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# Pioneers in Veterinary Cardiology: Birth of New Specialty

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# PIONEERS IN VETERINARY CARDIOLOGY

## BIRTH OF NEW SPECIALTY

Dr. David K. Detweiler

IN 1942 when Dr. David K. Detweiler began his studies on cardiovascular disease in animals this was almost a virgin field, except for work that had been done in Europe. There was little of significance in the English literature and the prevailing opinion amongst clinicians was that heart disease in animals was uncommon and of little importance. Dr. Detweiler recalls that as a student he was taught that digitalis was ineffective in animals; subsequent work showed that the reason for this opinion was that a proper oral dose-regimen had not been established for the various species.

Initially, Dr. Detweiler's work revolved about the use of the electrocardiogram, and physical examination, primarily of dogs and horses in the clinics of the Large and Small Animal Hospital. During these early years Dr. Detweiler began to establish relationships with physicians who specialized in cardiology. Dr. Martin H. Wendkos was especially helpful; he invited Dr. Detweiler to attend his evening cardiology clinic at Philadelphia General Hospital. It was here that Dr. Detweiler received training in the then current methods of clinical cardiology.

By 1952 Dr. Detweiler had accumulated enough information to publish, in the *Veterinary Extension Quarterly*, a review of seven years' experience with cardiovascular disease in the Small Animal Hospital of the Veterinary School. By this time it was apparent that heart disease was not uncommon in dogs and that it offered a fertile area of investigation and in 1954 a Heart Station was created. This led to an immediate increase in the number of animals examined for heart disease since there was now a central location to which patients could be referred.

In 1955-56 Dr. Detweiler was granted a Guggenheim Fellowship to study at the Veterinary Physiological Institute at the University of Zurich, Switzerland. While there, he conceived the idea of undertaking a large-scale epidemiological study of cardiovascular disease in dogs. It was this study which would lead to the development of the CCSU (Comparative Cardiovascular Studies Unit).

Upon returning to the United States Dr. Detweiler prepared a grant request for an epidemiological study of 5,000 dogs. This was funded by the National Institutes of Health (N.I.H.). Among those involved in this initial study were Dr. Donald F. Patterson, who did clinical work, Dr. Klaus Huhben, in pathology, and Mr. William Schnarr, who provided invaluable technical assistance. Another important addition to the group was Dr. Robert P. Botts, an epidemiologist, who was assigned temporarily to the project by the United States Public Health Service. The epidemiological study contributed the first definitive data on heart disease in dogs in this country. This information provided two historic breakthroughs: it formed the basis of establishing a new specialty in veterinary medicine, cardiology, and it supplied the impetus for conducting detailed comparative work. In the epidemiologic study a total of 4,831 dogs were examined, and the prevalence of heart disease was found to be about 10/1000 cases. Not to be overlooked in its importance was the fact that through this study Dr. Detweiler and his colleagues applied the first systematic approach for diagnosing cardiac disease in dogs using a combination of diagnostic methods—electrocardiography, auscultation, fluoroscopy, and radiography.

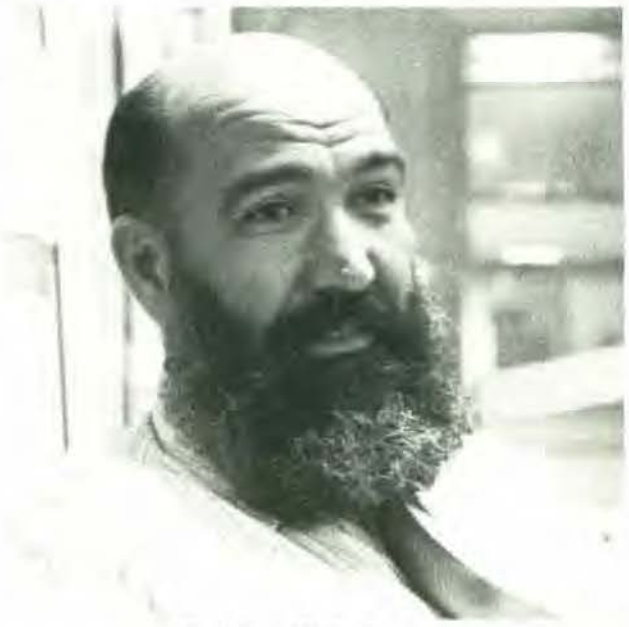
Primarily as a result of the epidemiological study and the fact that Dr. Detweiler had now established an international reputation in veterinary cardiology, a major grant was obtained in 1960. A one million dollar grant from N.I.H., to extend over a ten-year period, was obtained and CCSU was established.

