

**BASIC
PATHOPHYSIOLOGICAL
MECHANISMS OF
CONGESTIVE
HEART FAILURE**

Alice Tripp

Basic Pathophysiological Mechanisms of Congestive Heart Failure

A PROGRAMMED UNIT

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McGRAW-HILL BOOK COMPANY

NEW YORK
ST. LOUIS
SAN FRANCISCO
AUCKLAND
BOGOTÁ
DÜSSELDORF
JOHANNESBURG
LONDON
MADRID
MEXICO
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1 2 3 4 5 6 7 8 9 0 D O D O 7 8 3 2 1 0 9

This book was set in Press Roman by Allen Wayne Technical Corp. The editors were Laura A. Dysart and Orville W. Haberman, Jr.; the designer was Hermann Strohbach; the production supervisor was Jeanne Selzam.

R.R. Donnelley & Sons Company was printer and binder.

Library of Congress Cataloging in Publication Data

Tripp, Alice.

Basic pathophysiological mechanisms of congestive heart failure.

Bibliography: p.

1. Congestive heart failure—Programmed instruction.
2. Physiology, Pathological—Programmed instruction.

I. Title.

RC685.C53T74 616.1'2 78-13410

ISBN 0-07-065223-6

**Basic
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Preface

In nursing, a knowledge of pathophysiological mechanisms is basic to an understanding of the rationale for treatment and nursing intervention. The student is often overwhelmed when first confronted with these complicated mechanisms. All too frequently, what is learned consists of a list of etiological factors, signs, and symptoms related to the pathophysiological process, and the steps of the mechanism. The student is left with little understanding of the concept of the mechanism as a whole.

The purpose of this series of supplemental texts is to translate complex pathophysiological mechanisms into simple concepts that beginning students can understand. Humor is used to assist in the presentation of complicated material in an uncomplicated and informal way. Learning objectives, illustrations, analogies, frequent reviews, and a modified branching format are used to guide the student toward an understanding of a model of the whole mechanism and its interacting parts.

Each book is divided into sections and each section is followed by review questions. A comprehensive final review follows the last section of each book. The student may elect to use this review as a pretest as well as a posttest.

Since students are individuals and do not learn the same things in the same way or at the same rate of speed, provision has been made for individual learning needs. Progression through each book in the series is student-paced and the student receives immediate feedback as to the correctness of responses. The branching format enables the student to obtain information on why a particular response is incorrect or to skip ahead if the material is already understood.

The books in this series of supplemental texts were developed for beginning nursing students with minimal background in anatomy, physiology, and medical terminology. They are intended to be used as self-study material wherever the particular pathophysiological mechanism or concept is introduced in the nursing program. Each book is complete in itself and understanding the information presented in one book does not depend upon having read another book in the series. Therefore, the books may be read as a series in any sequence, or individually.

ACKNOWLEDGMENTS

I am especially indebted to the following people for their contributions in helping make this series of books possible.

James DeNio, Ed.D., who taught me how to write programmed instruction.

Sr. Rose Therese Bahr, R.N., Ph.D., who provided the opportunity and freedom to write the first book.

Roberta Thiry, R.N., Ph.D., who encouraged me to turn one book into a series.

Margery Duffey, R.N., Ph.D., who encouraged me to write.

The nursing students, who participated in reading, testing, and criticizing the books in this series.

Sue Duncan, R.N., B.S.N., who offered valuable constructive criticism and encouragement.

Charlene Marr, R.N., B.S.N., who typed page-after-page of illegible scrawl.

And, most important of all, my husband, Ben.

Alice Tripp

Objectives

Upon completion of the program, from memory on an objective test, the student will be able to:

- 1 Define congestive heart failure
- 2 Recognize major causes of congestive heart failure
- 3 Identify physiological mechanisms of compensated and decompensated heart failure
- 4 Identify the sequence of events leading to decompensated heart failure
- 5 Differentiate between right and left-sided heart failure from a list of mechanisms and/or symptoms associated with each

Hopes

It is hoped that upon completion of the program the student will be able to use the knowledge of the basic pathophysiological mechanisms of congestive heart failure as a basis for understanding treatment and nursing intervention.

Instructions to the Reader

Most books are read by starting on page one and reading straight through the book to the end. This book is different. It is a method of self-instruction, and you do not read the pages consecutively. In fact, you read only those pages you need to read in order to learn the material.

On each page you will be given some information. At the end of each item of information is a question to be answered. Select the answer you think is correct and turn to the page number that appears next to your answer. If you answer correctly, you will advance to a new item of information and answer another question. If you select an incorrect answer, you will receive an explanation of why you are incorrect and will be sent back to try again.

Your rate of progress through the program will depend upon how often you answer correctly. Speed is not important. What is important is to learn each item of information as it is presented.

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Section I

General Causes of Congestive Heart Failure

Mr. T. Dum, a patient in room 402, was telling his visitor, Ms. T. Dee, about his problems.

“See, when I push my finger down on the top of my foot like this, it leaves a little pit. My doctor calls it edema, but I call it trouble!”

