

result of the decomposition of the Fucus material by the bacteria. Since the N content of Fucus is very low, considerably less than is needed by the bacteria to bring about its decomposition, the amount of available N proved to be the limiting factor in the extent of decomposition of the Fucus by the bacteria. Since the decomposition of the humus in the mud results in the liberation of small amounts of N in an available form, the bacteria are thus enabled to bring about a considerably greater decomposition of the Fucus in the mud than in the water. This assumption was found to be correct, when, on adding small amounts of N in the form of ammonium salts or nitrates to the sea water, a great increase in the decomposition of the Fucus material took place. It is also possible that mud harbors certain bacteria which are not present in the water and which are able to decompose some of the specific carbohydrates present in the Fucus.

The nature of the organic residues in the sea may thus exert an important influence upon the amount of available N present at any one time in the sea water.

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Influence of Hyperpyrexia on Velocity of Blood Flow.*

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The radiotherm permits the study of hyperpyrexia uncomplicated by infectious disease. The body temperature can be raised or lowered at will. The radiotherm subjects the patient to the field of a high frequency radio oscillator and thereby induces hyperpyrexia (Hosmer,¹ Carpenter and Page²). The technique has been described fully by one of us (Bierman³).

The recent literature has been reviewed by Cheer,⁴ Bazett,⁵ and

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¹ Hosmer, Helen R., *Science*, 1928, **68**, 325.

² Carpenter, Chas. M., and Page, Albert B., *Science*, 1930, **71**, 450.

³ Bierman, William, *Arch. Phys. Ther., X-Ray, Radium*, 1932, **13**, 383.

⁴ Cheer, Sheo-Nan, *Am. J. Physiol.*, 1928, **84**, 587.

⁵ Bazett, H. C., *J. Am. Med. Assn.*, 1921, **97**, 1271.

Wiggers and Orias.⁶ Bazett summarized the differences and the similarities between fever and artificial hyperpyrexia. The pulse rate changes in the two conditions are similar and appear to depend on the temperature of the heart itself. Fever, especially during the rise of temperature, is associated with vasoconstriction in the skin, whereas vasodilatation occurs during artificial hyperthermia.

We studied the relation between body temperature as artificially elevated with the radiotherm and the circulation time. The method of determining the circulation time was devised by Robb and Weiss.⁷ If one injects a small measured dose of sodium cyanide intravenously into an individual, a marked increase in the depth of respiration appears in 15 to 25 seconds. The latent period represents the time that it takes for the cyanide to go from the site of injection, the elbow, to the heart, through the right side of the heart, to the lungs, through the lungs, back to the heart, through the left side of the heart to the carotid artery. The time, from the end of the injection to the first deep breath, is measured with a stop watch. The interval is the circulation time.

Sodium cyanide, in proper dosage, is perhaps the most active of all respiratory stimulants (Loevenhart, Lorenz, Martin, and Malone⁸). It was formerly believed that the seat of its action was the respiratory center in the medulla (Loevenhart⁹), but Heymans, Bouckaert, and Dautrebande¹⁰ showed that cyanide stimulates the respiration through the carotid sinus. Loevenhart calculated that sodium cyanide stimulates the respiration of the rabbit within a second after its appearance in the carotid artery.

Sodium cyanide for intravenous injection should be dissolved in physiological saline solution. It must be freshly prepared. It should not be sterilized lest the cyanide be decomposed. Cyanide is itself antiseptic, and the solution therefore will remain sterile. We used a 4% solution and injected 0.2 to 0.4 cc. according to body weight. A tuberculin syringe and a 20 gauge needle were employed. The duration of the injection was about a second. The end point was the time of the first deep breath but the patient always took several more after the first. It required 5 to 10 seconds for the respiration to return to normal. Sodium cyanide is destroyed

⁶ Wiggers, Carl J., and Orias, Oscar, *Am. J. Physiol.*, 1932, **100**, 614.

⁷ Robb, George, and Weiss, Soma, 1931, unpublished study.

⁸ Loevenhart, A. S., Lorenz, W. F., Martin, H. G., and Malone, J. Y., *Arch. Int. Med.*, 1918, **21**, 109.

⁹ Loevenhart, A. S., *Arch. Int. Med.*, 1915, **15**, 1059.

¹⁰ Heymans, C., Bouckaert, Jean J., and Dautrebande, L., *Arch. Internat. de Pharm. et de Therapei*, 1931, **40**, 64.

very rapidly in the body, being transformed, presumably, into the non-toxic sulfocyanate.

