the highest. The temperatures have been consistently lowest in Zone A, the area of central necrosis, where the circulation of blood is minimal or absent.

The temperature-readings have been strikingly uniform, despite the fact that the virulence of the infection, the age of the patient, the size and location of the lesion, the rectal temperature and the leukocyte count have varied.

Summary. Carbuncles occurring in 20 different patients have been studied with reference to the local heat produced at the site of the infection. The temperatures, recorded by means of a needle-type thermocouple, have been listed for the various zones of a carbuncle. Certain findings have been strikingly uniform; they are as follows:

1. The temperature within the most acutely inflamed portion

* Leeds and Northrup Company, Philadelphia, Pa.

of the carbuncle has rarely exceeded the rectal temperature of the patient at the same time.

2. The temperatures in the arbitrary zones established within a carbuncle on a basis of vascularity have, in general, been highest in the zone showing greatest evidence of active hyperemia and lowest in that area in which the tissue is necrotic and therefore ischemic.

3. The temperatures in the various zones of a carbuncle have shown a rather constant relation to each other and to the rectal temperature of the patient, despite variations in the febrile response of the individual to the infection, the age of the patient and the size and location of the lesion.

4. The temperatures of the apparently normal tissues directly surrounding the carbuncle have consistently been higher than those of the subcutaneous tissues at a distant point although that area showed no palpable or visible evidence of increased local heat.

These observations have been made as part of a series of experiments which, it is hoped, may throw some light on the nature of the mechanism active in the production of increased heat at the site of a localized infection.

8619 C

Cultivation of Poliomyelitis Virus *in vitro* in Human Embryonic Nervous Tissue.

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The current opinion of many investigators is that there is no unequivocal evidence that the virus of poliomyelitis has as yet been successfully cultivated outside the body. The recent demonstration that the virus is of very minute size (8 to 12 mμ[1]; 12 to 17 mμ[2]) emphasized the improbability that certain minute, visible microorganisms, which have been cultivated from poliomyelitic tissue, are etiologically related to the disease, while a critical analysis of

[1] Elford, W. J., Galloway, I. A., and Perdrau, J. R., *J. Path. and Bact.*, 1935, **40**, 35.

[2] Theiler, M., and Bauer, J. H., *J. Exp. Med.*, 1934, **60**, 767.