

edly delayed, as judged by the R. Q. obtained after its administration. The results obtained with glucose and fructose with regard to the R. Q. agree with the unpublished results of Wierzuchowski and Boothby.²

The specific dynamic action reached a maximum between two and two and one-half hours after the ingestion of 75 grams of the sugars studied here. The maximum heat production usually was coincident with the highest R. Q., although this was not invariably the case. At the end of 4½ hours the increased heat production had usually passed, the metabolism had fallen to the basal level, and the R. Q. had returned to the fasting level.

In the case of raw starch and dried cooked starch, although progressively increasing quotients were obtained during the first two hours, indicating an increasing utilization of carbohydrate, only slight changes of basal metabolism occurred. This indicated that the slow absorption did not result in a plethora metabolism, although sufficient glucose was absorbed to increase the R. Q. appreciably.

The amount of the specific dynamic action of lactose, which Lusk has found to be small in dogs in comparison to the other sugars, was found to be approximately equal to that of the other sugars with man.

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Ultra violet rays in the purification of cultures of *spirochaeta pallida*.

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During the past few years, we have been engaged in an effort to improve existing methods, whereby cultures of *Spirochaeta pallida* may be freed from contaminating bacteria, thus permitting more readily the isolation of the former organism. In the present investigation, it was our aim to test the selective bacteri-

² Personal communication.

cidal action of ultra-violet rays with the hope that this would accomplish our purpose.

To the best of our knowledge, no literature has yet appeared on the action of the ultra-violet rays on spirochætes in general or on the *Spirochæta pallida* in particular. The nearest approach to this problem was made by Rosenberger and Fanz,¹ who studied the effects of the Roentgen ray and radium on *Spirochæta pallida*. They found that fourteen day cultures of the spirochæte, exposed to full erythema doses of the X-ray (60 milliamperes, *i. e.*, five milliamperes for twelve minutes) showed no tendency to deterioration, but retained their activity and typical morphology. The transplants grew vigorously and did not die upon subsequent sub-cultures. Similar results were obtained upon exposing the cultures to radium for one hour. Even a full erythema dose of the Roentgen ray followed by a full erythema dose of radium failed to check the reproductive powers or the morphological characteristics of the organism. Rosenberger concludes, therefore, that the "X-ray and radium, in dosage harmless to man, possess no power to destroy this peculiar and interesting parasite."

Method of Investigation.

A number of preliminary experiments which need not be detailed here were carried out before the following technic was finally adopted. It will be noted that quartz glass (because of its great cost) was not used in this work, thus reducing much of the germicidal action of the ultra violet rays. The culture media, as well as other details of the methods used in these experiments have been described in a previous communication.²

Technic.

In a series of small sterile test tubes were placed 0.75 cc. of a stock culture of *Spirochæta pallida* grown on a modified Schereschewsky medium. To each tube was added one drop of a twenty-four hour bouillon culture of the contaminating organism to be tested. *Staphylococcus aureus* and *Bacillus coli* were the two types used, as representative of the Gram positive and

¹ Rosenberger, R. C., and Fanz, J. I., Researches from the John H. McFadden Research Laboratory of the Jefferson Medical College, Philadelphia, Pa., 1919.

² Weiss, C., and Wilkes-Weiss, D., *J. Inf. Dis.*, 1924, xxxiv, 212.

Gram negative groups of bacteria. Each tube was then exposed to ultra-violet radiations as projected from the Alpine Sun Lamp* for an allotted time and distance range. The apparatus was allowed to reach its maximum intensity by burning the lamp for fifteen minutes before exposing the tubes. The time intervals used were from fifteen seconds to sixty minutes, and the range varied from close application of the quartz lamp to a distance of 10 centimeters or more. The exposed material was now planted on horse serum medium, incubated at 37°, for fourteen days, and examined by dark field illumination (Leitz-Wetzlar oil immersion lens, 1/12 objective) for spirochætal growth, and by means of agar slants for bacteria.

As the work progressed, it occurred to us that contamination at the human or rabbit source of the *Spirochæta pallida* is not usually as great as was the number of bacteria added to our cultures of spirochætes. This led to the following experiments: One drop of a 1:10, 1:50, or 1:100 dilution of the bacterial growth (in double distilled water) was used instead of the pure culture. This series also includes the use of one drop of a mixture of equal quantities of bouillon growths of *B. coli* and staphylococci, as contaminating organisms.

