

CARDIO CARE



CARDIOVASCULAR RESEARCH INSTITUTE • UNT HEALTH SCIENCE CENTER AT FORT WORTH • VOLUME 1, NUMBER 1 • MARCH 2000

Welcome to the CRI...

Executive Committee

Peter B. Raven, PhD
Director

James L. Caffrey, PhD
Associate Director

Dan Dimitrijevič, PhD
Division of Cell & Tissue
Engineering

H. Fred Downey, PhD
Division of Cardiac
Hemodynamics

A. H. O-Yurvati, DO
Clinical Research &
Education

Michael L. Smith, PhD
Center for Sleep Research

Advisory Board

Joan Henry
Glaxco-Wellcome

Jere Mitchell, MD
UT Southwestern
Medical Center

Editorial Staff

Sondra England
Editor

Donald Watenpugh, PhD
Writer & Scientific
Consultant

CARDIO CARE is a publication of the Cardiovascular Research Institute at the University of North Texas Health Science Center at Fort Worth. Information contained in this publication is educational only and is not intended to replace proper medical evaluation. If you have specific medical questions concerning your personal health, please contact your family physician.

Medical consumers and patients are removed from the realm of research being conducted at universities and hospitals all over the world. Sometimes a specific scientific breakthrough is reported and you may wonder how that relates to you.

At the Cardiovascular Research Institute we want to educate the medical consumer with the information necessary to make sound medical decisions. We also want to educate the patient to understand not only how research can be applied to produce a safer medical treatment, but to bring definitions to the medical terminology the patient hears but often doesn't quite understand.

This quarterly newsletter will create a framework of understanding by providing definitions to basic medical terms used in discussions about heart

disease and prevention of heart disease; basic physiological information as to structure and function of the cardiovascular system and related systems; discussion of research at the

continued on page 3

About the Director...

Peter B. Raven, Ph.D., is the founder of the Cardiovascular Research Institute and serves as the director. He is professor and chairman of the UNT Health Science Center's Department of Integrative Physiology. Dr. Raven earned his Ph.D. at the University of Oregon and completed postgraduate studies at the Institute of Environmental Stress of the University of California at Santa Barbara.



Dr. Raven's professional interests include the physiology of aging and the physiology of exercise, especially with respect to cardiopulmonary responses. He has a long-term interest in exercise training and its effects on blood pressure control, and has investigated the effects of the environment (heat, cold, altitude, space and air pollution) on human physiological performance.

Dr. Raven has published over 200 scientific papers and book chapters in his fields of research. He is currently editor-in-chief of *Medicine & Science in Sports & Exercise* and served as co-chair at the Scientific Program of the 1996 Pre-Olympic Scientific Congress. Dr. Raven is a member of the American Heart Association, American College of Sports Medicine, and the American Physiological Society.

