

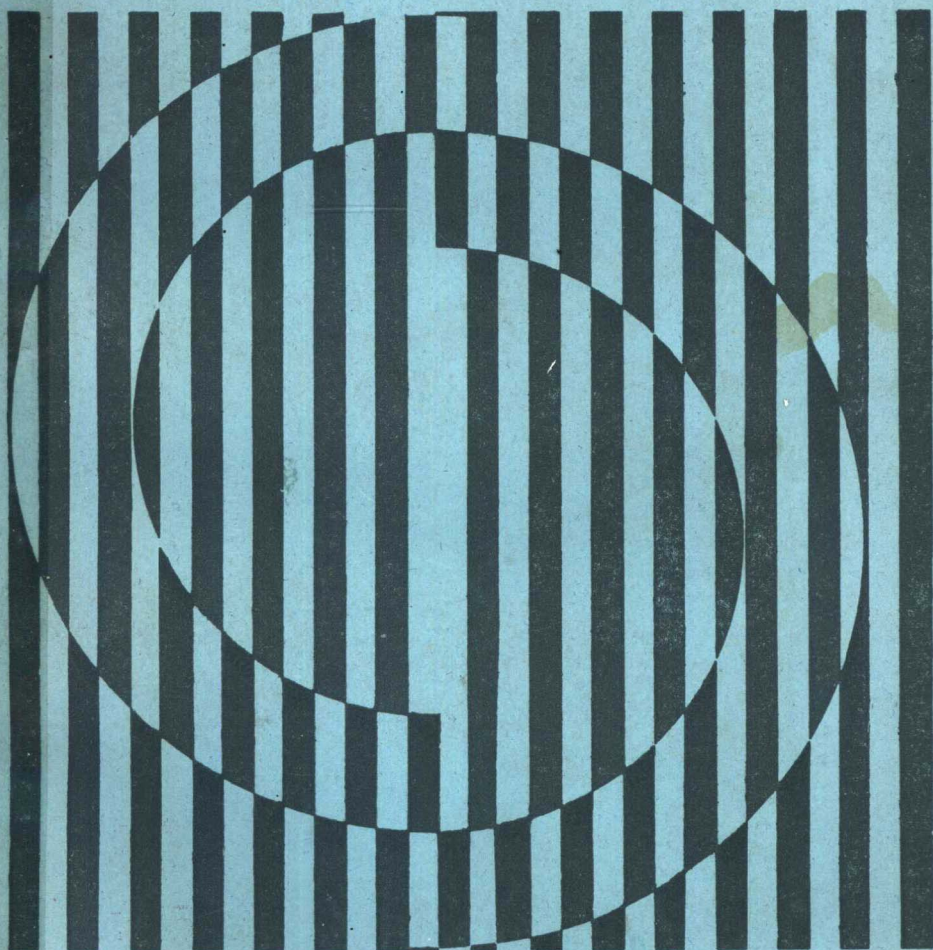
Septic Shock in Man

Edited by

S. G. Hershey, M.D.,

Louis R. M. Del Guercio, M.D.,

and Rita McConn, Ph.D.



Septic Shock in Man

EDITED BY

S. G. Hershey, M.D.

PROFESSOR OF ANESTHESIOLOGY

Louis R. M.

Del Guercio, M.D.

PROFESSOR OF SURGERY

Rita McConn, Ph.D.

ASSISTANT PROFESSOR OF SURGERY

ALL OF ALBERT EINSTEIN COLLEGE OF
MEDICINE OF YESHIVA UNIVERSITY,
BRONX

*Foreword by John M. Howard, M.D.,
Professor of Surgery, Hahnemann
Medical College and Hospital, Phila-
delphia; Chairman, Committee on
Shock, National Academy of Sciences-
National Research Council, Washing-
ton, D.C.; and Sam F. Seeley, M.D.,
Professional Associate, Division of
Medical Sciences, National Academy
of Sciences-National Research Coun-
cil, Washington, D.C.*

LITTLE, BROWN AND COMPANY, BOSTON

COPYRIGHT © 1971 BY LITTLE, BROWN
AND COMPANY (INC.)

