SECOND VIENNA SHOCK FORUM
Vienna Shock Forum Series
Series Editors: Günther Schlag and Heinz Redl

First Vienna Shock Forum
Part A: Pathophysiological Role of Mediators and Mediator Inhibitors in Shock

First Vienna Shock Forum
Part B: Monitoring and Treatment of Shock

Second Vienna Shock Forum
SECOND VIENNA SHOCK FORUM

Proceedings of the Second Vienna Shock Forum held May 12–14, 1988

Editors

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Ludwig Boltzmann Institute
for Experimental Traumatology
Vienna, Austria
Contents

Contributors ................................................................. xix
Preface
Günther Schlag and Heinz Redl ........................................ xli

1. ORGAN FAILURE/MEDIATORS

1.1. Acute Respiratory Failure
Lung in Shock—Posttraumatic Lung Failure (Organ Failure)—MOFS
Günther Schlag and Heinz Redl ........................................ 3

Adult Respiratory Distress Syndrome. Pathophysiology and Inflammatory Mediators in Bronchoalveolar Lavage
Jan Modig ................................................................. 17

Morphologic Features of the Lung in the Respiratory Failure Associated With Hypovolemic and Septic Shock
James C. Hogg ......................................................... 27

Pulmonary Fat Embolism—An Epiphenomenon of Shock or a Proper Mediator Mechanism?
Ulrich Bosch, Susanne Reisser, Gerd Regel, Gisela Windus, Werner J. Kleemann, and Michael L. Nerlich ........................................ 37

The Role of C3a in Pulmonary Alveoli Following Trauma
Udo Obertacke, Theo Joka, Gertrud Zilow, Michael Kirschfink, and Klaus-Peter Schmit-Neuerburg ........................................ 43

Cytological Changes in Alveolar Cells With ARDS
Theo Joka, Udo Obertacke, Z. Atay, E. Kreuzfelder, J. Kalotai, and L. Olivier ............................................................. 51

Septic Adult Respiratory Distress Syndrome and Multiple System Organ Failure
Jesus Villar, Miguel A. Blazquez, Santiago Lubillo, and Jose L. Manzano ............................................................... 57

Septic Shock and Acute Respiratory Failure
Jesus Villar, Miguel A. Blazquez, Santiago Lubillo, Jose Quintana, and Jose L. Manzano .................................................. 61
Escherichia coli Hemolysin Causes Thromboxane-Mediated Hypertension and Vascular Leakage in Rabbit Lungs
Werner Seeger, Henrik Walter, Heinz Neuhof, Norbert Suttrop, and Sucharit Bhakdi ............................................................... 67

Leukocyte Induced Pulmonary Damage Using Intraperitoneal Zymosan
Osvaldo Chiara, Pier P. Giomarelli, Emma Borrelli, Sandra Betti, Pietro Padalino, and Angelo Nespoli ............................................ 73

1.2. Endothelial Cells as Target Organ (in Shock)

Reaction of Vascular Intima to Endotoxin Shock
Nikolaus Freudenberg .................................................................... 77

Endotoxin-Induced Pulmonary Endothelial Injury
Barbara Meyrick, J.E. Johnson, and K.L. Brigham .......................... 91

Thrombin-Induced Neutrophil Adhesion
Peter J. Del Vecchio and Asrar B. Malik ........................................ 101

Cellular Interactions in Sepsis Induced Organ Failure
G. Zeck-Kapp, U.N. Riede, and N. Freudenberg ............................. 113

Effects of Bacterial Exo- and Endotoxins on Endothelial Arachidonate Metabolism
Norbert Suttrop, Werner Seeger, and Heinz Neuhof ....................... 119

Effects of Bacterial Toxins and Calcium-Ionophores on Endothelial Permeability In Vitro
Norbert Suttrop, Thomas Hessz, Thomas Fuchs, Werner Seeger, Detlev Drenckhahn, and Heinz Neuhof .............................. 127

1.3. Microcirculation

Tissue Oxygen Debt as a Determinant of Postoperative Organ Failure
William C. Shoemaker, Paul L. Appel, and Harry B. Kram ............ 133

Is Skeletal Muscle PO₂ Related to the Severity of Multiple Organ Failure and Survival in Critically Ill Patients?
Gerard I.J.M. Beerthuizen, R. Jan A. Goris, and Ferdinand J.A. Kreuzer ... 137

