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The history of veterinary cardiology

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Abstract Throughout civilization, animals have played a pivotal role in the advancement of science and medicine. From as early as 400 BC when Hippocrates recognized that diseases had natural causes, the steadfast advances made by biologists, scientists, physicians and scholars were fueled by timely and important facts and information- much of it gained through animal observations that contributed importantly to understanding anatomy, physiology, and pathology. There have been many breakthroughs and historic developments. For example, William Harvey in the 16th and 17th centuries clarified the importance of the circulatory system, aided by observations in dogs and pigs, which helped to clarify and confirm his concepts. The nineteenth century witnessed advances in physical examination techniques including auscultation and percussion. These helped create the basis for enhanced proficiency in clinical cardiology. An explosion of technologic advances that followed in the 20th century have made possible sophisticated, accurate, and non-invasive diagnostics. This permitted rapid patient assessment, effective monitoring, the development of new cardiotonic drugs, clinical trials to assess efficacy, and multi-therapy strategies. The latter 20th century has marshaled a dizzying array of advances in medical genetics and molecular science, expanding the frontiers of etiologies and disease mechanisms in man, with important implications for animal health. Veterinary medicine has evolved during the last half century, from a trade designed to serve agrarian cultures, to a diverse profession supporting an array of career opportunities ranging from private, specialty practice, to highly organized, specialized medicine and subspecialty academic training programs in cardiology and allied disciplines.

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Abbreviations

CCSU	comparative cardiovascular studies unit
CHF	congestive heart failure
DCM	dilated cardiomyopathy
ECG/EKG	electrocardiogram
EPS	intracardiac electrophysiology study
HCM	hypertrophic cardiomyopathy
MVD	mitral valve disease
MYBPC3	myosin binding protein C3
PDA	patent ductus arteriosus
PRAA	persistent right aortic arch
PS	pulmonic stenosis
RCM	restrictive cardiomyopathy
SAS	subaortic stenosis
VHS	vertebral heart size
WPW	Wolff-Parkinson-White

Introduction

The synopsis of pre-1960 cardiology history comes in part from notes prepared by David K. Detweiler for his Gary Bolton Memorial lecture at the American Animal Hospital Association meeting in 1983. At the time he said: "The idea that veterinary cardiology would grow into a recognized sub-specialty seemed incongruous 40 years ago when it was generally believed that heart disease is rare in animals and, when present, untreatable". The situation has changed remarkably. Veterinary cardiology has become organized, represented by American and European specialty boards, and mounting interest in other regions of the world including Asia, Middle East and South America. Veterinary cardiologists have contributed research papers, monographs and textbooks along with a specific award for cardiology: the David K. Detweiler Prize for Cardiovascular Research established in 1982 by the World Small Animal Veterinary Association. Moreover, cardiology specialty practices have become established worldwide and veterinary cardiologists are called upon as consultants by government and industry.

As such, it is appropriate to look back, examine our beginnings, evaluate our progress and query the future. In this regard animals and animal research have played key roles in promoting understanding in cardiovascular structure and function.

Hippocrates to Harvey

Hippocrates (ca 460-ca 370 BC) is considered the Father of Modern Western Medicine.[1] He was a proponent of clinical observation, recorded clinical signs and believed that all diseases had natural causes. This contrasted with earlier beliefs, that illnesses were governed by bad humors and spirits.

Aristotle (384–322 BC) is considered the founder of comparative anatomy. He could only dissect animals because human dissection was forbidden.[2] While his treatises, including anatomy and biology were mostly discredited in subsequent centuries, pediatric cardiac surgeons have recently developed the Comprehensive Aristotle Score used to rate the complexity and risk of operative procedures,[3] named for Aristotle and based upon his writing in 350 BC: "When there is no scientific answer available, the opinion perceived and admitted by the majority has (the) value of truth".

Claudius Galen (129–217 AD) was a Greek physician who by dissecting monkeys and pigs, gained additional knowledge used in treating injured gladiators.[4] He considered dark venous blood as the vehicle for "nutritive spirit" and thought it formed in the liver from water and absorbed food products which then flowed in veins to and from the heart. The blood gave up its impurities in the right heart and carried them via the pulmonary arteries to the lungs where they were exhaled. He thought some of the blood in the right ventricle seeped through invisible pores in the interventricular septum to the left ventricle, where it was exposed to "vital spirit" breathed into the lungs through the trachea, reaching the left heart via pulmonary veins. Red blood containing vital spirit then flowed to and from the arteries to all parts of the body. Galen's concepts prevailed for over 1400 years until discredited by Leonardo da Vinci and Vesalius.

Leonardo da Vinci (from Vinci Italy, 1452–1519) has been called the "Father of Medical Illustration".[5] He did not publish his work but kept drawings and observations in notebooks with the intention of writing a book someday. Leonardo wrote his notes as mirror images, possibly to prevent others from copying them, or because he was left-handed (Fig. 1). He was an engineering genius, inventor, artist, and anatomist and created meticulous drawings of human anatomy including the heart and abdominal organs. The notes and sketches were not discovered until a century later thus they had little influence on other writers during this period. He was a vegetarian, loved animals and sometimes bought caged animals at a market in order to set them free.

Andreas Vesalius, (1514–1564) was a Flemish physician-anatomist working at the University of Padua, Italy.[6] His own dissections helped to