ALL RIGHTS RESERVED. NO PART OF THIS
BOOK MAY BE REPRODUCED IN ANY FORM
OR BY ANY ELECTRONIC OR MECHANICAL
MEANS, INCLUDING INFORMATION STOR-
AGE AND RETRIEVAL SYSTEMS, WITHOUT
PERMISSION IN WRITING FROM THE PUB-
LISHER, EXCEPT BY A REVIEWER WHO
MAY QUOTE BRIEF PASSAGES IN A REVIEW.

LIBRARY OF CONGRESS CATALOG CARD NO.
78-146337

FIRST EDITION

ISBN 0-316-35875

4176-10E2-M10/71

PUBLISHED IN GREAT BRITAIN BY
CHURCHILL/LIVINGSTONE,
EDINBURGH AND LONDON

PRINTED IN THE UNITED STATES OF
AMERICA

*The drawing on the title page is a styl-
ized rendition of the familiar figure of
Siva, the Hindu god of destruction. Siva
seemed an appropriate symbol for a
conference dealing with shock, a force
destructive of human life.*

Foreword

A BIT OF HISTORICAL BACKGROUND on the contents of this book, the proceedings of the Conference on the Dynamics of Septic Shock in Man, is in order. In 1960 at a meeting of several committees of the National Research Council including the Committee on Shock, the status of shock research in man was critically examined and found to be disappointingly meager. The committees therefore endorsed the idea that greater effort should be directed toward the study of shock in man.

In 1962 a group of perhaps twenty investigators attended a small workshop-type conference at the National Academy of Sciences which we now refer to as the First Conference on Septic Shock. They met to describe their experiences and exchange ideas on septic shock, at that time already generally considered to be the most puzzling and lethal type of shock syndrome. Considering that the mortality associated with human septic shock was by best estimates in the range of 70 to 85%, the consensus was that insufficient research was being conducted in this area.

Two years later, in 1964, a second conference-workshop on septic shock, again relatively small but ambitiously conceived, was held at the Academy under the auspices of the Committee on Shock. This conference, designed to communicate what progress was being made in the study of septic shock in man, essentially revealed that most of the work was still being done in animals and centered about the consequences of injecting endotoxin. The opinion was expressed by a number of investigators that the dearth of good research data in man was probably due to a lack of know-how and of practical equipment for translating animal laboratory research techniques, particu-

FOREWORD

larly cardiovascular-respiratory measurements, to the bedside, the operating room, and to specially organized intensive care units.

Fortunately, since this second conference techniques have been improvised and instrumentation developed at a gratifying pace. Well-conceived and reliable methods for obtaining measurements in man are accumulating. It became apparent to us a few years ago that the time would soon be ripe for another conference, this one to be the long-needed productive presentation and analysis of meaningful information on septic shock in man. The work being done in the Acute Clinical Research Center at the Albert Einstein College of Medicine was among the finest in the nation, and studies in septic shock were progressing particularly well. The Committee on Shock therefore requested the Einstein group to take the lead in bringing together investigators from across the nation. The resulting conference, organized with notable competence and expertise, fulfilled its mission and achieved our most optimistic expectations.

This book, which is based on the conference proceedings, draws together virtually all the existing worthwhile information on the subject in a well-organized format and bears eloquent testimony to the success of the conference. We were distinctly privileged to have participated in the conference, and it is a pleasure to express our admiration and gratitude to Drs. Hershey, Del Guercio, and McConn for undertaking to organize the meeting and for allowing us to include our remarks in this superb volume.

JOHN M. HOWARD

SAM F. SEELEY

Washington, D.C.

Preface

THE CONFERENCE on the Dynamics of Septic Shock in Man, sponsored by Albert Einstein College of Medicine of Yeshiva University in collaboration with the Committee on Shock of the Division of Medical Sciences, National Academy of Sciences-National Research Council, was held November 13-15, 1968, at Albert Einstein College of Medicine in New York.