Phase-Related Vascular Reactivity in Hemorrhagic Shock
Hermann August Henrich, Franz Bäumer, and Rolf Edgar Silber ........ 143

Ultrastructural Study of the Gastric Mucosa After Septic Shock in the Rat
Katerina Kotzampassi, Efthimios Eleftheriadis, Athanasia Alvanou, Emmanouel Tzartinoglou, Chryssi Foroglou, and Homeros Aletras 151

Do Endotoxinemia and Sepsis Impair the Regulatory Functions of Capillary Endothelial Cells?
Anders Gidlöf and David H. Lewis ................................................ 157
### Contents / ix

**Peripheral Circulation in Septic Shock**  

**Pulmonary Pressure-Flow Relationship and Peripheral Oxygen Supply in ARDS Due to Bacterial Sepsis**  
Thomas Kloess, Ulrich Birkenhauer, and Bernd Kottler ............................. 175

**The Relationship Between Oxygen Supply and Oxygen Uptake in Septic Shock: The Possible Role of Endotoxin**  
D. De Backer, A. Roman, and JL. Vincent ............................................. 181

**Pulmonary Venous Hemodynamics and Disturbances of Gas Exchange During E.Coli Bacteremia in the Goettingen Miniature Pig**  
Reinhold Fretschner, Thomas Kloess, Heinz Guggenberger, and Bernd Wagener ............................. 185

#### 1.4. Cardiovascular System

**Cardiovascular Dysfunction in Human Septic Shock**  
Joseph E. Parrillo ................................................................. 191

**Cardiopulmonary Response to Endotoxin and the Eicosanoids**  
Daniel L. Traber, David N. Herndon, and Lillian D. Traber ........................... 201

**Cardiac Function Changes Monitored by Radionuclide Ventriculography in the Septic Shock Baboon Model**  
I.C. Dormehl, J.P. Pretorius, R.D. Burow, M.F. Wilson, J. Kilian, M. Maree, N. Hugo, and R. de Winter ............................................ 207

**The Influence of Tachycardia During Shock on Changes in Cardiac Volumes**  

**Isolated Rabbit Heart Preparation to Evaluate the Inotropic Effect of Endotoxin**  
Peter E. Krösl, Zafar Khapkour, Martin Thurnher, Seth W.O. Hallström, and Heinrich M. Schima ........................................... 225

**Negative Inotropic and Cardiovascular Effects of a Low Molecular Plasma Fraction in Prolonged Canine Hypovolemic Traumatic Shock—Papillary Muscle and Isolated Heart Preparation**  
Seth Hallström, Christa Vogl, Zafar Khapkour, Martin Thurnher, Peter Krösl, Heinz Redl, and Günther Schlag ........................................ 231

**Evaluation of Heart Performance During Septic Shock in Sheep**  
Josef Newald, Kazuro Sugi, Christa Vogl, Peter Krösl, Daniel L. Traber, and Günther Schlag ........................................ 237

**The Cultured Rat Heart Cell: A Model to Study Direct Cardiotoxic Effects of Pseudomonas Endo- and Exotoxins**  
Karl Werdan, S.M. Melnitzki, G. Pilz, and T. Kapsner ............................. 247
Chemical Characterization of a Positive Inotropic Plasma Factor in Shock
Imre Szabó, Botond Penke, József Kaszaki, and Sándor Nagy 253

Pathophysiologica Correlates of Cardiac Overperformance in Sepsis and Septic Shock
Carlo Chiarla, Ivo Giovannini, Giuseppe Boldrini, and Marco Castagneto 259

1.5. Mediators Complement System
Anaphylatoxin Generation and Multisystem Organ Failure in Acute Pancreatitis
Lennart Roxvall, Anders Bengtson, and Mats Heideman 265

Is Activated C3 a Premier Factor of DIC Development in Septic Shock?
Qixia Wu, Zhenyuan Liu, Ying Dang, Li Chen, and Huacui Chen 271

Complement Activation and Endotoxin in Sepsis
P. Padalino, M. Gardinali, J. Pallavicini, O. Chiara, G. Bisiani, and A. Nespoli 277

