PHYSIOLOGY.

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BIOLOGICAL TEST FOR THYROID SUBSTANCE.

PAUL TRENDelenburg (Biochemische Zeitschrift, Bd. xxix. S. 396), continuing Reid Hunt's work on the aceto-nitril test for the recognition of small quantities of thyroid substance, investigated the effects produced by injection of aceto-nitril into animals previously treated with the blood of thyroidectomised animals. Briefly, Reid Hunt's reaction depends upon the fact that white mice fed with thyroid substance are more resistant to the poisonous action of aceto-nitril than normal white mice not so fed. This seems to be due to the fact that in the former there is a greater difficulty in the splitting off of the CH₃ group, and so the hydrocyanic acid component is more slowly set free. This is judged to be the case because thyroid-fed animals are not more resistant to free HCN than normal ones. The protection against aceto-nitril begins within a few days of the commencement with thyroid feeding, and lasts for more than two weeks. The protection can reach a high standard; thus a mouse fed for a period of eleven days with a total quantity of 20 mgrms. dried thyroid substance is resistant to twenty times the lethal dose. The degree of the protection is apparently proportional to the amount of iodine in the preparation, but it is necessary to point out that even the iodine-free thyroid substance exerts a quite distinct influence. As the author holds the view that the function of the thyroid is the neutralisation of poisonous substances which form in the tissues of the body, and are carried to the thyroid by the blood, &c., he thought that these toxic products might be the substances which raised the resisting power of the animal towards aceto-nitril. The thyroid normally would contain these in a concentrated form, while the blood of the normal animal would be comparatively free from them. On the other hand, the blood of a thyroidectomised animal might be rich in these substances. Trendelenburg thought that it might be possible to demonstrate the presence of these non-iodised toxic products in the blood of thyroidectomised animals. The method of experimentation and the results were as follows:—The mice were fed for some weeks before, and also during the experiment, with oats and water. The animals were first tested to discover the minimal lethal dose of

recommend the examination of the parathyroids in any case of sudden death which is not otherwise satisfactorily explained. It is interesting to note that the twin of the first case and also another two-and-a-half-months-old brother died suddenly—cause unknown.
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aceto-nitrii. This was dissolved in fresh distilled water and injected under the skin of the back. Blood was taken from thyroidectomised cats during the period when the symptoms of thyroidectomy were best marked. The animals during this stage were lethargic, somnolent—allowing, for example, a mouse to pass over the face without making any attempt to seize it. The blood was dried in a vacuum desiccator, powdered, and made up into pills with syrup. These were given to the mice in the morning. In the control experiments, which were always carried out first of all, it was found that when 18 mgrms. (over a period of nine days) of Knoll’s thyraden powder were given, the mice withstood a dose of 2:9 mgrms. aceto-nitrii per gramme body-weight, while all the control animals not so fed with thyroid substance died after any dose larger than 0:57 mgrms. per gramme body-weight. The protection, therefore, was sufficient to counteract five times the lethal dose. Strange to say, Bayer’s iodothyrin exercised no protective influence.

Before giving the blood of thyroidectomised animals it was necessary to give the blood of normal animals. It was found that in no case after feeding with the blood of normal animals was there an increase in the resisting power towards aceto-nitrii, but in Reid Hunt’s experiments rather a slight diminution. On testing the effects produced by feeding with the dried blood of thyroidectomised animals it was found that the mice so treated withstood about double the lethal dose of aceto-nitrii.

Trendelenburg therefore concluded that in the blood of thyroidectomised animals there are substances present which give the same biological test as the thyroid gland itself, and as the blood of patients suffering from exophthalmic goitre. It is still, however, a matter of doubt as to the nature of these bodies which are present in the blood of thyroidectomised animals as well as in the thyroid itself.

**Metabolic Changes in the Aqueous Humour.**

Knape (*Skandinav. Arch. f. Physiologie*, Bd. xxiv. S. 259) gives in an interesting communication the results of a prolonged investigation on the above subject. These results may be shortly summarised as follows:

1. The salt concentration of the aqueous humour is not altered either by atropin mydriasis or eserin myosis; that is to say, salt and water are secreted in the same proportion after atropin and eserin as in the normal eye. A higher saline concentration in the blood-serum is accompanied by a higher saline concentration in the aqueous humour. The osmotic pressure of the ocular fluids is higher than the blood-serum of the same animal.