The purpose of this conference was to bring together as many persons as was practical from the United States and Canada who were doing meaningful, well-documented studies on patients in septic shock. It was hoped that gathering these investigators under one roof at one time would not only provide a forum for presenting the essence of most of the worthwhile recent work in this area, but would also evoke a vigorous and critical interchange of information. We thought that if we could rock the boat in terms of how specific our knowledge of the nature of septic shock really is, the result would be, in some measure, to help identify and separate from this poorly communicated and poorly assessed body of data those theoretical concepts and that clinical therapy of most merit and promise. These proceedings might also provide the impetus for new and imaginative research to the end that the prevailing therapeutic empiricism would be reduced, perhaps resulting in a lowering of the disproportionately high mortality of septic shock. In general, the pathogenesis of the various shock syndromes is poorly understood. Their dynamics, however, except for septic shock, have been sufficiently elucidated so that prompt, aggressive therapy can successfully resuscitate most shock victims. In the case of septic shock, however, not only is the pathogenesis even more puzzling, but its pathophysiology also remains frustratingly muddled and controversial; for the most part, its victims cannot be success-

PREFACE

fully treated by any means presently available. Appreciation of the interrelationships between sepsis and shock in man has been limited by two factors in particular: (1) analogies between experimental models in animals and the septic shock syndromes seen in man are questionable and speculative, and (2) clinical measurements in human beings have been confused by such uncontrollable factors as preexisting disease, lack of base-line reference data, and loss of continuity in measurement when it is interrupted by emergency procedures and desperate therapeutic measures. Nevertheless, some important areas of clinical physiological interest have yielded to experimental observation in man and have been intensively studied during the past few years. This new information provided the substance on which the conference was built and, we trust, made it possible to achieve some of our objectives.

Our aim in converting the conference proceedings into a printed symposium was to make the content available in its original intent and purpose to a broader audience than the limited number of persons who were able to attend. To transpose the spoken into the written word without losing sight of this purpose, the recorded proceedings have been updated by each of the participants and significantly edited. We hope that we have accomplished our mission and effectively translated "the message" into "the medium."

S. G. H.

L. R. M. Del G.

R. McC.

Bronx

Conference Participants

SAFUH M. A. ATTAR, M.D.

PROFESSOR OF SURGERY, UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE; DIRECTOR, RESEARCH COAGULATION LABORATORY, SHOCK TRAUMA CENTER, UNIVERSITY OF MARYLAND HOSPITAL, BALTIMORE

SILVIO BAEZ, M.D.

PROFESSOR OF ANESTHESIOLOGY AND PHYSIOLOGY, ALBERT EINSTEIN COLLEGE OF MEDICINE OF YESHIVA UNIVERSITY, BRONX

HUBERT BELL, M.D.

ASSISTANT PROFESSOR OF MEDICINE, THE UNIVERSITY OF KANSAS SCHOOL OF MEDICINE, KANSAS CITY

JOHN R. BORDER, M.D.

ASSOCIATE PROFESSOR OF SURGERY, THE STATE UNIVERSITY OF NEW YORK AT BUFFALO SCHOOL OF MEDICINE; ATTENDING SURGEON, EDWARD J. MEYER MEMORIAL HOSPITAL, BUFFALO

LELAND C. CLARK, JR., PH.D.

PROFESSOR OF RESEARCH PEDIATRICS, UNIVERSITY OF CINCINNATI COLLEGE OF MEDICINE, CINCINNATI

GEORGE H. A. CLOWES, JR., M.D.

CLINICAL PROFESSOR OF SURGERY, HARVARD MEDICAL SCHOOL; VISITING SURGEON, HARVARD SURGICAL SERVICE AND SEARS SURGICAL LABORATORY, BOSTON CITY HOSPITAL, BOSTON

CONFERENCE PARTICIPANTS

JAY N. COHN, M.D.

ASSOCIATE PROFESSOR OF MEDICINE, GEORGETOWN UNIVERSITY SCHOOL OF MEDICINE; CHIEF, DEPARTMENT OF HYPERTENSION AND CLINICAL HEMODYNAMICS, VETERANS ADMINISTRATION HOSPITAL, WASHINGTON, D.C.

