cant cortical component. None of our cases have revealed follicles in the right gonad.

The degree of sex-reversal attained is probably proportional to the quantity of estrone introduced though considerable variation occurs with any given dosage. The basis for the changes observed is the intersexual composition of the zygotically male gonads brought about by administration of estrone. Differences in response of gonads is attributable to differences occurring in normal development of testis rudiments on opposite sides. The left testis passes through a stage from approximately 7 to 11 days during which a definite germinal epithelium containing germ cells is present over the entire free surface, whereas the right only occasionally shows scattered traces of this structure. It is this germinal epithelium of the testis, particularly the left, which becomes activated by the introduced estrones and develops into ovarian cortex. The differences in response between testes clearly indicates that they basically possess the same fundamental asymmetrical condition long known to be characteristic of right and left ovaries in birds.

The phenomenon of sex-inversion in the fowl has come to be associated entirely with a masculinization of the female while the opposite condition, a spontaneous development of female characters by genetically determined males has not been generally admitted. These experiments show that such transformations are possible and it is therefore altogether probable that some of the hermaphroditic fowl reported in the literature may actually have been feminized males, owing to development of ovarian cortex on testes, rather than masculinized females as interpreted.

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Electrocardiographic Changes in Ethylene Glycol Poisoning.

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During the course of some experiments on the pathology of ethylene glycol poisoning of pups some striking alterations in cardiac rhythm were noted. These observations prompted the formulation of a series of experiments designed to determine the cause of the cardiac arrhythmia. Repeated electrocardiograms were made on 4 littermate puppies 6 weeks of age and on 4 adult dogs. The ethylene glycol was administered orally as a 4% solution which the animals

were permitted to drink *ad libitum*. A record was made of the daily quantity of the solution imbibed by each animal. Two pups and 2 adult dogs drank a solution of c.p. ethylene glycol while the others imbibed water which contained an equivalent amount (4%) of a commercial antifreeze (Prestone) which is largely ethylene glycol. The survival period of pups and adult dogs ranged from 100 to 174 hours and 74 to 136 hours respectively.

Control electrocardiograms were recorded twice on each animal before the administration of ethylene glycol. The heart rate of the pups as shown by these electrocardiograms ranged from 130 to 190 per minute, whereas, that of the adult dogs varied from 85 to 160 per minute. The cardiac rhythm was quite regular.

Following the initiation of the ethylene glycol poisoning the electrocardiograms were recorded daily until toxic symptoms developed, at which time the interval between the successive records was reduced to from one-half to 4 hours. When the electrocardiograms were taken the animals were suspended on either a wooden or a canvas frame. The suspension apparatus maintained the dogs in a standing posture. Needle electrodes introduced into the skin and subcutaneous tissue were used to pick up the heart potentials. Lead I electrocardiograms were recorded from symmetrical regions of the skin overlying the middle and caudal portion of each scapula. These skin areas were marked so that repeated electrocardiograms could be recorded from exactly the same place. Since it was the primary object of these experiments to ascertain the cause of the arrhythmia, it was deemed unnecessary to record more than one lead.

Examinations of the electrocardiograms recorded at various stages during the poisoning episode showed significant changes in the functional activity of the pacemaker. In pups, the characteristic findings displayed by the electrocardiograms may be summarized as follows: (1) A profound bradycardia, the heart rate in most instances being reduced to less than one-half that of the original normal value (normal rate of 130 to 160 reduced 60 to 70 per minute); (2) exaggerated sinus arrhythmia showing marked cyclic changes in the R-R intervals and rhythmic changes in the height of the R waves, the magnitude being greatest when the R-R intervals were the longest (Fig. 1); (3) sino-auricular block showing typical S-A dropped beats; (4) slight displacement of the S-T segments and in some instances diphasic T waves; (5) the P-R and Q-S intervals of all records remained within normal limits.

Electrocardiograms of the poisoned adult dogs differed considerably from those obtained in pups. The sinus arrhythmia was not pronounced. The bradycardia, though quite marked was not as

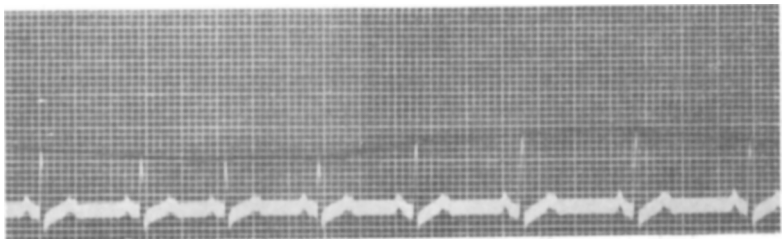

FIG. 1.