Under the terms of this grant the administration and the work done in the CCSU would be under the direct supervision of Dr. Detweiler. The three general areas of activity of the CCSU were designated to be: research, especially in the comparative aspects of heart disease; training; and a center for collecting and disbursing information. The CCSU was designated as an international training center by the World Health Organization.

One of the very important findings of the epidemiological study was that the forms of congenital heart disease detected in dogs were anatomically and clinically similar to those known to exist in man, and had a prevalence rate of about 5.6/1,000 dogs in the clinical population.

One of the first research efforts of the CCSU was a study on the inheritance of heart disease in dogs. This work has been carried out by Dr. Patterson and was initiated when analysis of the records of the epidemiological study indicated that the five most common cardiac anomalies in dogs were not randomly distributed amongst pure breeds. For example, the incidence of patent ductus arteriosus was found to be highest in poodles, and the following conditions were most prevalent in the species indicated: pulmonic stenosis (beagles), subaortic stenosis (Newfoundlands), persistent right aortic arch (German shepherds), and Tetrology of fallot (keeshond). It was apparent that congenital cardiac defects in dogs deserved intensive study and there was a need for an individual expertly trained in genetics. From 1964 to 1966, Dr. Patterson studied genetics at Johns Hopkins University, and while there continued to conduct studies on dog families in a number of breeds that have an unusually high frequency of a particular defect. Subsequent studies by Dr. Patterson involving experimental matings of dogs donated to the project have substantiated the validity of the earlier observations in the epidemiological study; the offspring of matings between dogs with congenital cardiac defects were affected with the same type of defect in a high frequency. Continued work by Dr. Patterson and his colleagues showed for the first time, in any species, genetic determinants. This finding led to a series of grants to further delineate the mode of inheritance and an investigation of the affects of genetic defects on the embryologic development of the heart. This work was done in collaboration with Dr. James W. Buchanan, Dr. David H. Knight, and Dr. Robert L. Pyle as well as collaborators from other institutions in the United States and foreign countries. Dr. Patterson is now recognized as a pioneer and an international leader in the study of cardiac malformations in dogs and has broadened his work to include studies of other genetically related diseases. He is chief of the section on Medical Genetics, the only such unit in any

Dr. David H. Knight



Dr. James W. Buchanan

Dr. Donald F. Patterson

***The epidemiological study contributed the first definitive data on heart disease in dogs.***

veterinary school in the world.

The training program of the CCSU has paid huge dividends. Not only has it provided other institutions and agencies with a body of veterinary cardiologists, but several individuals who either trained in the program, or became associated with it at its outset, have remained at the Veterinary School where they have assumed important roles in the research, teaching and clinical service programs. Noteworthy are Drs. James W. Buchanan, David H. Knight, Julius Melbin, E. Neil Moore, and Fred Fregin. Mr. William Schnarr who was with the unit at its inception has obtained a master's degree in pathopaleontology and is presently working on a Ph.D. degree.

Drs. E. Neil Moore and Joseph F. Spear have done some brilliant work in the field of electrophysiology, and in particular have studied and defined the sites in the heart which contribute to arrythmias and conduction disturbances. Physicians from HUP, trained under Drs. Moore and Spear, have now perfected techniques for surgical excision of these sites, thus correcting serious arrythmias in man. Dr. Moore, in association with Dr. John P. Boineau formerly of Duke University Medical School, and now director of cardiology, Medical College of Georgia, conducted research which led to a better understanding and a method of surgical correction of the arrythmia seen in the Wolff-Parkinson-White (WPW) syndrome in man.