In-situ Complement Activation, Pulmonary Hypertension, and Vascular Leakage in Rabbit Lungs—the Role of the Terminal Complement Complex
Werner Seeger, Ruth Hartmann, Heinz Neuhof, and Sucharit Bhakdi 283

The Role of the Complement System in the Pathogenesis of Multiple Organ Failure in Shock
T. Zimmermann, Z. Laszik, S. Nagy, J. Kaszaki, and F. Joo 291

Quantitation of C3a by Elisa Using a Monoclonal Antibody to a Neoantigenic C3a Determinant
Gertrud Zilow, Werner Naser, Arno Friedlein, Andrea Bader, and Reinhard Burger 299

1.5.1. Granulocytes, Proteinases, Oxygen-Radicals
Proteases as Mediators of Pulmonary Vascular Permeability
H. Neuhof, Ch. Hoffmann, W. Seeger, N. Suttorp, and H. Fritz 305

Role of Endotoxin and Proteases in Multiple Organ Failure (MOF)
Ansgar O. Aasen, Anne-Lise Rishovd, and Jan O. Stadaas 315

Neutrophil Stimulation by PMA Increases Alveolar Permeability in Rabbits
Hilmar Burchardi, Notker Graf, Hartmut Volkmann, and Heribert Luig 323

Changes of Ceruloplasmin Activity in Patients With Multiple Organ Failure
Reiner Dauberschmidt, Heinz Mrochen, Barbara Griess, Karin Kaden, Christel Dressler, Hans Grajetzki, and Manfred Meyer 331

Chemiluminescence-Inducing Radicals in Experimental Porcine Septic Shock Lung
Hubert Reichle, Ulrich Pfeiffer, Peter Wendt, and Günther Blümel 339
Lipidperoxidation in a Canine Model of Hypovolemic-Traumatic Shock
Camille Lieners, Heinz Redl, Helmut Molnar, Walter Fürst, Seth Hallström, and Günther Schlag ................................................................. 345

Detection of 4-Hydroxy-Nonenal, a Mediator of Traumatic Inflammation, in a Patient With Surgical Trauma and in the Sephadex Inflammation Model
Mohie Sharaf El Din, Günter Dussing, Gerd Egger, Herwig P. Hofer, Rudolf J. Schaur, and Erwin Schauenstein ......................................................... 351

1.5.2. Endotoxin
Mediators of Acute Lung Injury in Endotoxaemia
J.R. Parrat, N. Pacitti, and I.W. Rodger ......................................................... 357

The Overwhelming Inflammatory Response and the Role of Endotoxin in Early Sepsis
Ulrich Schoeffel, Martin Lausen, Günther Ruf, Bernd-Ulrich von Specht, and Nikolaus Freudenberg ................................................................. 371

The Effect of Mucosal Integrity and Mesenteric Blood Flow on Enteric Translocation of Microorganisms in Cutaneous Thermal Injury
David N. Herndon, Stephen E. Morris, J. Allen Coffey, Jr., Rusty A. Milhoan, Daniel L. Traber, and Courtney M. Townsend ........................................ 377

Endogenous Fibrinolysis in Septic Patients
Reinhard Voss, Gerhard Borkowski, Daniela Reitz, Heinrich Ditter, and F. Reinhard Matthias ................................................................. 383

Hemodynamic and Proteolytic Responses in Relation to Plasma Endotoxin Concentrations in Porcine Endotoxemia
Frode Naess, Olav Røise, Johan Pillgram-Larsen, Tom E. Ruud, Jan O. Stadaas, and Ansgar O. Aasen ................................................................. 389

Functional Determination of tPA, PAI, and Fibrinogen in Endotoxin Shock of the Pig
M. Spannagl, H. Hoffmann, M. Siebeck, H. Fritz, and W. Schramm ............ 395

Studies on Interactions of Endotoxin With Factors of the Contact System of Plasma
Olav Røise, Bonno N. Bouma, Jan O. Stadaas, and Ansgar O. Aasen ............ 401

Dose Related Effect of Endotoxin on the Reticulo Endothelial System (RES), the Sinusoidal Cells in the Liver, and on Hepatocytes From Rats
M.R. Karim, N. Freudenberg, M.A. Freudenberg, and C. Galanos ............ 407

The Trigger for Posttraumatic Multiple Organ Failure: Surgical Sepsis or Inflammation?
M.L. Nerlich ......................................................................................... 413

