male rat is relatively deficient in, but not free of, the luteinizing factor. The pituitaries of 49 adult females induced luteinization in every instance irrespective of the magnitude of the ovarian enlargement.

Experiments now in progress indicate that castration qualitatively alters the activity of the gonadotropic complex of the hypophysis in rats. A pituitary gland no longer under the influence of the testes shows an increase in the luteinizing factor, which becomes definitely evident about the 20th day after gonadectomy. The concentration of the luteinizing factor becomes such that from the 1st to the 11th month after the operation, injection of pituitary powder from these animals produces heavy luteinization in ovaries of normal and hypophysectomized test rats in every instance. In time, however, the luteinizing capacity is again diminished and the pituitary glands become devoid of this factor even at high dosages.

Conclusions: Assays of male and female rat hypophyses were made by injecting acetone dried glands into normal and hypophysectomized immature female rats. Male hypophyses stimulated follicular development only, unless large amounts of the desiccated glands were administered. The hypophyses of adult female rats induced luteinization at all dose levels.

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Respiratory Effects from the Passage of Polarizing Currents Through the Medulla Oblongata.*

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In a series of experiments now extending over several years we have been attempting to investigate the site and functioning of the central respiratory mechanism by exposing the posterior portion of the floor of the fourth ventricle and studying the effects of local cooling of that region and the effects of the application of certain drugs to it. It was felt that additional information might be gained by studying the effects of the passage of polarizing currents through this part of the brain stem for it seemed likely that if too great

* These experiments were supported in part by a grant from the Rockefeller Foundation to Robert Gesell for studies on respiration.

current density was avoided, it might be possible in this way to produce temporary depression of function without causing irreparable tissue damage.

Twenty experiments have been performed. In all these, dogs anesthetized either with morphine and urethane or with pentobarbital were used. As one electrode we used the instrument which had previously served as our applicator in the experiments on central cooling. The silver chloride plated silver tip of this electrode, triangular in shape, measuring about 3 mm on a side, was placed in light contact with the floor of the fourth ventricle in the calamus scriptorius. A large, indifferent electrode, also silver-silver chloride was wrapped in cotton soaked in saline and placed, in some experiments, in the mouth, in others beneath the skin over the occiput.

With the electrodes so placed, a current of only a few milliamperes resulted in profound changes in respiration. In some cases the effects were completely reversible while in other cases recovery did not occur, suggesting that permanent damage had been done. Inspection of the brain in these latter cases frequently revealed gross tissue destruction.

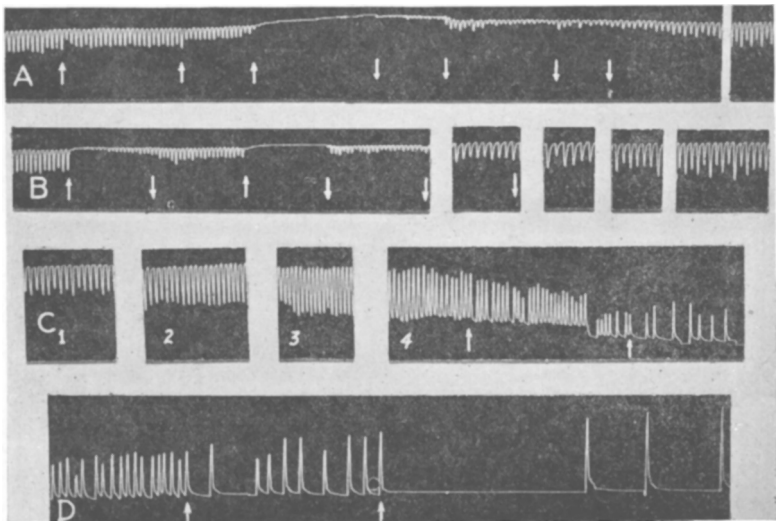

FIG. 1.

Effect of polarizing currents on respiration. Records are of circumference changes of the abdomen, downstroke representing inspiration. Upright arrows indicate increases in current strength, inverted arrows decreases. In records A and B the last arrow indicates decrease of the current to zero. In record C the current was increased in the intervals shown by breaks in the record. In record A the electrode in contact with the surface of the brain was the cathode; in record B, the anode; in record C, the anode; and in record D, the cathode.

The results, somewhat variable, seem to fall into 2 groups. In the majority of the experiments, the effect of the passage of such a current was a decrease in amplitude of respiration proportional to the current strength and independent of the direction of current flow. When respiration ceased, it was with the chest in the expiratory position. These results we believe represent the effect of depression of the entire respiratory center—inspiratory as well as expiratory parts. Two examples of this type of response are illustrated in Fig. 1 A and B.

The other type of response, illustrated in Fig. 1 C and D, is characterized by a marked increase in the duration of inspiration resulting in so-called apneustic respiration. This type of breathing we have also produced by local cooling of the floor of the fourth ventricle[1] and by the application of cocaine[2] and is the result, we believe of depression of the expiratory portion of the central respiratory mechanism leaving the inspiratory portion relatively unaffected. It is interesting that all of the stages between normal respiration and apneusis which have been observed during gradual cooling and the gradual absorption of cocaine may also be seen during the passage of a polarizing current. This is well illustrated in Fig. 1 C. The first effect seen in C_2 is a slight decrease in the duration of the expiratory pause with a small increase in the respiratory rate. In C_3 we see that the expiratory pause is now almost completely abolished with as yet no evidence of inspiratory prolongation, resulting in a considerable acceleration of respiration. In C_4 the expiratory pause has completely disappeared and an inspiratory pause appears and becomes progressively more marked until the respiration is decidedly apneustic in type with the rate far below normal. Complete recovery did not occur in this case, the respiration remaining somewhat apneustic in type after cessation of the current. Re-application of the current, now in the opposite direction, Fig. 1 D, greatly intensified the apneusis.

[1] Nicholson, H. C., *Am. J. Physiol.*, 1936, **115**, 402.

[2] Nicholson, H. C., and Sobin, S., in press.