Dr. Julius Melbin works in the field of hemodynamics, in which he is attempting to solve problems associated with the mathematical expression of blood flow that have been controversial for the past 150 years. Before coming to the veterinary school and receiving his V.M.D. degree and then an M.Sc. degree in cardiology and a Ph.D. degree in biomedical engineering, Dr. Melbin had trained as an engineer. The scope of Dr. Melbin's work deals in a general way with blood flow and the coupling of the heart with the vascular system and how these two are interrelated. Some of the complex equations developed by him were beyond anyone's knowledge when he began his work. One particular area of investigation by Dr. Melbin involves the study of how blood vessel design affects hemodynamic control without any energetic needs at all.

*Photographs by Mr. Wood*

Dr. Detweiler along with Dr. Buchanan and Dr. Knight has been primarily interested in acquired cardiovascular disease. In recent years Dr. Detweiler has concentrated especially on electrocardiography in the dog and cardiovascular toxicology. Today, Drs. Buchanan and Knight are responsible for the clinical program in cardiology in the Veterinary Hospital of the University of Pennsylvania (VHUP) and operate the Heart Station. Dr. Knight is chief of the section of cardiology and Dr. Buchanan functions as the cardiac surgeon. Dr. Buchanan was the first to develop the field of cardiac surgery in veterinary medicine. Dr. Knight made pioneering studies on the hemodynamic and anatomical effects of heart worm infestation on the heart and pulmonary circulation in the dog.

Other work that originated in the CCSU involved a study of the pathological characteristics of vascular disease in dogs and swine and investigations on the effects of exercise on the cardiovascular system of the horse.

Dr. Fregin, who worked at New Bolton Center, conducted research on the cardiovascular response to exercise in the horse and found that some unique adjustments occur in this animal. Dr. Fregin, who also operated the Heart Station at the rural campus, left the faculty in 1981.

The overall program of research and clinical work on dogs conducted by various individuals of the CCSU staff has resulted in a comprehensive understanding of heart disease in this animal. It is now known that a triad of pathological lesions are responsible: valvular fibrosis, intramural coronary arterial sclerosis, and foci of diffusely distributed necrosis. The pathogenesis of heart disease in the dog usually involves valvular lesions starting early in life, leading to mitral insufficiency in the middle years and finally congestive heart failure in the aged dog.

Funding for the CCSU lasted for about seventeen years. Since the end of the umbrella-type funding by NIH, each investigator has developed his/her individual grant proposals; there has been no central funding nor use of common facilities. Actually today the term CCSU is used primarily in a historical sense but it still functions as a source of information.

The impact of this pioneering work and the development of the CCSU on veterinary and comparative cardiology is so great that it is difficult to measure. There is no doubt that the Unit became the world leader in comparative cardiology and that the work of the past forty years led to the development of an entirely new specialty in veterinary medicine. In 1942 there were no veterinarians who were board certified in cardiology; today there are over thirty who have this specialty certification in the American College of Veterinary Internal Medicine (subspecialty, cardiology). Research reports from individuals in the CCSU are published in the most prestigious journals on an international basis. The contributions of the CCSU in the area of congenital heart disease are unique in the annals of cardiology; it is safe to say that no other institution in the world could make an equal contribution.

Beyond its impact on veterinary and comparative cardiology the CCSU has played a very important role in the renaissance of the Veterinary School in the past two decades. Through the development of this Unit, worldwide attention was focused on the Veterinary School as an institution dedicated to forging an outstanding research program. It is reasonable to say that the CCSU attracted not only individuals to cardiology but that it was also responsible for attracting good people to other programs. Internally, it is also acceptable to speculate that the CCSU, through its success, stimulated faculty members to intensify their research efforts.

Dr. Detweiler recruited an exceptional group of individuals to staff the CCSU and many have contributed to its success. Through his great personal efforts Dr. Detweiler has truly earned the accolade, "Father of Veterinary Cardiology." ***Dr. John Martin Gregory Thibodeau, a junior student, contributed to this story.***