studies. In 10 done post mortem "R" colonies occurred alone once, "S" colonies alone once, and "R" and "S" 8 times. Six successful colony studies from living patients showed "R" colonies alone in 3 instances, with one subsequent death; "S" alone in 2 with 2 deaths; and "R" and "S" in one which resulted in death. In the total series "R" colonies were recovered 13 times and "S" colonies 12.

Case No. 20 is of particular interest in that pure cultures growing variant "R" colonies were isolated twice during life. The first puncture was obtained at the height of the disease, the second at the onset of crisis. Colonies obtained from the latter were more nearly completely rough than those obtained from the former. Both strains showed very low virulence for mice and inagglutinability in type specific serum, but were restored to virulence and agglutinability by mouse passage.

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Effect of Anterior Pituitary Upon Production of Red Pigment in the Salamander Pseudotriton ruber ruber (Soninni).

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A marked change in coloration occurs at the time of metamorphosis in most salamanders. We have obtained evidence that this change is not produced by the thyroid hormone in the case of red pigment formation. Thyroidectomized larvae of *Hemidactylium scutatum* will assume the red coloration of the adult although they do not metamorphose.[1] Larvae of the red salamander *Pseudotriton ruber* when precociously metamorphosed with thyroid extracts are yellow and not red. Since the anterior pituitary is known to play a part in normal metamorphosis we have tested the effect of anterior pituitary implants upon red salamanders which have been precociously metamorphosed with thyroid solutions.

Fifty larvae of *Pseudotriton ruber,* 30 to 50 mm. in length, were metamorphosed in a solution of 1:15,000 desiccated thyroid. Before transformation was completed 7 of the largest specimens of the same size (Group A) were selected and each of 4 given subcutaneous

[1] Noble, G. K., and Richards, L. B., *Anat. Rec.*, 1931, **48**, 58.

implants of 2 pars anterior of toad pituitary. Three specimens received muscle, to serve as controls. The gland material was taken from freshly killed adult *Bufo fowlerii,* and given at regular intervals, 3 times a week. The salamanders, throughout the experiment, were kept without food, in separate dishes, at room temperature, with just enough spring water in the dish to keep the surfaces moist.

A few days later 5 fully metamorphosed salamanders of the series (Group B) were implanted in the same manner, 3 serving as experimental, 2 as control animals. At the same time 9 more specimens (Group C), also completely transformed, were implanted, but on a different schedule. The 5 experimentals were implanted twice a week, with 3 pars anterior each, the 4 controls with muscle. A fourth group (D), of 4 specimens, completely transformed, received implants of pars intermedia plus pars posterior. Two salamanders were implanted twice a week, with 4 pituitaries each, and 2 implanted 3 times a week with 3 pituitaries each. After 30 days, or 12 grafts for Groups A and B, and 9 for Group C, the implanting was stopped. The reaction to the anterior pituitary was apparent in all of the experimental specimens but most marked in Group A, on which the implanting was begun before the completion of metamorphosis. After the 6th implant all 4 experimental animals assumed a reddish tinge not seen in the controls. Their color became increasingly red with every implant. After the 12th implant they ranged from a capucine-yellow to flame-scarlet.[2] The control salamanders changed color slightly, as did the stock from which all were taken, becoming lighter in hue—and finally ranged from orange-buff to antimony yellow. In Group B, on which the implants were begun after the completion of metamorphosis, but in the same manner as Group A, the results are positive but not as marked. The 3 experimentals, range from capucine-yellow to orange-chrome, not achieving the flame-scarlet of Group A. The 2 controls were light-orange-yellow. In Group C (implanted twice a week) the color of the experimentals, after 12 implants, was only slightly more red than that of the control specimens. The 5 salamanders receiving anterior lobe ranged from ochraceous-buff to a shade between capucine-yellow and orange. The 3 controls ranged from light-orange-yellow to buff-yellow. Group D, implanted with pars intermedia plus pars posterior, became very dark, due to the expansion of the melanophores, and assumed a greenish hue. The black pigment overshadowed the background color to such an extent that it was practically impossi-

[2] Ridgway, R., 1912, Color Standards and Nomenclature, Washington.

ble to name that color. The general effect was of olive-lake to yellowish-citrine. From these data it is evident that the red color of an adult *Pseudotriton ruber* may be induced in prematurely metamorphosed individuals by anterior pituitary implants. It seems probable that in the normal development of the salamander it is the release of a quantity of anterior pituitary hormone, initiating metamorphosis, which brings about the assumption of adult red color at this time.

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Typhoid Agglutinins as Influenced by the Conditioned Reflex in Man.

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In order to throw some light on the relation of the nervous system to the production of antibodies, an investigation of the artificial production of typhoid agglutinins in man was undertaken. Following the procedure which Metalnikov[1] used with animals, the plan followed in 3 experiments was to inject patients for 21 successive days with a small dose of typhoid vaccine subcutaneously, immediately after application of an ice cube to the cheek. After a rest period of approximately 2 weeks the patients were given the conditioning stimuli alone, that is, ice cube, and the prick of the needle. The curve of typhoid agglutinins was determined.

In the first experiment with 12 subjects, 6 received typhoid vaccine daily and 6 received injections of sterile saline. The latter served as a control group and did not show any titer during the injection period. Following the administration of conditioning stimuli alone to the first 6 subjects, 2 showed a slight rise in titer from 1-200 to 1-250.

In the second experiment 12 subjects received typhoid vaccine (groups of 4 receiving different dosages). Two weeks later the conditioning stimuli alone were applied. Blood was taken 75 minutes later. Of the 11 subjects so tested 6 showed a rise in titer of one tube (one dilution-step), one a rise of 2 tubes and one a rise in 3 tubes, in the usual dilutions of 1-20, 1-40, 1-80, 1-160, 1-320,

[1] Metalnikov, S., *Ann. d. I. Inst. Past.*, 1931, **46**, 137.