1/500 suspension of the brain of a Tunisian-infected guinea pig. Temperatures were taken twice a day during the vaccination without any considerable rise being noted. This is contrary to the observation of Zinsser and Castaneda, but was probably due to the small amount of vaccine used in our experiment as compared to the doses used by them. All the controls gave typical reactions and of the 10 vaccinated animals only 5 had fever. The others proved to have been completely protected against the infection.

We find it interesting to publish these experiments, even though they are not extensive, because they prove that even with a small amount of vaccine it is possible to protect guinea pigs against the Old World strain by the Mexican vaccine of Zinsser and Castaneda.

Encouraged by the recent work of Sanchez Casco[6] we have vaccinated 2153 persons, mainly among employees of the public bathing houses for indigents and among the inmates, physicians and nurses of the Belen prison, where a focus of typhus was recently discovered. In no case did we observe any accident due to the vaccination. Dr. M. Bustamante of the Department of Transmissible Diseases has vaccinated some 6,000 persons in epidemic zones, and every day the demand and use of the vaccine is greater. We feel confident that this method of protection will prove of great assistance in the typhus problem in this country.

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On Individual Differences in Chicken Blood.

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I. The existence of numerous individual serological differences in the blood of chickens has been established by several authors by means of rabbit immune agglutinins,[1] immune isoantibodies,[2] and normal isoantibodies.[3, 4] The most interesting and exhaustive

[6] Sanchez-Casco, R., *Medicina*, 1932, **12**, 316.

[1] Landsteiner, K., and Miller, Jr., C. P., PROC. SOC. EXP. BIOL. AND MED., 1924, **22**, 100.

[2] Todd, C., *Proc. Roy. Soc.* B., 1930, **106**, 20, **107**, 197; see Hadda, S., and Rosenthal, F., *Z. Immunitätsforsch.*, 1912-1913, **16**, 524.

[3] Karshner, W. M., *J. Lab. Clin. Med.*, 1928-1929, **14**, 346.

[4] Shimidzu, T., *Tohoku J. Exp. Med.*, 1931, **18**, 97; see Bailey, C. E., *Am. J. Hyg.*, 1923, **3**, 370.

studies were carried out by Todd, who demonstrated with the use of immune isoagglutinins an almost complete individual specificity —a result in harmony with his older experiments with White[5] on cattle blood.

As is seen from the following tests, a differentiation of individual chicken blood can also be made without difficulty by using absorbed normal ox sera.

TABLE I.

Absorptions were made by mixing inactivated ox serum diluted 1:2 with ½ its volume of washed and packed chicken blood cells. After one hour at room temperature, the mixtures were centrifuged. Tests were made by adding 2 drops of the fluid to 1 drop of a 2.5% suspension of washed chicken blood cells. Readings after 2 hours at room temperature.

Three absorptions were made with bloods 4, 7, and 10. With all the other bloods, 2 absorptions were made, although the fluids were completely exhausted after one treatment.

Absorbed with cell No.	Chicken Cells No. 1	2	3	4	5	6	7	8	9	10	11	12
1	0	+	±	++	+±	+±	++	±	+	++±	+	**0**
2	0	0	±	++	+±	+	++	tr	±	++±	+	0
3	0	±	0	++	±	0	++	0	tr	++±	tr	0
4	0	±	0	±	0	0	+±	0	tr	++±	0	0
5	0	0	0	+±	0	0	++	0	ftr	+±	0	0
6	0	±	0	++	±	0	++	0	±	++±	tr	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	±	0	+±	±	ftr	++±	0	tr	++±	ftr	0
9	0	±	0	++	±	tr	++	0	0	++±	0	0
10	0	0	0	0	0	0	ftr	0	0	0	0	0
11	0	+	0	++	+	±	++±	ftr	±	++±	0	0
12	0	+±	+	++	+±++		++±	+±	+	++±	+	0

The intensity of the reactions is indicated as follows: 0, ftr (faint trace), tr (trace), ±, ±, +, ++, etc.

The tests (Table I) show that the agglutinins present in normal serum permit of a differentiation of individual blood properties, since most of the 12 chicken bloods examined could be distinguished from each other. From some preliminary experiments it seems possible that the differentiation can be carried further by using various normal sera.