Endotoxin Does Not Play a Key Role in the Pathogenesis of Multiple Organ Failure. An Experimental Study
Ignas P.T. van Bebber, Ron G.H. Speekenbrink, Paul H. M. Schillings, and R. Jan A. Goris ............................................................................ 419
1.5.3. Platelet Activating Factor (PAF)

The Potential Role of Platelet-Activating Factor (PAF) in Shock, Sepsis, and Adult Respiratory Distress Syndrome (ARDS)
Pierre Braquet and David Hosford .......................................................... 425

The Role of Platelet-Activating Factor (PAF) in Immune and Cytotoxic Processes
Jean Michel Mencia-Huerta, Bernadette Pignol, Monique Paubert-Braquet, and Pierre Braquet .......................................................... 441

Effect of Platelet-Activating Factor (PAF) Administration in Chronically Instrumented Sheep—Analysis of PAF in Plasma
Harald Gasser, Anna Schiesser, Heinz Redl, Martin Thurnher, Christa Vogl, Eva Paul, Sabine Krautschneider, and Günther Schlag ................. 447

Modulation of Resynthesis of 1-Alkyl-2-Arachidonyl-Glycero-3-Phosphocholine and Phosphatidylinositol for Interception In Vivo of Free Arachidonic Acid, Lyso-PAF, Diacyl-Glycerols, and Phosphoinositides
J.A. Bauer, K. Wurster, P. Conzen, and H. Fritz ........................................ 455

1.5.4. Tumor Necrotizing Factor (TNF)

The Role of Tumor Necrosis Factor/Cachectin in Septic Shock
Joop M.H. Debets, Wim A. Buurman, and Cees J. van der Linden ............. 463

TNF-Induced Organ Changes in a Chronic Ovine Model—Possible Role of Leukocytes
Heinz Redl, Günther Schlag, Camille Lieners, Eva Paul, Anna Schiesser, Herbert Lamche, Walter Aulitzky, and Christoph Huber ..................... 467

The Involvement of Platelet-Activating Factor (PAF)-Induced Monocyte Activation and Tumor Necrosis Factor (TNF) Production in Shock
B. Bonavida, M. Paubert-Braquet, D. Hosford, and P. Braquet .................. 485

1.6. Trauma (Sepsis)-Induced Changes of the Immune System

Graduation of Immunosuppression After Surgery or Severe Trauma
Michael W. Holch, Peter J. Grob, Walter Fierz, Werner Glinz, and Stephanos Geroulanos ................................................................. 491

Media tors and the Trauma Induced Cascade of Immunologic Defects
Eugen Faist, Wolfgang Ertel, Angelika Mewes, Theo Strasser, Alfred Walz, and Sefik Alkan ................................................................. 495

Early Deterioration of the Immune System Following Multiple Trauma
Mohammad Maghsudi, Michael L. Nerlich, Johannes A. Sturm, Michael Holch, Jochen W. Seidel, and Uwe Schmuckall .................................. 507

Monocyte Dependent Suppression of Immunoglobulin Synthesis in Patients With Major Trauma
Wolfgang Ertel and Eugen Faist .............................................................. 513
The T Lymphocyte-Mediated Immune Reaction in Polytrauma
Matthias Cebulla, Peter Kühnl, Knut Frederking, Peter Konold, and
Alfred Pannike .......................................................... 517

Serum Mediated Depression of Chemiluminescence Response of
Granulocytes in Hemorrhagic Shock
Volker Bühren, Oliver Gonschorek, Günther Sutter, and Otmar Trentz ........ 523

Breakdown of C3 Complement and IgG in Peritonitis Exudate—
Pathophysiological Aspects and Therapeutic Approach
A. Billing, H. Kortmann, D. Fröhlich, and M. Jochum ....................... 527

1.7. Metabolic Disorders

Abnormal Metabolic Control in the Septic Multiple Organ Failure Syndrome:
Pharmacotherapy for Altered Fuel Control Mechanisms
John H. Siegel, Thomas C. Vary, Avraham Rivkind, Ron Bilik, Bill Coleman,
Ben E. Tall, and J. Glenn Morris ....................................... 535