“I’ve got troubles too. Can’t breathe too well because of this heart.” Ms. Dee panted. “Guess I shouldn’t have walked up those stairs. Does that edema thing hurt?”

“You bet it does. Doc says this edema is all inside, too. Guess that’s why I feel so bad. Doc told me it was all because my heart doesn’t work right anymore. Say, are you all right?”

Suddenly, Ms. T. Dee slumped down in the chair by the window and gasped, “Air! I’ve got to have air!” Her breathing was becoming more labored and wheezy. She began coughing up pink frothy sputum.

Mr. T. Dum and Ms. T. Dee have something in common—congestive heart failure.

Before we learn how congestive heart failure develops in the body we will first find out what it is.

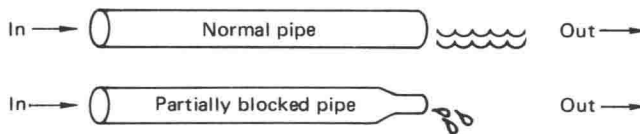
PLEASE TURN TO PAGE 2

FROM PAGE 1

The circulatory system is made up of a heart, arteries, capillaries and veins. We might think of the circulatory system as a circular pipe attached to a pump. The heart acts as a pump to keep blood flowing around and around in one direction.

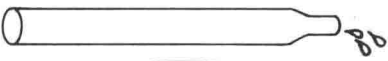

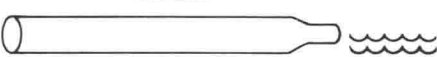
If we take a section of the pipe (a vessel), we see that blood flows in one end and out the other. Consider what happens if we change the outflow end of the pipe (vessel) so it is partially blocked. Now, the outflow end is smaller than the rest of the pipe (vessel). Fluid flows in, but has a difficult time getting out.

Look at the picture below.



Vessels are not rigid like pipes. They are capable of expanding and contracting. Look at the pictures below. Which picture illustrates what would happen to a vessel that has been partially blocked at its outflow end?

Turn to the page indicated beside the answer of your choice.

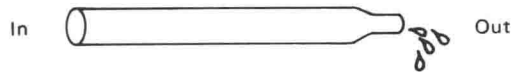
- | | | |
|----|---|--------|
| 1. |  | Page 4 |
| 2. |  | Page 5 |
| 3. |  | Page 6 |

You are on the wrong page! Nowhere in the program were you directed to turn to this page.

Perhaps you did not understand the directions. In order to benefit from this book you must follow the directions at the bottom of each page.

FROM PAGE 2

Your answer: This picture illustrates what would happen to a vessel that has been partially blocked at its outflow end.

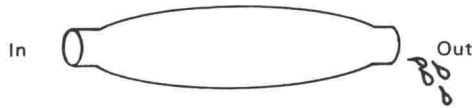


Not so! Remember, a vessel is not rigid like a pipe. Vessels are made up of elastic tissue, which is capable of expanding and contracting. If fluid continues to flow into the vessel but has difficulty getting out the other end, the vessel will expand like a balloon.

RETURN TO PAGE 2 AND CHOOSE A BETTER ANSWER

FROM PAGE 2

Your answer: This picture illustrates what would happen to a vessel that had been partially blocked at its outflow end.



You are so right! As the volume of blood behind the block increases, it causes the vessel to *stretch* or *dilate*. In this situation, the *increased volume* of blood behind the blockage is referred to as *congestion*.

Eventually, the increased volume of blood that has congested behind the blockage in the vessel will act as a block itself. The result is decreased blood flow through the vessel. The condition we have just described is called *passive congestion*.

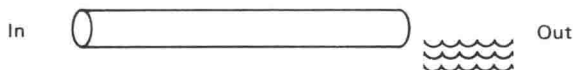
In passive congestion, you would expect dilatation of vessels, excess blood in the vessels, and

Increased blood flow
Decreased blood flow

Page 7
Page 8

FROM PAGE 2

Your answer: This picture illustrates what would happen to a vessel that has been partially blocked at its outflow end.



Wrong. The illustration you have chosen indicates that the vessel does not change and the outflow of blood is maintained. This cannot be if a partial block occurs in the vessel. Blood will have a difficult time getting past the block and the outflow of blood will decrease. Less blood will flow out of the vessel than flows in. Since vessels are made of elastic tissue, the portion of the vessel behind the block will expand.

RETURN TO PAGE 2 AND SELECT A BETTER ANSWER

FROM PAGE 5

Your answer: In passive congestion, you would expect dilatation of blood vessels, excess blood in the vessels, and *increased blood flow*.

No. In passive congestion there is decreased blood flow. Let's say we have a turnstile at the end of a narrow hall that everyone must pass through to enter a ballpark. As long as the turnstile continues to work, everything is fine and many, many people enter the ballpark. But if the turnstile becomes stuck so that it opens only after a large number of people push against it, people will start jamming up behind the turnstile—all of them pushing and shoving (congestion).

Fewer people will be going through the turnstile and the hall will become so congested that very few new people will be able to enter the hall (decreased flow through the area).

This set of conditions is similar to what occurs in passive congestion.

RETURN TO PAGE 5