R ADAMS COWLEY, M.D.

PROFESSOR OF THORACIC AND CARDIOVASCULAR SURGERY AND DIRECTOR, CENTER FOR THE STUDY OF TRAUMA, UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE, BALTIMORE

JOHN H. DAVIS, M.D.

PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, THE UNIVERSITY OF VERMONT COLLEGE OF MEDICINE; SURGEON-IN-CHIEF, THE MEDICAL CENTER HOSPITAL OF VERMONT, BURLINGTON

LOUIS R. M. DEL GUERCIO, M.D.

PROFESSOR OF SURGERY, ALBERT EINSTEIN COLLEGE OF MEDICINE OF YESHIVA UNIVERSITY, BRONX

RONALD H. DIETZMAN, M.D.

SENIOR MEDICAL FELLOW, DEPARTMENT OF SURGERY, THE UNIVERSITY OF MINNESOTA MEDICAL SCHOOL, MINNEAPOLIS

WILLIAM R. DRUCKER, M.D.

PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, THE UNIVERSITY OF TORONTO FACULTY OF MEDICINE, TORONTO

JOHN H. DUFF, M.D.

ASSISTANT PROFESSOR OF SURGERY, MCGILL UNIVERSITY FACULTY OF MEDICINE; ASSOCIATE SURGEON, ROYAL VICTORIA HOSPITAL, MONTREAL

JACOB FINE, M.D.

EMERITUS PROFESSOR OF SURGERY, HARVARD MEDICAL SCHOOL, BOSTON

EDWARD D. FRANK, M.D.

ASSISTANT PROFESSOR OF SURGERY, HARVARD MEDICAL SCHOOL, BOSTON

EDWARD W. FRIEDMAN, M.D.

CLINICAL INSTRUCTOR IN SURGERY, HARVARD MEDICAL SCHOOL;
SURGEON, BETH ISRAEL HOSPITAL, BOSTON

BENNIE GEFFIN, M.D.

ASSISTANT PROFESSOR OF ANAESTHESIA, HARVARD MEDICAL SCHOOL;
ASSOCIATE DIRECTOR, RESPIRATORY UNIT, AND ASSOCIATE ANES-
THETIST, MASSACHUSETTS GENERAL HOSPITAL, BOSTON

ROGER M. GOLDWYN, PH.D.

SYSTEMS SCIENCE FACULTY, I.B.M. RESEARCH WATSON LABORA-
TORY, YORKTOWN HEIGHTS, NEW YORK

HAROLD D. GREEN, M.D.

GORDON GRAY PROFESSOR AND CHAIRMAN, DEPARTMENT OF PHYSI-
OLOGY, THE BOWMAN GRAY SCHOOL OF MEDICINE OF WAKE FOREST
UNIVERSITY, WINSTON-SALEM, NORTH CAROLINA

SHELDON E. GREISMAN, M.D.

ASSOCIATE PROFESSOR OF MEDICINE AND PHYSIOLOGY, UNIVERSITY
OF MARYLAND SCHOOL OF MEDICINE, BALTIMORE

ALAN C. GROVES, M.D.

DEPARTMENT OF SURGERY, SHAUGHNESSY VETERANS HOSPITAL,
VANCOUVER

FRASER N. GURD, M.D.

PROFESSOR OF SURGERY, MCGILL UNIVERSITY FACULTY OF MEDI-
CINE; SURGEON-IN-CHIEF, MONTREAL GENERAL HOSPITAL, MON-
TREAL

ARLO S. HERMRECK, M.D.

RESIDENT SURGEON AND U.S. PUBLIC HEALTH SERVICE POST-
DOCTORAL FELLOW IN PHYSIOLOGY, THE UNIVERSITY OF KANSAS
MEDICAL CENTER, KANSAS CITY

S. G. HERSHEY, M.D.

PROFESSOR OF ANESTHESIOLOGY, ALBERT EINSTEIN COLLEGE OF
MEDICINE OF YESHIVA UNIVERSITY, BRONX

CONFERENCE PARTICIPANTS

JOHN M. HOWARD, M.D.