2. The total protein metabolism in the aqueous humour is not influenced by atropin, but is increased in eserin myosis.
3. The viscosity of the aqueous humour is normal after atropin, increased after eserin, and the increase is due to an increased protein content.

4. Atropin mydriasis exercises no influence on the passage of typhoid agglutinins, haemagglutinins, and haemolytic amboceptors from the serum into the aqueous humour, while the passage of these is greatly facilitated in eserin myosis, sometimes rising to ten times the amount present in the control eye.

5. No fibrin is formed in the normal aqueous humour, while in eserin myosis the aqueous humour often clots, but never after atropin.

6. Atropin mydriasis retards, while eserin myosis hastens, the passage of fluorescein from the blood into the anterior chamber.

7. Intra-ocular pressure is not influenced by atropin or eserin.

8. Atropin dilates the vessels of the conjunctiva and of the iris, while eserin contracts the former and dilates the latter. The retinal vessels are not appreciably affected.

9. The aqueous humour is produced by the iris, and also, although to a lesser extent, by the ciliary body.

The various alterations which these drugs give rise to in the production and composition of the aqueous humour depend upon the influence which they exert upon the vital activity of the endothelial cells of the blood-vessels.

**Blood Changes at High Altitudes.**

In an interesting communication by Morawitz (*Deutsch. med. Wochenschr.*, 1910, No. 8) attention is specially directed to a physiological method of distinguishing between newly-formed and normal red cells. If the blood of a normal rabbit be kept at body temperature in an aseptic condition and excluded from air, the oxygen content only diminishes very slowly, while if the blood from animals which have been experimentally rendered anaemic by withdrawal of blood at intervals be kept under exactly the same conditions, the oxygen is rapidly used up—in fact, may disappear within a quarter to half an hour. Carbonic acid has then taken its place. The author concludes that the normal red cells show a minimal gas exchange, while the newly-formed red cells, which circulate in large quantities in the blood after anaemia due to haemorrhage, have a very active gaseous exchange. He believes, therefore, that this method may be employed to recognise regenerative changes taking place in the blood.

The author and a colleague ascended the Col d'Olen (3000 metres) to Mosso's laboratory and estimated there daily the number of the blood cells, their haemoglobin content, and their oxygen consumption. They noticed the usual increase of erythrocytes, although this was not
so marked as that observed by other investigators. They found that the oxygen consumption of the blood taken at this altitude was never greater than at sea level. The experiments were carried out for a period of eight days. The author concludes that the increase in erythrocytes, which is immediately observed on arrival at a high altitude, and which rapidly disappears, is due to an altered distribution of the cells in the vascular system, and not to regenerative changes in the blood. He therefore agrees with Zuntz's explanation of the phenomenon.

**Muscular Work.**

Palmén (*Skandinav. Arch. f. Physiologie, Bd. xxiv. S. 168*) took a long series of ergograms before and after practice and found that not only does the total output of work increase with practice, but also the capacity for prolonged work. An increase in the volume of the muscles and also of the tendons occurs after training, along with changes in the nervous system. Moderate tobacco smoking facilitates at first the output of work, but rapidly this diminishes, and the diminution is most marked in cases where the musculature has been previously fatigued.

The total amount of work for a given height of lift diminishes proportionately with the increase in the weight lifted, and the same holds good in experiments with a constant amount of work per second when the height of the lift is correspondingly varied. The total work for any given weight increases as the intervals between the acts are increased; that is to say, the smaller the amount of work per second. For the performance of equal amounts of work per hour with different weights, the intervals between the lifts must increase as the weight increases. The most favourable resting pause (five seconds in the case of the author) between the working periods corresponds with the quickest rate at which the work for a given weight can be carried out which produces no sign of fatigue.

The author draws certain theoretical conclusions from his investigations. There are two factors which play a part in so-called muscular fatigue, the true "muscular" fatigue, which is the more prominent when large weights are lifted, and the other a "toxic" fatigue of the central nervous system, which is more evident with smaller loads and a more rapid working rate.