hemoglobin following a standard dose of liver or iron is apt to react above the average to other food factors. We speak of dogs as overactive or subnormal in their response with hemoglobin production.

It may be objected that amino acids added to a diet containing proteins of unknown amino acid make-up give a confused picture of no value. No such objections are made to experiments where iron or copper are added to various diets in anemia due to blood loss or deficient diets. Moreover the internal metabolism of proteins is almost limitless in its complexity and we are merely adding one factor to a host of others in even the simplest type of experiment. To illustrate, an anemic dog during a complete fast with no intake of food factors whatever will produce a considerable amount of new hemoglobin and if given some iron during a fast of 2 weeks will often produce more than 100 gm. of new hemoglobin. This must come from body protein and it has been shown that this new hemoglobin is in part related to the materials which otherwise would appear in the urine as waste products (urea and ammonia fraction).[3] This remarkable conservation of end products and exchange of materials within the body during a fast is an index of what the body can do and indicates the complexity of the internal protein metabolism related to hemoglobin production. The addition of an amino acid to this complex reaction may give a significant response which must be accepted as a fact even if the explanation is unpalatable.

9338 P

Transplantation of Gonads from Lethal to Normal Larvae in *Drosophila melanogaster.*

ERNST HADORN.* (Introduced by B. H. Willier.)

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Those lethal genes which allow the individual to develop up to a certain stage before death occurs are of particular interest in analyzing experimentally the problem of gene action during ontogeny.

[3] Daft, F. S., Robscheit-Robbins, F. S., and Whipple, G. H., *J. Biol. Chem.*, 1933, **103**, 495.

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In such a study we have to deal with the question whether the lethal genes affect unfavorably the development of all organs or whether the cessation of development is the result of their deleterious action on certain organs only, which then would inhibit also the further development of those organs in which the genetic constitution has no primary lethal effect.

In investigating this problem the recessive mutation *"lethal-giant"* (*—lgl—*discovered and located by C. B. Bridges, 1933, Chromosome 2, *locus* 8.2—unpublished) was found to be suitable. The homozygotes show externally a normal development during larval life up to the time of pupation. Unable to pupate normally, they survive as full grown larvae for several days. Usually they are very transparent and bloated. This appearance is the result of an abnormally small fat body and of an accumulation of body fluid. From 4 to 6 days after the time when normal pupation takes place, a few of the lethals die as larvae, but most of them form "pseudopupæ". These have a hardened and darkened cuticle within which no further development occurs.

In the lethal larvae the imaginal discs degenerate completely, while the larval organs show a normal histological structure. From these facts it may be inferred that the lethal gene produces a fatal effect only on the anlagen of the imago, which differentiate later than the larval organs. Of special interest are the gonads which form early in development like the larval organs, but continue their development into the imago in genetically normal individuals. Whether the gonads which are parts of the lethal larva can develop normally may be ascertained only by experimental means. At the third larval instar of such lethals the ovaries are normal in structure and size while the testes show considerable inhibition of growth. The developmental potencies of both ovaries and testes were tested by transplanting them into genetically normal larvae of the same age. The method of Ephrussi and Beadle[1] which was used, allows full development of both ovaries and testes in case they are of normal constitution. The host flies were dissected and the graft examined several days after hatching.

Transplantation of ovaries: From a total of 41 transplants made, 36 ovaries were found. In every case the ovary has developed to a *considerable degree* beyond the stage to which it can go in a lethal larva. The transplants grow and elongate; the egg strings differentiate and their apical ends exhibit contractive movement as in the normal. However the development attained is not complete. The

[1] Ephrussi, B., and Beadle, G. W., *Am. Nat.*, 1936, **70**.

transplants never reach the size of a full grown normal ovary and, although eggs are formed, they degenerate before reaching their full size. It makes no difference whether the ovaries are attached to the host oviducts or are free.

Transplantation of testes: Out of a total of 32 testes transplanted not one developed. In most cases the transplant was not found at all. In a few cases only a small vestigial part of it could be dissected out from the host. These failed to differentiate further.

Conclusions. The distinct but limited development of the transplanted ovaries shows that this organ still has developmental potencies at a time when other organs, such as the imaginal discs, degenerate. This means that *the lethal genetic constitution prevents further development in different organs at different periods of time.* Whether the further development of the ovaries is based on autonomous potencies or whether it is a result of a favorable influence coming from the genetically normal host cannot be determined from these experiments.

The striking difference found between the developmental potencies of transplanted ovaries and testes seems to be correlated with the fact that prior to transplantation, the testes during the third larval instar already show such deleterious changes brought about by the lethal conditions as to prevent their increase in size, whereas the ovaries seem not yet affected.

9339 P

Resuscitation of the Heart from Ventricular Fibrillation with Drugs Combined with Electric Shock.*

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Hoffa and Ludwig[1] demonstrated that electrical stimulation of the mammalian heart led to ventricular fibrillation and death. Prevost and Battelli[2] studied the effect of electric currents on the heart and reported that a brief countershock of sufficient strength applied directly to the heart through an electrode placed on the ventricles

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1 Hoffa, M., and Ludwig, C., *Z. f. rat. Med.*, 1850, **9**, 107.

2 Prevost, J.-L., and Battelli, F., *Comptes Rendus des Séances de L'Académie des Sciences*, 1899, **129**, 1267.