Alterations in the Metabolic Control of Carbohydrates in Sepsis
John J. Spitzer, Gregory J. Bagby, Diane M. Hargrove, Charles H. Lang, and
Károly Mézáros .......................................................... 545

Hepatic Dysfunction in Multiple Systems Organ Failure as a Manifestation
of Altered Cell-Cell Interaction
Frank B. Cerra, Michael West, Timothy R. Billiar, Ralph T. Holman, and
Richard Simmons ................................................................ 563

Modification of Protein Kinase C (PKC) Activity and Diacylglycerol (DAG)
Accumulation in Hepatocytes in Continuous Endotoxemia
Judy A. Spitzer, I.V. Deaciuc, E.B. Rodriguez de Turco, B.L. Roth,
J.B. Hermiller, and J.P. Mehegan ......................................... 575

Influence of Sepsis on Perfused Rat Liver Metabolism
E. Kovats, J. Karner, A. Simmel, J. Funovics, and E. Roth ............... 589

Changes of Serum Amino Acid Concentrations in Experimentally Induced
Endotoxic Shock. The Significance of Hyperalaninemia in the Prediction
of Lethality
Birgit Metzler, Albert W. Rettenmeier, Isolde Wodarz, and
Friedrich W. Schmahl ..................................................... 595

Metabolism and Function of Septic Kidneys
K. Kürten ........................................................................... 601

Regional Respiratory Quotients in Sepsis and Shock
Ivo Giovannini, Carlo Chiarla, Giuseppe Boldrini, and Marco Castagneto .... 607

Analysis of the Determinants of CO2 and O2 Exchange Ratios in Shock
Ivo Giovannini, Carlo Chiarla, Giuseppe Boldrini, Carlo Iannace, and
Marco Castagneto ......................................................... 613

Hyperventilation in Trauma and Shock
Carlo Chiarla, Ivo Giovannini, Giuseppe Boldrini, and Marco Castagneto .... 619
2. MONITORING SCORES/BIOLOGICAL MONITORING

The Use of Scoring Systems in Patients With Cardiogenic and Septic Shock
Günter Pilz, Alexander Stäblein, Elisabeth Reuschel-Janetschek, Gernot Autenrieth, and Karl Werdan ................................. 625

Prognostic Indices of Sepsis
Angelo Nespoli, Pietro Padalino, Claudio Marradi, Jacopo Pallavicini, Luca Fattori, and Giuliana Bisiani ................................. 633

Efficiency of Sepsis Score, AT III- and Endotoxin Evaluation in Predicting the Prognosis of Post-Operative Sepsis in the Intensive Care Unit
N. Kipping, R. Grundmann, M. Hornung, and C. Wesoly ................................. 637

Risk Factors of the Multiple Organ Failure
P. Lehmkuhl, A. Schultz, and J. Gebert .................................. 643

Biochemical Analysis in Posttraumatic and Postoperative Organ Failure
Heinz Redl and Günter Schlag .................................. 649

Posttraumatic Plasma Levels of Mediators of Organ Failure
Marianne Jochum, Alexander Dwenger, Theo Joka, and Johannes Sturm .... 673

Plasma Levels of Granulocyte Elastase and Neopterin in Patients With MOF
Richard Pacher, Heinz Redl, and Wolfgang Wolosczuk ..................... 683

Elastase-α1-PI: Early Indicator of Systemic Infections in Pediatric Patients
Christian P. Speer, Michaela Rethwilm, Friedrich Tegtmeier, and Manfred Gahr ................................. 689

Leucocytes, Neutrophilia, and Elastase-a1-Proteinase-Inhibitor-Complex: Marker of Different Validity for Monitoring the Perioperative Infection Risk
Peter C. Fink, Rolf Erdmann, Friedrich Schöndube, and Ivo Baca ................................. 695

Validity of the Elastase Assay in Intensive Care Medicine
Hermann Lang, Marianne Jochum, Hans Fritz, and Heinz Redl ................................. 701

An Automated Homogeneous Enzyme Immunoassay for Human PMN Elastase
M. Dreher, G. Gunzer, R. Helger, and H. Lang ................................. 707

Diiodotyrosine (DIT): A New Marker of Leukocyte Phagocytic Activity in Sepsis and Severe Infections
H.-J. Gramm, H. Meinhold, K. Voigt, and R. Dennhardt ................................. 711

