Preliminary trials in two monkeys which were found to carry in the nasopharynx and throat gram positive hemolytic streptococci and gram negative hemolytic bacilli (*Hemophilus hemolyticus*?) suggested that both these bacterial species disappeared within 2 hours following the administration of tyrothrycin. Cultures taken 5 days after a single treatment revealed no hemolytic colonies in the case of one monkey, whereas in that of the other they appeared only in the throat cultures. Following a second application at this time all cultures were negative within 3 hours. Repeated cultures remained negative for at least 4 days without further treatment. No local or general reactions to the material either in these animals or in a human volunteer were observed.

Accordingly, 5 human carriers of hemolytic streptococcus were treated. Two of them had been persistent nasal carriers for two months following scarlet fever, and 3 were convalescent in the third week of this disease. The results are presented in Table I. Only

TABLE I

DATE OF CULTURE

Carrier		6/13		6/14		6/15		6/16		6/17		6/18		6/19		6/20	6/21	6/23
* L	N	+++		0		0		0		0		0		0		0	0	0
	T	0	S°	0	S	0	S	0	S	0	SS#	0	SS#	0	##	0	0	0
* McD	N	nd		nd		nd		++		+		+		0		0	0	0
	T	nd	S	nd	S	nd	S	++	S	+++	SS#	0	SS#	±	##	0	0	0
+ S	N	++++		++++		++++		++++		++++		±		++		++	0	0
	T	+++		++++	S	++++	S	++++	S	+++	SS#	±	SS#	0	##	0	0	0
+ McC	N	++++		+++		±		++		0		0		0		+	0	0
	T	+		+	S	+++	S	±	S	0	SS#	0	SS#	0	##	0	0	0
+ E	N	+++		++++		+++		++		+++		±		0		0	+	±
	T	0		++	S	++++	S	++	S	+++	SS#	±	SS#	0	##	+	0	0

*—Chronic carrier. +—Convalescent scarlet fever patient. ±—1 col. on plate; +—2–5 col. on plate; ++—5–10 col.; +++—many col.; ++++—pure culture with plate hemolysed. nd—Culture not received. S—Spraying. SS—Two sprayings. #—Preliminary cleansing before spray. ##—Spraying stopped at this time. °—Spraying preceded subsequent cultures by 16–24 hours at all times.

in the case of carrier L was an immediate reduction in the number of streptococci obtained. In the others it was not until the fifth day that a striking diminution or disappearance of the organisms occurred, although 3 to 4 sprayings had been administered. This abrupt change on the fifth day we ascribe to the more intensive application of the tyrothrycin begun at that time which seemed warranted by the entire absence of reactions from the smaller orienting doses. These preliminary observations are insufficient to indicate the value of tyrothrycin in the elimination of hemolytic streptococcus from carriers. They are sufficiently encouraging, however, to justify further trial of the material not only against this type of carrier but against others harboring diphtheria bacilli, meningococci and pneumococci. We are now investigating these possibilities.

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DEVELOPMENT OF HOMEOTHERMY IN BIRDS

ADULT birds are grouped with mammals as homeothermic or warm-blooded. The development of homeothermy occurs in the early life of the individual and corresponds to the increase in body temperature above that of the environment. This is accomplished through the appearance of special heat-regulating mechanisms presumably located in the base of the brain, in hypothalamus.[1]

Observations show that homeothermy in birds occurs either early or late in the development, depending largely upon the developmental state of the young at hatching. With altricious birds (pigeon, pelican), the young of which are naked and helpless for a while, the mechanism for the control of body temperature does not become effective until several days after hatching. Kendeigh and Baldwin[2, 3] showed on the house wren that the body temperature of a nestling rises above the external temperature primarily during the fourth to ninth days after hatching. On the other hand, with precocious birds (chick, turkey, pheasant) the young of which are covered with down and soon leave the nest, the mechanism for the control of body temperature becomes effective much earlier, presumably before hatching.

As to the time of the development of homeothermy

[1] S. W. Ranson, *Rev. Publ. Assn. Nerv. Ment. Dis.*, 20: 342–399, 1940.

[2] S. C. Kendeigh and S. P. Baldwin, *Am. Naturalist*, 62: 249–278, 1928.

[3] S. P. Baldwin and S. C. Kendeigh, Cleveland Mus. Nat. History, 3: 1–196, 1932.

in the chick, Pembrey *et al.*[4, 5] suggested, on the basis of response in gaseous metabolism to changing temperatures, that it occurs just before hatching. However, the observations of Eycleshymer[6] and Penjonschkewitsch and Rotanow[7] indicate that the temperature of the developing egg begins to rise above the temperature of the incubator sometimes during the mid-period of embryonic development.