The patients were those undergoing treatment for chronic disorders, arthritis, psoriasis, disseminated sclerosis, paresis, tabes, and mycosis fungoides. One patient had in addition a luetic aortic insufficiency. The circulation time was measured when the patient was placed between the plates of the radiotherm prior to turning on the current. The velocity was again determined in an hour or 2 when the temperature had reached 102 or 103°F. It was again estimated in 2 cases when the temperature had risen still higher, and in 3 instances it was measured after the patient had been removed from the radiotherm and the temperature had begun to fall.

TABLE I.

Diagnosis	Date	Hour	Mouth Temp.	Rectal Temp.	Pulse Rate	Circula- tion Time	Dosage of 4% NaCN
						Sec.	cc.
Gonorrheal arthritis	12-26-31	1:00 P. M.	98.6	99.2	62	20	0.2
		2:00 "	101.0	101.8	120	8	"
		3:00 "	102.6	103.6	108	6	"
Psoriasis	5-19-32	9:30 A. M.	97.0	98.2	66	23	"
		11:30 "	102.8	104.0	120	9	"
		2:50 P. M.	101.0	102.3	112	11	"
Multiple Sclerosis	6- 2-32	9:10 A. M.	98.0	98.0	64	23	"
		10:50 "	103.2	103.6	120	12½	"
		11:30 "	105.0	105.8	128	11	"
Tabo-paresis Aortic Insufficiency	6-19-31	9:20 "	97.4	98.0	80	26	0.3
		10:55 "	102.0	103.0	104	16	"
		11:40 "	104.4	105.8	126	6	"
Mycosis Fungoides	6-19-31	12:40 P. M.	99.4	100.2	100	11	0.4
		2:10 "	102.4	104.0	128	7	"
General Paresis	6-24-31	11:50 A. M.	98.7	99.6	80	17	0.25
		1:50 P. M.	102.0	103.6	108	10	"
		3:30 "	101.2	—	110	13	"

Results. The circulation time shortened as the body temperature rose, and conversely, the circulation time lengthened as the temperature fell. The blood velocity was increased during hyperpyrexia. The velocity was not always proportional to the temperature nor to the pulse rate but followed the temperature more closely than it did the pulse.

Other changes in the circulation, besides acceleration of the heart rate, play a rôle in the increased velocity of the blood that occurs during hyperthermia. These include the output of the heart per minute; the path taken by the cyanide; the peripheral resistance, and the viscosity of the blood.

Summary. The circulation time was measured with the cyanide method during hyperpyrexia induced by the radiotherm. Seventeen observations were made on 6 patients. In every case the circulation time diminished as the body temperature rose, being roughly proportional to the body temperature.

Conclusion. During hyperpyrexia, induced by radiotherapy, there is an acceleration of the velocity of blood flow.

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Differences in Response of Female Macacus Monkey to Extracts of Anterior Pituitary and of Human Pregnancy Urine.*†

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Extracts either of the anterior pituitary or derivatives of human pregnancy urine cause follicular growth followed by rapid luteinization in the rodent's ovary. The present report emphasizes the difference in biological response between these 2 substances after a study of a considerable series of Macacus monkeys.

Ovaries of 31 experimental monkeys, ranging in body weight from 1800 to 5100 gm., have been studied. These animals were treated with anterior pituitary implants, with water soluble fraction of the pyridine extract of sheep anterior pituitary (Fevold, Hisaw and Leonard), with an extract of pregnancy urine (Zondek's method), and with Antuitrin S, also a pregnancy urine derivative. Animals were treated for 4 to 30 days, injections being made in most cases twice daily, subcutaneously or intravenously.

Hisaw and his associates¹ reported the effects of the pyridine extracts of the anterior lobe in causing follicular growth and changes in the sexual skin of monkeys. The action of pyridine extract on the ovary of the monkey in the present series (ovaries of 13 animals studied microscopically) may cause either the small cystic condition, similar to the effects obtained by implants (Allen, Hartman) or a rather uniform growth of all follicles depending on

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† The dried sheep pituitaries and the Antuitrin S were supplied by Parke, Davis and Company, through the interest and courtesy of Dr. O. P. Kamm.

¹ Hisaw, Fevold and Leonard, *Proc. Soc. Exp. Biol. and Med.*, 1931, **20**, 204.