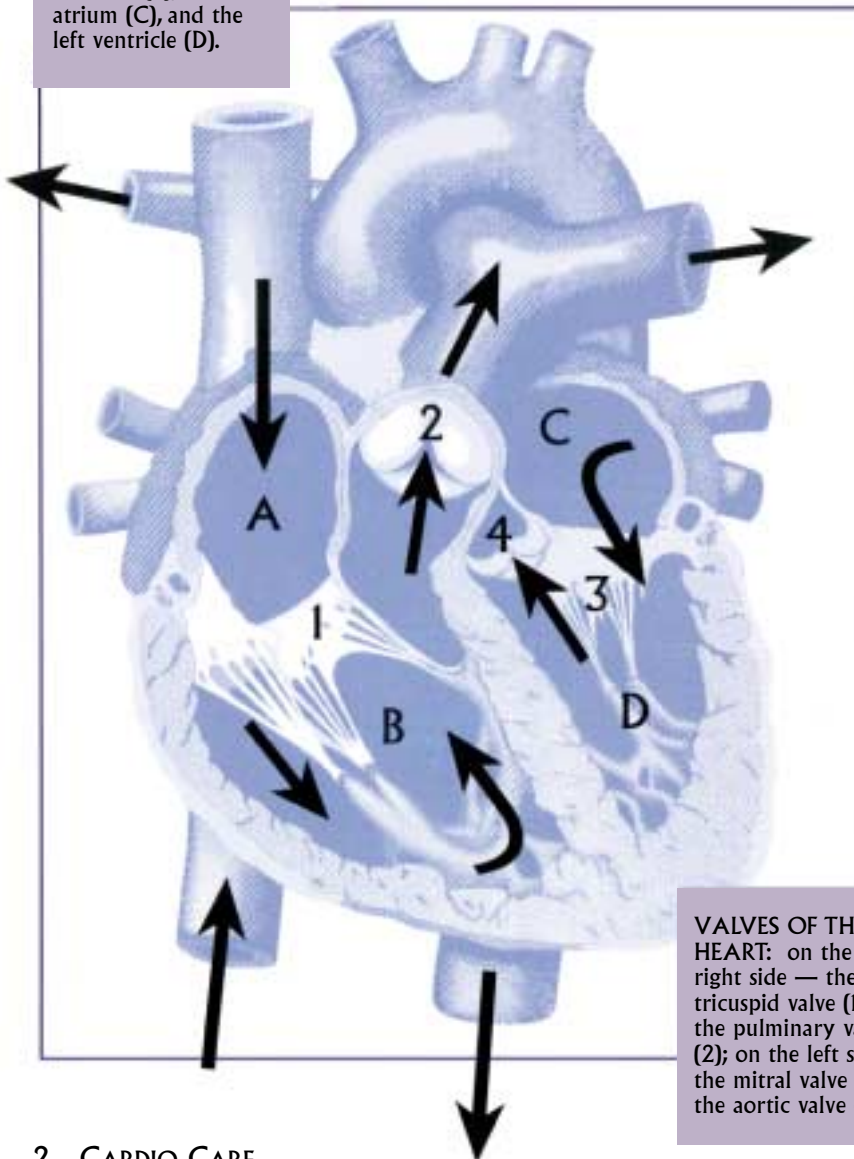
The Cardiovascular Research Institute was established in 1995 as an Institute of Discovery of the UNT Health Science Center. It is a multidisciplinary program designed to promote basic and clinical research, education, clinical practice and community outreach programs in the prevention, diagnosis, treatment and rehabilitation of cardiovascular disease of human beings of all ages.

The Heart... how does it work?

Like the rest of our body, the heart works very well and very hard... if we take good care of it. But how does it actually do its job of pumping blood so well?

The heart is made of muscle and connective tissue. Heart muscle is different from the muscle we use to move other parts of our body. Heart muscle contracts spontaneously and repetitively. These contractions occur

CHAMBERS OF THE HEART: the right atrium (A), the right ventricle (B); the left atrium (C), and the left ventricle (D).



VALVES OF THE HEART: on the right side — the tricuspid valve (1) and the pulmonary valve (2); on the left side — the mitral valve (3) and the aortic valve (4).

about once per second, but occur faster in children and much faster during physical activity — up to about 200 times per minute. The heart begins contractions before we are born and does not stop until we die.

Function

The muscle that moves our body does so through connections to the bones of our skeleton. However, heart muscle performs work without any attachments to bone. Instead, the contracting heart muscle surrounds four chambers which contain blood. When the muscle contracts blood moves out of the chambers through valves. When the heart relaxes, the chambers refill with blood. This process repeats over and over again.

The heart is actually two pumps, side by side, operating in unison. Each side of the heart has two chambers: an atrium and a ventricle. Humans and other mammals have what is called a four-chambered heart.

Two halves of the heart

On the right side of the heart, the right atrium receives deoxygenated blood from the body's tissues; then the right ventricle pumps the blood to the lungs, where it is replenished with oxygen from the air we breathe.

The left side of the heart receives oxygenated blood from the lungs into the left atrium; then the left ventricle pumps the blood to all of the body's tissues.

The receiving chambers, the two atria, contain blood coming from the veins at relatively low pressure. At the very start of a heart beat, the atria contract to help fill the ventricles; the

ventricles are still relaxed while the atria contract. Then, the ventricles contract and eject blood from the heart into the arteries at high pressure.

The right ventricle has an easier job than the left ventricle because the lungs are very near the heart, and the arteries in the lungs are not very stiff, so they offer little resistance to the flow of blood. Therefore, to move blood into the lungs the right ventricle must generate only about one-fifth of the blood pressure required by the left ventricle during contraction. The left ventricle works harder; it requires substantial pressure to pump blood through many long arteries to all of the body's tissues. So because the left ventricle must produce a higher pressure, the muscular walls of the left ventricle are thicker than the walls of the right ventricle.