Serum Proteins and Cytokines for Prediction of Sepsis?
A.F. Hammerle, G. Pöschl, R. Kirnbauer, F. Trautinger, M. Micksche, and O. Mayrhofer ................................. 715

The Prognostic Value of Plasmaproteins in Patients With Abdominal Sepsis
Michael Rogy, Reinhold Függer, Wolfgang Graninger, Friedrich Herbst, Michael Schepner, and Franz Schulz ................................. 719

CRP Predicts Complications in Pancreatitis and Peritonitis
Åke Lasson, Rikard Berling, and Kjell Ohlsson ................................. 725

The PFI-Index According to Aasen for Prognosis and Course of Polytraumatized Patients
D. Nast-Kolb, Ch. Waydhas, I. Baumgartner, M. Jochum, K.-H. Duswald, and L. Schweiberer ................................. 731
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components of the Kallikrein-Kinin-System in Patients With ARDS</td>
<td>737</td>
</tr>
<tr>
<td>G. Fuhrer, W. Heller, W. Junginger, O. Gröber, and K. Roth</td>
<td></td>
</tr>
<tr>
<td>Biochemical and Hormonal Parameters in Patients With Multiple Trauma</td>
<td>743</td>
</tr>
<tr>
<td>M. Brandl, E. Pscheidl, W. Amann, A. Barjasic, and Th. Pasch</td>
<td></td>
</tr>
<tr>
<td>Patterns of Endocrine Secretion During Sepsis</td>
<td>751</td>
</tr>
<tr>
<td>R. Dennhardt, H.-J.Gramm, K. Meinhold, and K. Voigt</td>
<td></td>
</tr>
<tr>
<td>Phospholipase A in Severely Ill Patients</td>
<td>757</td>
</tr>
<tr>
<td>Roland M. Schaefer, M. Teschner, and A. Heidland</td>
<td></td>
</tr>
<tr>
<td>The Clinical Significance of Serum Phospholipase A in Patients With</td>
<td>763</td>
</tr>
<tr>
<td>Multiple Trauma</td>
<td></td>
</tr>
<tr>
<td>Ch. Waydhas, I. Baumgartner, D. Nast-Kolb, P. Lehnert, K.H. Duswald,</td>
<td></td>
</tr>
<tr>
<td>and L. Schweiberer</td>
<td></td>
</tr>
<tr>
<td>Lymphocyte/Monocyte-Ratio Correlates With Survival From Infections</td>
<td>769</td>
</tr>
<tr>
<td>and Multi-Organ Failure Following Polytrauma</td>
<td></td>
</tr>
<tr>
<td>Michael W. Holch, Peter J. Grob, and Werner Glinz</td>
<td></td>
</tr>
<tr>
<td>A Prospective Study to Evaluate Posttraumatic Liver Function by</td>
<td>775</td>
</tr>
<tr>
<td>Scintigraphy as a Possible Predictor of Organ Failure</td>
<td></td>
</tr>
<tr>
<td>G. Regel, M.L. Nerlich, K.F. Gratz, H.P. Friedl, and J.A. Sturm</td>
<td></td>
</tr>
</tbody>
</table>

3. GENERAL THERAPY

Prophylaxis and Therapy of the Multiple Organ Failure Syndrome (MOFS): Early Ventilatory Support
Herbert Benzer, Wolfgang Koller, Christian Putensen, and Günther Putz

The Use of Exogenous Surfactant to Treat Patients With Acute High-Permeability Lung Edema
Roger G. Spragg, Paul Richman, Nicolas Gilliard, T.Allen Merritt,
Bengt Robertson, and Tore Curstedt

Exogenous Surfactant in Experimental Aspiration Trauma
Wolfgang Strohmaier, Heinz Redl, and Günther Schlag

Effect of an Altered Fluid Regimen on Extravascular Lung Water in
Advanced Septic Shock States
Ernst Zadrobilek, Vichra Evstatieva, Paul Sporn, and Karl Steinbereithner

Effect of Large Volume Replacement With Crystalloids on Extravascular
Lung Water in Human Septic Shock Syndrome
Ernst Zadrobilek, Werner Hackl, Paul Sporn, and Karl Steinbereithner