PROFESSOR OF SURGERY, HAHNEMANN MEDICAL COLLEGE AND HOSPITAL, PHILADELPHIA; CHAIRMAN, COMMITTEE ON SHOCK, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL, WASHINGTON, D.C.

WILLIAM E. HUCKABEE, M.D.

PROFESSOR OF MEDICINE AND PHARMACOLOGY, BOSTON UNIVERSITY SCHOOL OF MEDICINE, BOSTON

JOHN M. KINNEY, M.D.

PROFESSOR OF SURGERY, COLUMBIA UNIVERSITY COLLEGE OF PHYSICIANS AND SURGEONS, NEW YORK

ROCH LAPOINTE, M.D.

ASSISTANT PROFESSOR OF SURGERY, UNIVERSITY OF SHERBROOKE FACULTY OF MEDICINE, SHERBROOKE, QUEBEC

MYRON B. LAVER, M.D.

PROFESSOR OF ANAESTHESIA, HARVARD MEDICAL SCHOOL; ANESTHETIST, MASSACHUSETTS GENERAL HOSPITAL, BOSTON

STANLEY M. LEVENSON, M.D.

PROFESSOR OF SURGERY, ALBERT EINSTEIN COLLEGE OF MEDICINE OF YESHIVA UNIVERSITY, BRONX

RICHARD C. LILLEHEI, M.D.

PROFESSOR OF SURGERY, THE UNIVERSITY OF MINNESOTA MEDICAL SCHOOL, MINNEAPOLIS

LLOYD D. MacLEAN, M.D.

PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, MCGILL UNIVERSITY FACULTY OF MEDICINE; SURGEON-IN-CHIEF, ROYAL VICTORIA HOSPITAL, MONTREAL

RITA McCONN, PH.D.

ASSISTANT PROFESSOR OF SURGERY, ALBERT EINSTEIN COLLEGE OF MEDICINE OF YESHIVA UNIVERSITY, BRONX

A. P. H. McLEAN, M.D.

ASSISTANT PROFESSOR OF SURGERY, MCGILL UNIVERSITY FACULTY

OF MEDICINE; ASSOCIATE SURGEON, ROYAL VICTORIA HOSPITAL,
MONTREAL

PATRICIA A. MOHR, M.D.
DEPARTMENT OF SURGERY, MOUNT SINAI SCHOOL OF MEDICINE OF
THE CITY UNIVERSITY OF NEW YORK, NEW YORK

JOHN A. MONCRIEF, M.D.
PROFESSOR OF SURGERY, MEDICAL UNIVERSITY OF SOUTH CAROLINA,
CHARLESTON

GEORGE MOTSAÏ, M.D.
FELLOW IN SURGERY, THE UNIVERSITY OF MINNESOTA MEDICAL
SCHOOL, MINNEAPOLIS

WILLIAM A. NEELY, M.D.
ASSOCIATE PROFESSOR OF SURGERY, UNIVERSITY OF MISSISSIPPI
SCHOOL OF MEDICINE, JACKSON

LOUIS R. ORKIN, M.D.
PROFESSOR AND CHAIRMAN, DEPARTMENT OF ANESTHESIOLOGY, AL-
BERT EINSTEIN COLLEGE OF MEDICINE OF YESHIVA UNIVERSITY,
BRONX

RICHARD M. PETERS, M.D.
PROFESSOR OF SURGERY AND BIOENGINEERING AND CHAIRMAN, DI-
VISION OF THORACIC SURGERY, UNIVERSITY OF CALIFORNIA, SAN
DIEGO, SCHOOL OF MEDICINE, SAN DIEGO

HENNING PONTOPPIDAN, M.D.
ASSISTANT CLINICAL PROFESSOR OF ANAESTHESIA, HARVARD MEDI-
CAL SCHOOL, BOSTON

JOHN C. A. RAISON, M.D.
ASSOCIATE CLINICAL PHYSIOLOGIST, PACIFIC MEDICAL CENTER, SAN
FRANCISCO

JONATHAN E. RHOADS, M.D.
PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, THE UNI-
VERSITY OF PENNSYLVANIA SCHOOL OF MEDICINE, PHILADELPHIA

CONFERENCE PARTICIPANTS

PAUL R. SCHLOERB, M.D.