Heart valves

Heart muscle contractions would do nothing if it were not for the valves in the heart. Valves make sure that blood flows in only one direction through the heart. Valves between the atria and ventricles close at the very beginning of ventricular contraction to prevent backflow of blood into the atria. During ventricular contraction, other valves open to allow blood to be ejected by the ventricles into the arteries carrying blood from the heart — from the right ventricle into the pulmonary artery and from the left ventricle into the aorta. At the end of the ventricular contraction, those arterial valves close; as the ventricles relax the blood pressure in the ventricles decreases and the higher pressure in the arteries pushes the valves shut.

In our next issue of Cardio Care, we will continue our presentation of “The Heart.”

Dr. Watenpaugh is a Research Assistant Professor in the Department of Integrative Physiology at UNT Health Science Center and a CRI faculty member.

Welcome continued from page 1

CRI while identifying the benefit of CRI research to the public.

Research at the CRI

While the Cardiovascular Research Institute (CRI) is continually researching the many diseases that make up the genre known as heart disease, such as myocardial infarction,



hypertension, and congestive heart failure, we are also looking at ways to improve the overall patient tolerance of medications and developing devices to insure a better recovery for patients of cardiac surgery.

We currently have five divisions of research: Cardiac Endocrinology, Cardiac Metabolism, Cell & Tissue Engineering, Cardiac Hemodynamics, Cardiac and Vascular Molecular Genetics, and the Center for Sleep Research. CRI investigators also work with industry leaders in the testing of new products and equipment.

Dr. Raven works in the laboratory with graduate student Paul Fadel to investigate the regulation of blood pressure during exercise. Photo: Charlene Ghaedi

Glossary of Terms used in this issue:

aortic / aorta: a very large, elastic artery carrying oxygenated blood from the left ventricle to the systemic circulation (whole body).

arterial blood: blood carried in the arteries, away from the heart.

arteries: thick-walled, muscular blood vessel carrying blood away from the heart at high pressure; all arteries except the pulmonary (lung) artery carry oxygenated blood.

atrium: one of two chambers (right and left) in the heart which receive venous blood.

coronary artery: the arteries supplying the heart tissues with blood.

pericardium: fibrous membrane sac covering the heart and the beginning of the great vessels.

pulmonary artery: large, major artery which carries deoxygenated blood from the right ventricle to the lungs.

vascular tissue: blood vessel tissue.

vein: a blood vessel carrying blood to the heart; all veins except the pulmonary (lung) veins carry deoxygenated blood.

venous blood supply: blood from the veins.

ventricular / ventricle: lower chambers on either side of the heart; the left ventricle receives oxygenated blood from the left atrium and drives it by the contraction of its walls into the aorta; the right ventricle receives the deoxygenated blood from the right atrium and drives it by contraction into the pulmonary artery.

ventricular ejection: ejection of blood from the ventricles of the heart.

CRI Faculty

James L. Caffrey, Ph.D.

Associate Director of the CRI

Division of Cardiac Endocrinology

S. Dan Dimitrijevic, Ph.D.

Division of Cell & Tissue Engineering

H. Fred Downey, Ph.D.

Division of Cardiac Hemodynamics

Stephen Grant, Ph.D.

Division of Molecular and Vascular Genetics

Robert T. Mallet, Ph.D.

Division of Cardiac Metabolism

Michael L. Smith, Ph.D.

Center for Sleep Research

Associate Faculty

Neeraj Agarwal, Ph.D.

Mark Baker, D.O.,

Barbara A. Barron, Ph.D.

Joan F. Carroll, Ph.D.

Glenn Dillion, Ph.D.

Richard Easom, Ph.D.

Michael J. Forster, Ph.D.

Robert W. Gracy, Ph.D.

Patricia A. Gwartz, Ph.D.

Robert L. Kaman, Ph.D.

Andras Lacko, Ph.D.

Robert R. Luedtke, Ph.D.

Muriel Marshall, D.O., Ph.D.

Michael Martin, Ph.D.

Walter McConathy, Ph.D.

William McIntosh, D.O.,

A. H. O-Yurvati, D.O.

Frederick A. Schaller, D.O.

Xiangrong Shi, Ph.D.

Craig W. Spellman, D.O., Ph.D.

Scott Stoll, D.O., Ph.D.

Donald E. Watenpugh, Ph.D.

Martin Weiss, D.O.

Thomas Yorio, Ph.D.



UNIVERSITY of NORTH TEXAS
HEALTH SCIENCE CENTER at Fort Worth

★
Education, Research,
Patient Care and Service

CARDIOVASCULAR RESEARCH INSTITUTE
3500 Camp Bowie Boulevard
Fort Worth, Texas 76107-2699