We have made a further and more detailed study of the temperature changes of the developing chick by the method of cultivation in an opened egg.[8, 9] The plotted data in Fig. 1 in general agree with previous investigations, perhaps with the exception that at later stages of incubation the values are not so low as those of Eycleshymer,[6] observed in water at 36.7° C., and not so high as those of Penjonschkewitsch and Rotanow,[7] observed in a still-air type incubator at 38.5° C. It is not unusual to observe such variation because both hypo- and hyperthermia in precocious birds can be produced experimentally[10] even after hatching when there is a depression or elevation in the environmental temperature.

Our curve demonstrates that the developing chicken egg, although producing heat, at first behaves as a poikilothermic or "cold-blooded" animal. In a few days of incubation the temperature of the egg rises above that of the temperature of the incubator, and the embryo gradually becomes a homeothermic or "warm-blooded" animal. However, the true homeothermy presumably is not acquired by the chick until the fourth or fifth day after hatching[11]

It is also interesting to note that the rise in temperature of the developing egg is not uniform but is somewhat periodic. The periods of decline in the temperature of the egg about the 9th or 10th day and the 15th or 16th day coincide with the observed cyclical suppressions in the growth rate of the embryo.[12]

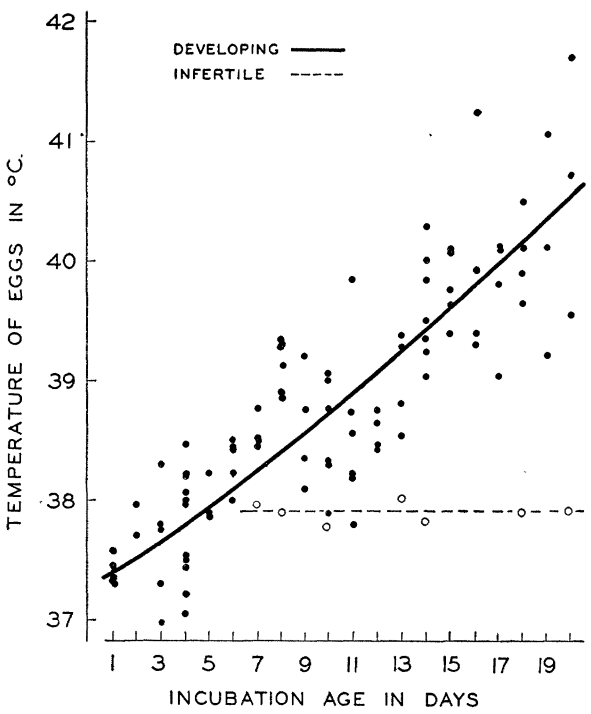

FIG. 1. Temperature changes of the developing eggs. Each dot represents the average value of several measurements on an individual egg. Circles indicate the temperature measurements of infertile eggs. All observations were made in the glass top incubator with slow air movement at the temperature on the level of thermocouple 37.75° C.

ALEXIS L. ROMANOFF

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN A. C. OPERATED ELECTRONIC INDUCTORIUM

ALL the various types of electronic inductoria with which the writer is familiar seem to have been designed to do some specific task and, consequently, little thought seems to have been given to the general applicability or low cost of these designs.[1] There has been a need for an inductorium that would answer the everyday requirements of a physiology laboratory at the low cost and great convenience associated with most electronic devices.

Several inductoria have been constructed here which make use of the familiar saw-tooth wave generator circuit. They have been used for three years in the physiology and the pharmacology departments and have given trouble-free service with a considerable saving in the usual time of experimentation. The circuit

[4] M. S. Pembrey and M. H. Gordon, *Jour. Physiol.*, 16: v–vii, 1894.

[5] M. S. Pembrey, M. H. Gordon and R. Warren, *Jour. Physiol.*, 17: 331–348, 1894–95.

[6] A. C. Eycleshymer, *Biol. Bull.*, 12: 360–374, 1907.

[7] E. E. Penjonschkewitsch and A. N. Rotanow, *Arch. Geflugelkunde*, 8: 369–383, 1934.

[8] A. L. Romanoff, *Anat. Rec.*, 48: 185–189, 1931.

[9] This method permits to maintain a very uniform temperature in the egg free from interferences either of air movement or of changes in atmospheric pressure caused by the presence of egg-shell. The measurements were made by a thermocouple through the window of the egg at temperature of 37.75° C.

[10] J. C. Scholes, Thesis, Cornell University, 1938.

[11] W. F. Lamoreux and F. B. Hutt, *Poultry Sci.*, 18: 70–75, 1939.

[12] A. L. Romanoff, SCIENCE, 70: 484, 1929.

[1] F. A. Fender, SCIENCE, 89: 491, 1939; O. A. Schmitt and O. F. Schmitt, *ibid.*, 76: 328, 1932; O. A. M. Wyss, *ibid.*, 84: 431, 1937.