laboratory table, 8 inches lift was quite adequate for most purposes. The adjusting handle D was arranged so that a person seated and looking through a spectrometer would find no difficulty in making the necessary height adjustment. The stability of the truck for photographic purposes is excellent.

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SPECIAL ARTICLES

GROWTH RATES AND RACIAL SIZE IN RABBITS AND BIRDS

IT is a thankless task to try to correct an error which has crept into scientific literature, but at times necessary, unless error is to be allowed to continue indefinitely. A case in point I find in the work of a former pupil who was allowed to study observations of my own upon the growth rate of rabbits and to publish conclusions based upon them in which I am unable to concur. To be specific, I find in a recent interesting and important paper by Riddle[1] and others this statement, "Robb found that the percentage growth-rate from birth to puberity is the same in these two races of rabbits, but after puberty this rate is more depressed in the small race." The two races mentioned in the quotation are my own Flemish Giant (large size) and Polish (small size) races, and the data used by Robb were supplied from observations which I had personally made and they were later published elsewhere in greater detail.[2] Robb[3] says (p. 308), "During the fourth month Polish and hybrid animals undergo a more rapid retardation of growth than do the Flemish Giants. Their growth rate values, *which have been indistinguishable hitherto* (italics mine) diverge at this time." The point which I wish to emphasize is that the growth rates are *not* identical in the large and small races at any time, either subsequent to birth or prior to it, as shown by Castle,[2] and Castle and Gregory.[4] The large race not only undergoes cell division prior to birth faster than the small race but also grows at a faster rate after birth, so that the growth curves of the two races steadily diverge. Nor is the percentage increase in weight by 10-day intervals the same in the two races as Robb suggests. This is shown in detail in my Table 4 (1929, p. 433)[2] from which I will reproduce the data for females only (the largest group).

TABLE

PERCENTAGE INCREASE IN WEIGHT BY 10-DAY INTERVALS OF LARGE RACE AND SMALL RACE FEMALE RABBITS

Age in days	Large	Small	Difference
0– 10	221	207	14
10– 20	72	67	5
20– 30	67	70	−3
30– 40	45	34	11
40– 50	25	22	3
50– 60	20	16	4
60– 70	16	15	1
70– 80	15	12	3
80– 90	13	11	2
90–100	12	9	3
100–110	11	8	3
110–120	9	5	4
120–130	9	6	3
130–140	8	4	4
140–150	7	3	4
150–160	6	4	2
160–170	4	2	2
170–180	4	3	1
180–190	4	4	0
190–200	3	1.6	1.4

Except for the single age group (20 to 30 days), the growth rate of the large race is consistently higher. For some statistical reason which I can not explain the small race gain in that period is apparently higher, but it falls back into its proper place of more retarded growth rate in the next period (30 to 40 days) and there remains. In his zeal for "the equation for autocatalysis sponsored by Crozier" Robb overlooked the consistent difference in growth rate between the large and small races, and assumed the existence of two distinct growth cycles. I had hoped that my own publication of the complete data without comment would be a sufficient correction of Robb's mistake, of which I was not aware until I came to study the data myself, subsequent to the preparation of his manuscript, but since his conclusions rather than my own are accepted by even such veteran investigators as Riddle, I think it imperative to point out that the two are inconsistent. Dr. Robb will, I am sure, acquit me of any ill will, either in seeming to have been a too lax critic of his own work in advance of its publication or a too severe critic afterward.

The important general conclusion to which all our studies of size inheritance in rabbits point is that differences in adult body size are determined primarily by different growth potentials inherent in the gametes (eggs and sperm) of each race. The effects of these

[1] O. Riddle, D. R. Charles and G. E. Cauthers, *Proc. Soc. Exp. Biol. and Med.*, 29: 1216–1220, 1932.

[2] W. E. Castle, *Jour. Exp. Zool.*, 53: 421–454, 1929; *ibid.*, 60: 325–338, 1931.

[3] R. C. Robb, *Brit. Jour. Exp. Biol.*, 6: 292–310, 1928.

[4] W. E. Castle and P. W. Gregory, *Jour. Morph. and Physiol.*, 48: 81–104, 1929; SCIENCE, 73: 680–681, 1931; *Jour. Exp. Zool.*, 59: 199–211, 1931.

differences in growth potential are manifested first in differences in rate of segmentation of the fertilized egg, then in differences in the size of the blastocyst and of the embryonic area which develops upon it, later in difference in size of the young at birth and in (percentage) growth rate subsequent to birth, and finally in a more prompt and complete arrest of growth at puberty. Robb was able to show that differences in size of the endocrine glands are correlated with differences in general body size and so that differences in endocrine activity are probably not responsible for the differences in adult body size. This started Gregory and myself on a search for the causative agency elsewhere and we think that by a study of the embryology we have located it in the gametes.

If Robb's statement were correct that there is no difference in percentage growth rate between large race and small race rabbits prior to puberty, it would present an exceptional situation requiring explanation. As it is, all the facts of embryology, of size at birth, of post-natal and post-pubertal growth are consistent and referable to a common agency inherent in the gametes at the time of fertilization.

The observations of Riddle and others on birds indicate that a similar situation exists there also with only this complication, that size on hatching (unlike birth weight in mammals) is absolutely limited by the size of the egg (including everything within the limy shell). It seems probable, therefore, that racial size in vertebrates generally is determined by constitution of the gametes, and that endocrine glands enter only as secondary agencies in modifying the growth rate in the later stages of the life cycle.

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CULTIVATION OF THE VIRUS OF INFECTIOUS LARYNGO-TRACHEITIS OF CHICKENS

THE ability of certain viruses, *e.g.*, vaccine virus, Virus III and herpes virus, to multiply in a fluid medium has been demonstrated by the work of Maitland and Maitland,[1] Eagles and McLean,[2] Andrewes,[3-5] Maitland and Laing,[6] Li and Rivers[7] and others. The report to be made here is concerned with the results of the application of methods used by some of these investigators in the cultivation of the virus of infectious laryngotracheitis of chickens.

The medium devised by Li and Rivers[7] for the cultivation of vaccine virus, consisting simply of minced chicken embryo and Tyrode's solution, has proved satisfactory and has been used most extensively. The containers used were 50 cc Erlenmeyer flasks, with cotton stoppers, over which were placed two layers of lead foil. In each flask, 0.5 cc of minced embryo and 5 cc of Tyrode's solution, sterilized by filtration, were placed. Bacteriologically sterile Berkefeld V filtrates of an infusion broth suspension of tracheal exudate obtained from an infected chicken were used to initiate the cultures. Sterile emulsions of spleen tissue from infected chickens were also tried, but without success.

To start a culture, 0.5 cc of filtrate was added to each flask of medium. New cultures were made at five- to seven-day intervals by the direct transfer of 0.5 cc of the old culture into flasks of fresh medium. The cultures were tested for the presence of virus by the injection of 0.1 cc into the tracheas of susceptible chickens. In this manner, active virus has been demonstrated in a number of cultures that were separated from the original culture by a sufficient number of generations that virus could be present only by reason of multiplication. In only one series of cultures has virus been present beyond the twelfth generation. In this series, which is still carried, virus has been demonstrated in cultures of the twenty-second generation. In this instance, the multiplication of virus is more than 5×10^{23}.

It has been proved that virus may be present in some, but not all, flasks of media of the same generation of cultures. Therefore, in the tests for virus, it has been necessary to make inoculations separately with the contents of several flasks. The virulence of the culture virus has been observed to equal that of the virus filtrate with which the cultures were initiated.

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