RESEARCH PROFESSOR OF SURGERY, THE UNIVERSITY OF KANSAS SCHOOL OF MEDICINE; STAFF SURGEON, THE UNIVERSITY OF KANSAS MEDICAL CENTER, KANSAS CITY

SAM F. SEELEY, M.D.

PROFESSIONAL ASSOCIATE, DIVISION OF MEDICAL SCIENCES, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL, WASHINGTON, D.C.

WILLIAM C. SHOEMAKER, M.D.

PROFESSOR OF SURGERY, MOUNT SINAI SCHOOL OF MEDICINE OF THE CITY UNIVERSITY OF NEW YORK, NEW YORK

HERBERT SHUBIN, M.D.

ASSOCIATE PROFESSOR OF MEDICINE, UNIVERSITY OF SOUTHERN CALIFORNIA SCHOOL OF MEDICINE, LOS ANGELES

JOHN H. SIEGEL, M.D.

ASSOCIATE PROFESSOR OF SURGERY, ALBERT EINSTEIN COLLEGE OF MEDICINE OF YESHIVA UNIVERSITY, BRONX

FIORINDO A. SIMEONE, M.D.

PROFESSOR OF MEDICAL SCIENCES AND CHAIRMAN, SECTION OF SURGERY, DIVISION OF BIOLOGICAL AND MEDICAL SCIENCES, BROWN UNIVERSITY, PROVIDENCE

WESLEY W. SPINK, M.D.

REGENTS' PROFESSOR OF MEDICINE, THE UNIVERSITY OF MINNESOTA MEDICAL SCHOOL, MINNEAPOLIS

PETER A. STEWART, PH.D.

PROFESSOR OF MEDICAL SCIENCES, DIVISION OF BIOLOGICAL AND MEDICAL SCIENCES, BROWN UNIVERSITY, PROVIDENCE

ALAN P. THAL, M.D.

PROFESSOR OF SURGERY, THE UNIVERSITY OF KANSAS SCHOOL OF MEDICINE, KANSAS CITY

CARL W. WALTER, M.D.

CLINICAL PROFESSOR OF SURGERY, HARVARD MEDICAL SCHOOL; SURGEON, PETER BENT BRIGHAM HOSPITAL, BOSTON

CONFERENCE PARTICIPANTS

MAX HARRY WEIL, M.D., PH.D.

ASSOCIATE PROFESSOR OF MEDICINE AND DIRECTOR, SHOCK RESEARCH UNIT AND THE CENTER FOR THE CRITICALLY ILL, UNIVERSITY OF SOUTHERN CALIFORNIA SCHOOL OF MEDICINE, LOS ANGELES

B. W. ZWEIFACH, PH.D.

PROFESSOR OF BIOENGINEERING, DEPARTMENT OF ENGINEERING SCIENCES, UNIVERSITY OF CALIFORNIA, SAN DIEGO, SCHOOL OF MEDICINE, SAN DIEGO

2341
H 58

Contents

FOREWORD by <i>John M. Howard and Sam F. Seeley</i>	vii
PREFACE	ix
CONFERENCE PARTICIPANTS	xv

I. BACKGROUND PATTERNS IN SEPTIC SHOCK

S. G. Hershey, Chairman

1. THE ECOLOGY OF HUMAN SEPTIC SHOCK	3
<i>Wesley W. Spink</i>	
2. SUSTAINING MECHANISMS IN SEPTIC SHOCK	15
<i>B. W. Zweifach</i>	
3. THE BACTERIAL ELEMENT IN SEPTIC SHOCK	27
<i>Carl W. Walter</i>	

