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Developmental Aspects of the Electrocardiogram.**MAURICE DIONNE, ELWOOD SCHAFER AND HERBERT POLLACK.**

(Introduced by Shields Warren.)

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Recent improvements in the technique previously described^{1, 2} have been made by the addition of a special circuit³ with 3 vacuum tubes between the electrodes and the galvanometer. This apparatus gives a known and desired amplification (5 to 30 times) of the heart voltage, without distortion. By its use, a new series of electrocardiograms of the chick embryo from the fourth day to the twentieth day was taken.

Five distinct waves are seen as early as the fourth day. These, like those of the adult mammalian heart, can be separated into 2 parts, the auricular complex and the ventricular complex. The auricular complex consists of the P-wave which is followed immediately by a wave of longer duration, Ta, which occupies the remainder of the P-R interval. The analogy may be drawn between this new wave (Ta) and the T-wave following the ventricular complex. The ventricular complex starts with a sharp summit R, and a dip S. There is no Q-wave in any record. The T-wave follows, always diphasic in type. The recorded voltages on the fourth day were read from the β lead and the circuit resistance was 4300 to 5400 ohms.

The average P-wave deflection was 0.015 millivolts, Ta-wave was 0.010 millivolts. The average R-wave was 0.070 millivolts, the S-wave 0.070 millivolts, and the T-wave took origin 0.017 millivolts negatively to the isoelectric and after becoming 0.018 millivolts negative went to a summit of 0.003 millivolts before returning to the base line.

In the α lead the P-wave is diphasic up to the tenth day inclusive, after which it is always negative. The Ta wave is positive to the eleventh day inclusive and then becomes negative. The R-wave is upright, the S-wave dips, and the T-wave always starts negatively to the isoelectric line and is invariably diphasic.

¹ Pollack, H., *Proc. Soc. Exp. Biol. and Med.*, 1930, **28**, 61.

² Pollack, H., *J. Lab. and Clin. Med.*, 1931, **16**, 1194.

³ Pollack, H., Dionne, M., and Schafer, E., *J. Lab. and Clin. Med.*, 1931, **16**, 1198.

The β lead, as well as the gamma lead, is very similar in form to the α , except that the P-wave is always positive.

The deflections are low at first, come to their greatest height at the eighth to ninth days in the auricular complex, and at the ninth to tenth day in the ventricular complex. Following these dates, they again become low to gain slowly afterwards to the twentieth day.

The behavior of these tracings points to a possible relation to the establishment and initiation of a nervous control over the chick embryo heart, which occurs at approximately the same time. Thus, nervous control would be inhibitory in type and would affect the auricular complex earlier than the ventricular complex. The series is now being extended to include the first days of life outside the shell.

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Pellagra and Vitamin Deficiency.

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Despite the fact that pellagra is a definite clinical entity, extensive investigation over several centuries has failed to establish a causative agent.^{1, 2, 3} Of all the many theories advanced as to its etiology, the two most important would seem to be infection or dietary deficiency. All attempts to transmit the disease have failed and no incontrovertible evidence of an infectious agent have been advanced. The relationship of this disease to poverty has been stressed since its earliest recognition. Goldberger, *et al*,^{3, 4, 5, 6} brought forward considerable additional evidence toward establishing pellagra as a dietary deficiency disease.

¹ Wood, Edward Jenner, "Pellagra." *Oxford Medicine*, Vol. IV, part I, page 307.

² Funk, C., *Die Vitamine*. Wiesbaden, 1914.

³ Goldberger, J., "The transmissibility of pellagra." *U. S. Public Health Rep.*, Nov. 17, 1916, page 3159.

⁴ Goldberger, Waring, and Willets, "The prevention of pellagra." *U. S. Public Health Rep.*, 1915, XXX, page 3116.

⁵ Goldberger, Wheeler, and Sydenstricker, "The relation of diet to pellagra incidence." *U. S. Public Health Rep.*, March 19, 1920, XXXV, page 648.

⁶ Goldberger, J., and Wheeler, G. A., "Experimental production of pellagra in human beings by means of diet." Hygienic Laboratory, Washington; *Bull.* 120, Feb. 7, 1920.