Summary of Results.

The action of ultra-violet light when projected through thin walled small test tubes containing mixtures of *Spirochæta pallida* and various bacteria may be summarized as follows: With an exposure of 75 seconds at close range, Colon bacilli were killed and treponemata showed good growth. This growth diminished as the time of exposure was increased. Upon re-inoculating on to the fresh media, the spirochætes exhibited good procreative and normal morphological properties, with no evidence of bacterial contamination. A five to ten cm. projection distance was lethal to the spirochætes within 45 to 60 minutes. One hour's radiation at a distance of 10 cm. did not prove bactericidal, but with the lamp placed five cm. away from the tubes and allowed to act but 45 minutes, the Colon bacillus was effectively destroyed.

When a definite interval of exposure to ultra-violet rays was selected, it was observed that the lighter suspensions of bacteria

* We are indebted to Doctor J. F. Schamberg, the director of this Institute for the use of his "Alpine Sun Lamp" apparatus.

TABLE I.
Action of ultra-violet rays on cultures of *Spirochæta Pallida* and Colon or Staphylococci (in dilute suspensions). Lamp at close range.

Organism	Dilution of Bacterial Culture	Time Exposure	Dark Field Examinations	Bacterial Growth
Colon Bacillus	1:10	60 seconds	++++	+
		65 "	+++	0
		70 "	+++	0
		75 "	++	+
		80 "	+++	0
		90 "	+++	+
	1:50	60 "	++	0
		65 "	+	0
		70 "	±	0
		75 "	+++	+
		80 "	+++	+
		90 "	++	0
	1:100	60 "	0	0
		65 "	++	0
		70 "	++	+
75 "		+	0	
Staphylococcus Aureus	1:10	60 "	++	0
		70 "	+++	0
		80 "	+	0
		90 "	±	0
	1:50	60 "	+++	0
		70 "	++	0
		80 "	+	0
		90 "	0	0
	1:100	60 "	±	+
		70 "	+	+
		80 "	+	0
		90 "	0	0
Colon Bacilli and Staphylococci	1:10	60 "	+	Colon + and Staph. +
		70 "	+	
		80 "	+	
		90 "	0	
		120 "	Lost	
	1:50	60 "	±	0
		70 "	0	0
		80 "	++	0
		90 "	0	0
		120 "	0	0
	1:100	60 "	+	0
		70 "	+	0
		80 "	++	0
		90 "	0	0
		120 "	0	0

++++ excellent growth
+++ good growth

++ fair
+ poor

± occasional spirochæte
0 no growth

were more readily killed than heavier ones. In other words, this germicidal phenomena is quantitative. It was also noted that the further the source of the rays was from the organisms, all other things being equal, the less the bactericidal action. The longer the time of action, the greater the danger to both the bacteria and spirochætes. A period of exposure of 90 to 120 seconds at close range consistently proved detrimental or lethal to the pallida. Up to an interval of one minute, they were little affected.

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Experimental studies on the formation of Hassall's corpuscles.

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This work was undertaken with the hope that a study, by the method of autoplasmic transplantation, of the regenerative changes in the thymus gland of an animal like the guinea pig, whose thymus normally contains large numbers of Hassall's corpuscles, would yield some conclusive information concerning the origin of these structures.

Since 1846 when Hassall¹ described these corpuscles, they have held the attention of histologists, embryologists, and pathologists who have worked with this gland. It is interesting, that even today, in spite of the great number of studies dealing with the thymus gland, there is no unanimity of opinion in regard to the origin and possible function of these corpuscles.

A review of the meager thymus transplant literature shows that the previous work cannot be evaluated for our own histological studies, since none of the previous workers studied in detail the cytological changes which occur in the regenerating transplant.

In this work we used young guinea pigs, varying in age from 30 to 45 days. Both main lobes of the thymus were removed and they were immediately placed in a sterile physiological salt solu-

¹ Hassall, *The microscopical anatomy of the human body in health and disease.* London, 1846.