HISTORY OF ELECTROCARDIOLOGY

Introductory Note to a Classic Article by Francis Galton

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Several inherited arrhythmic disorders, such as the Long QT Syndrome (LQTS), the Brugada Syndrome, and arrhythmogenic right ventricular dysplasia are of particular interest to the noninvasive electrocardiologist in view of the unique genotypic-electrocardiographic phenotypic findings associated with each of these disorders. These inherited alterations in the electrophysiology of the heart are all autosomal dominant conditions, although the Jervell and Lange-Nielsen form of LQTS can have a recessive component (double dominant inheritance) manifest by concomitant bilateral neural deafness. We know that each of these disorders is associated with a gene mutation that results in an abnormal protein, either an ion channel protein, or a structural protein in the case of arrhythmogenic right ventricular dysplasia.

When was the relationship between genes and proteins first appreciated? Most people have the impression that Mendel initiated this concept, but this is not true. Mendel initiated the field genetics with his article on the inheritance of peas, but the law of heredity really began with Francis Galton in a short article he published in *Nature* in 1898 entitled "A Diagram of Heredity"¹ and reprinted in this history

of cardiology section of *Annals*. Starting a few years after Mendel, Galton carried out a series of experiments, also with peas, and developed his "Ancestral Law of Heredity" that he summarized in a now classic diagram in his 1898 article. This background concept on heredity led a physician, Dr. Archibald Garrod, to make a critical interpretation about a benign familial disorder called alkaptonuria.² This disorder has as one of its phenotypes the darkening of excreted urine after the urine is exposed to air for some time. Dr. Garrod recognized the inherited nature of this condition and proposed in 1902 that alkaptonurics inherit an inability to produce a specific enzyme (protein) that degrades alkaptans. He referred to this defect as an "inborn error of metabolism." Garrod drew heavily on the concepts proposed by Galton in the diagram of heredity,¹ and it is for this reason that we are reproducing Galton's article in its entirety.

REFERENCES

1. Galton F. A diagram of heredity. *Nature* 1898;57:293.
2. Garrod A. The Incidence of Alkaptonuria: A Study in Chemical Individuality. *The Lancet* 1902; ii, 1617.