As these findings suggested similar experiments with the blood of other species, tests were made with guinea-fowl and turkeys. Within these species as well, certain differences were noticed, but the variations were much less pronounced. If one would venture to offer an explanation for these facts, it might be suggested that possibly the greater diversity in the blood of chickens is correlated to the existence of a large number of somatic variations in this species, re-

[5] Todd, C., and White, R. G., *Proc. Roy. Soc.*, B, 1910, **82**, 416; *J. Hyg.*, 1910, **10**, 185; *Proc. Roy. Soc.*, B, 1911, **84**, 255.

sulting from extensive selective breeding and perhaps the derivation from several ancestral forms.

II. A striking aspect of the experiments of Todd and White on cattle and of Todd on chicken blood is, as already mentioned, the large number of differences. This great diversity would seem less puzzling if it could be explained by the existence of more or less well defined serological factors, such as exist in human blood.[6, 7] Thus the combination of n independent factors would yield 2^n differences. Actually in cattle blood a division into groups has been demonstrated by Little, and by Hofferber and Winter, and from Todd's genetic studies on chicken families, certain types appeared to exist. Furthermore, in experiments made by L. C. Dunn and one of the writers, an agglutinogen, whose heredity was apparently that of a single dominant property, was found in several chicken families by means of an anti-chicken rabbit immune serum.

In the following experiments (Table II), 2 types of chicken blood could be demonstrated with the aid of normal ox sera and Forssman immune sera, produced by injecting rabbits with horse kidney, or alcoholic extracts of cat or dog blood along with pig serum. On testing batches of chicken bloods with the diluted ox sera, it was seen that practically all gave the strongest agglutination reactions with the same bloods whereas others were consistently weakly agglutinable. Also when the cells were tested with various Forssman immune sera, it was observed that all acted similarly in that the strongest agglutination took place with the same cells which were, however, not those most sensitive to the ox sera. This specificity is seen from Table II, representing tests with 9 out of about 30 chicken bloods, those having been selected which reacted most intensely with

TABLE II.

The ox sera were diluted 1:20, the Forssman antisera 1:10. Tests and readings were made as in the experiments recorded in Table I.

Sera	Chicken Cells No. 7	10	4	15	16	8	11	17	18
Ox No. 1	++±	++±	++	++±	0	0	±	±	0
Ox No. 2	++±	++±	++±	++±	0	0	±	+	0
Ox No. 3	++±	+++	+++	+++	0	0	±	±	0
Anti-horse kidney	0	0	±	±	0	0	++±	++±	+±
Anti-cat blood extract	0	0	±	+	tr	0	++±	++±	+±
Anti-dog blood extract	0	0	±	tr	0	0	++	+±	±

Bloods Nos. 4, 7, 8, 10, and 11 are the same as those in Table 1.

[6] Landsteiner, K., *Wien. Klin. Wschr.*, 1901, 1132.

[7] Landsteiner, K., and Levine, Ph., *J. Exp. Med.*, 1928, **47**, 757.

one or the other of the 2 sorts of sera and such as gave negative or weak reactions with both.

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Study of Endocrine Factors Influencing Mammary Development and Secretion in the Mouse.

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At sexual maturity the mammary gland of the female mouse consists of the primary duct (galactophore) system. Theelin injections or ovarian implants induce a similar galactophore development in both castrate males and females. No response of the mature female gland is noted after theelin treatment. This is in agreement with the findings of Turner *et al.*,[1] that theelin, theelol or crude estrogenic extracts will not influence the mammae beyond the development of the galactophores. Thus the follicular hormone seems responsible for the establishment of the primary duct system.

It is more or less generally believed that the corpus luteum governs the advanced development of the mammary gland. A satisfactory luteal extract was not obtained. However, luteinization of the ovaries by extracts of the anterior lobe pituitary* or of pregnancy urine† induces development of the secondary ducts (interlobular canals) and later of the alveolar anlagen. In the intact animal this development is much more rapid after pituitary administration than after Antuitrin S. After ovariectomy, neither of these substances will bring about growth of the interlobular canals. Total hysterectomy also inhibits their development even though functional corpora lutea are present in the ovaries. If hysterectomy is done before the appearance of any interlobular canals, they do not appear even after extended periods of luteinizing treatment. Interlobular canals only partially developed at the time of hysterectomy are inhibited from any further growth. Thus it appears that the formation of these secondary ducts is dependent upon the uterus, the activity of which is in turn governed by the corpus luteum.

[1] Turner, C. W., Frank, A. H., Gardiner, W. U., Schultze, A. B., and Gomez, E. T., *Anat. Rec.*, 1932, **53**, 227.

* Pituitary extract whole gland (sheep).

† Antuitrin S.