II. RESPIRATORY ASPECTS

S. G. Hershey, Chairman

4. RESPIRATORY FAILURE IN SEPTIC SHOCK	37
<i>Henning Pontoppidan, Bennie Geffin, and Myron B. Laver</i>	
5. PULMONARY MECHANICS IN SEPTIC SHOCK	47
<i>Richard M. Peters</i>	
6. RESPIRATORY MEASUREMENT IN ACUTELY ILL PATIENTS: A NEW SYSTEM FOR STUDY	59
<i>John C. A. Raison</i>	
GENERAL DISCUSSION No. 1	69

CONTENTS

III. OXYGEN TRANSPORT AND UTILIZATION

Stanley M. Levenson, Chairman

- | | |
|--|-----|
| 7. OXYGEN TRANSPORT AND GLUCOSE METABOLISM IN SEPTIC SHOCK | 75 |
| <i>Leland C. Clark, Jr.</i> | |
| 8. OXYGEN TRANSPORT AND UTILIZATION IN FULMINATING SEPSIS AND SEPTIC SHOCK | 85 |
| <i>George H. A. Clowes, Jr.</i> | |
| 9. OXYGEN UPTAKE IN SEPTIC SHOCK | 107 |
| <i>A. P. H. McLean, J. H. Duff, A. C. Groves, R. Lapointe, and L. D. MacLean</i> | |

IV. METABOLIC ASPECTS

Stanley M. Levenson, Chairman

- | | |
|---|-----|
| 10. ENERGY DEMANDS IN THE SEPTIC PATIENT | 119 |
| <i>John M. Kinney</i> | |
| 11. METABOLIC ASPECTS OF SHOCK | 131 |
| <i>Paul R. Schloerb</i> | |
| 12. CARDIORESPIRATORY AND METABOLIC ALTERATIONS IN SEPTIC SHOCK AND THEIR POSSIBLE PHYSIOLOGICAL MECHANISMS | 141 |
| <i>William C. Shoemaker and Patricia A. Mohr</i> | |
| GENERAL DISCUSSION No. 2 | 157 |

V. CARDIOCIRCULATORY ASPECTS: 1

Louis R. M. Del Guercio, Chairman

- | | |
|--|-----|
| 13. PATTERNS OF CARDIOVASCULAR RESPONSE IN SEPTIC SHOCK | 173 |
| <i>John H. Siegel, Roger M. Goldwyn, and Louis R. M. Del Guercio</i> | |
| 14. THE VASCULAR EFFECTS OF BACTERIAL PRODUCTS AND THEIR IMPORTANCE IN SEPSIS AND SEPTIC SHOCK | 191 |
| <i>Alan P. Thal, Hubert Bell, and Arlo S. Hermreck</i> | |

15. PATHOPHYSIOLOGY OF SEPTIC SHOCK	201
<i>Edward D. Frank and Edward W. Friedman</i>	
GENERAL DISCUSSION No. 3	211

VI. CARDIOCIRCULATORY ASPECTS: 2

Louis R. M. Del Guercio, Chairman

16. HEMODYNAMIC MECHANISMS OF SEPTIC SHOCK	219
<i>Max Harry Weil and Herbert Shubin</i>	
17. THE USE OF CORTICOSTEROIDS IN THE TREATMENT OF SEPTIC SHOCK	231
<i>Ronald H. Dietzman, George Motsay, and Richard C. Lillehei</i>	
18. CHANGES IN CARDIOPULMONARY FUNCTION IN THE SEVERELY STRESSED PATIENT	239
<i>John R. Border</i>	
GENERAL DISCUSSION No. 4	254

VII. SPECIAL PROBLEMS IN SEPTIC SHOCK

F. A. Simeone, Chairman

19. SPECIAL PROBLEMS OF FLUIDS IN SEPTIC SHOCK	265
<i>Jonathan E. Rhoads</i>	
20. SPECIAL PROBLEMS OF FLUIDS IN BURNS	269
<i>John A. Moncrief</i>	
21. ENDOTOXIN AND THE RETICULOENDOTHELIAL SYSTEM IN SHOCK	275
<i>Jacob Fine</i>	

VIII. OVERVIEW OF CONFERENCE

22. SUMMARY	291
<i>F. A. Simeone</i>	
INDEX	303