Electrocardiogram of pup No. 1 poisoned with 4% c.p. ethylene glycol—1-22-1938. Time 5:15 P.M. Interval of 170¼ hours after the beginning of the poisoning.

Heart rate 75/min.

Record No. 24 showing sinus arrhythmia with cyclic changes in the amplitude of the R waves, the amplitude being greatest when the R-R intervals are the longest.

extensive, the lower limit of 70 to 75 per minute being reduced from the control pulse rates of 85 to 160 per minute. The pronounced slowing of the heart developed shortly before death and was sometimes preceded by a definite tachycardia. One of the adult dogs whose control heart rate was 85 per minute showed only an increase in heart rate, reaching 115 per minute 10 hours before death. One electrocardiogram recorded from one of the dogs 2 hours before death, showed a prolonged P-R interval greater than 0.20 seconds; the electrocardiogram in this instance measured 0.28 seconds. The irregularity of cardiac rhythm was caused in part by S-A dropped beats but also by nodal and ventricular premature contractions. The most constant and striking alteration of the electrocardiograms of adult dogs occurred in the S-T segments and in the T wave (Fig. 2). An S wave of 1.5 to 3 mm followed by a low take-off and a convex curvature of the S-T segment, and a large diphasic T wave were found to be a more or less constant S-T complex. The magnitude

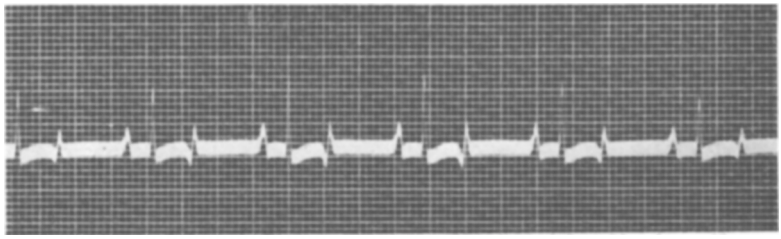

FIG. 2.

Electrocardiogram of adult dog No. 10 poisoned with 4% c.p. ethylene glycol—1-20 1938. Time 10:45 P.M. Interval of 126¾ hours since the start of the ethylene glycol poisoning.

Heart rate 75/min.

Record No. 9 showing the typical S-T changes and diphasic T wave characteristic of ethylene glycol poisoning.

of the diphasic T wave usually measured 2 mm as a negative deflection and 3-5 mm as a positive deflection. In 2 of the adult dogs the positive phase of the diphasic T wave appeared first; in one, the negative phase was the first to appear and in the other dog there was a reversal of the initial deflection, being negative in the first 3 records showing diphasic T waves, positive in the next 4, and again negative in the last 3.

Conclusions. Bradycardia which was sometimes preceded by tachycardia developed in dogs poisoned with ethylene glycol. The cardiac arrhythmia of both immature and mature dogs were both regular and irregular in character. The regular alteration of rhythm was caused by an exaggerated sinus arrhythmia. The irregularity of cardiac rhythm of pups was caused by sino-auricular block, whereas, in adult dogs, it was caused not only by sino-auricular block but also by nodal and ventricular extra-systoles. A partial A-V block developed in only one of the 4 adult dogs and in this instance it did not occur until 2 hours before death. Atrio-ventricular block, therefore, appeared to be an exception rather than a rule in ethylene glycol poisoning. The deep S waves and the displacement and curvature of the S-T segment combined with a diphasic T wave were constant findings in the electrocardiograms of adult dogs after the developmeent of toxic symptoms of ethylene glycol poisoning. Similar S-T changes occurred in pups but much less extensively. The abnormal S-T complex (deep S wave, low take-off and convex curvature of S-T segment followed by a diphasic T wave) therefore appeared to be a characteristic alteration of the electrocardiograms of dogs poisoned with ethylene glycol. The electrocardiograms of dogs poisoned with "Prestone" were identical with those poisoned with c.p. ethylene glycol.

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Effects of Morphine Sulphate on Hypothalamus of the Cat.

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In 16 animals under light ether anesthesia, a needle electrode was inserted stereotaxically into the hypothalamus and observations were made as to the changes in the responses of this structure to faradic stimulation after the intra-hypothalamic or the intraperitoneal injec-