Hydroxyethyl Starch and Lung Lymph Flow in an Ovine Model of
Endotoxemia
Hans J. Lübbesmeyer, Jesse Basadre, Michael Möllmann, Lillian Traber,
James Maguire, David N. Herndon, and Daniel L. Traber

Can Hemofiltration Increase Survival Time in Acute Endotoxemia—A Porcine
Shock Model
F. W. Schildberg
Decontamination of the Gastrointestinal Tract and Prevention of Multiple Organ Failure. An Experimental Study
Ignas P.T. van Bebber, Roland M.G.H. Mollen, Joop P. Koopman, and R. Jan A. Goris ............................ 827

3.1. Corticosteroids

Development of Animal Models for Application to Clinical Trials in Septic Shock
Lerner B. Hinshaw ........................................... 835

Dilemmas of the Clinical Trial; Review and Critique of VA Cooperative Study of Corticosteroid in Systemic Sepsis
Michael F. Wilson ........................................... 847

Corticosteroids for Septic Shock and the Adult Respiratory Distress Syndrome
Roger C. Bone .............................................. 857

Nebulized Corticosteroid in Experimental Respiratory Distress
Sten Walther, Ingvar Jansson, Björn Bäckstrand, and Sten Lennquist .......... 867

Influence of Methylprednisolone Pretreatment on Coagulation, Fibrinolysis, Hemodynamics, and Cellular Responses in Porcine Endotoxemia
Olav Røise, Frode Naess, Johan Pillgram-Larsen, Tom E. Ruud, Jan O. Stadaas, and Ansgar O. Aasen .......... 873

Prevention of Anaphylatoxin Formation by High-Dose Corticosteroids in Total Hip Arthroplasty
Wolfgang Gammer, Anders Bengtson, and Mats Heideman .................... 879

3.2. Radical Scavengers

Free Radical Scavengers in the Cardiopulmonary Response to Endotoxin
Daniel L. Traber, David N. Herndon, and Lillian D. Traber ....................... 885

The 21-Aminosteroid U74006F Reduces Systemic Lipid Peroxidation, Improves Neurologic Function, and Reduces Mortality After Cardiopulmonary Arrest in Dogs
JoAnne E. Natale, Robert J. Schott, Edward D. Hall, J. Mark Braughler, and Louis G. D’Alecy ....................... 891

Alpha-Mercaptopropionylglycine in Haemorrhagic Shock
B. Weidler, B. v. Bormann, M. Kahle, and G. Hempelmann ....................... 897

Dynamics of Prostacyclin and Thromboxane During Myocardial Ischemia
Elizabeth Röth, Dezsö Keleman, Bela Török, Alexander Nagy, and Susan Pollak ........................................ 907

Protection by Recombinant Human Superoxide Dismutase in Lethal Rat Endotoxemia
Johannes Schneider, Elmar Friderichs, and Hubert Giertz ....................... 913
3.3. PAF Antagonists

Effect of a New and Specific PAF-Antagonist, WEB 2086, on PAF and Endotoxin/Tumor Necrosis Factor Induced Changes in Mortality and Intestinal Transit Velocity
Hubert Heuer ................................................................. 919

The Pathophysiological Role of PAF in Anaphylactic Lung Reaction in the Guinea Pig and in Endotoxin Shock Evidenced by the Specific PAF-Antagonist WEB 2086
Hubert Heuer and Jorge Casals-Stenzel ................................. 925

Effect of PAF-Antagonists in Endotoxin Shock—Ovine and Rat Experiments
Soheyel Bahrami, Heinz Redl, Martin Thurnher, Christa Vogl, Eva Paul, Anna Schiesser, and Günther Schlag ................................................................. 931

3.4. Protease Inhibitors

Therapeutic Effects of the Combination of Two Proteinase Inhibitors in Endotoxin Shock of the Pig
M. Siebeck, H. Hoffmann, J. Weipert, and M. Spannagl ................ 937

Leukocyte Neutral Proteinase Inhibitor of the Pig: Modification by Eglin C and Superoxide Dismutase of the Response to Shock
M. Siebeck, H. Hoffmann, R. Geiger, and L. Schweiberer ................ 945

Reasons for the Ineffectiveness of Eglin C to Ameliorate Endotoxin Shock in Sheep
Wolfgang G. Junger, Camille Lieners, Heinz Redl, and Günther Schlag ...... 953

Clinical Relevants of the Membrane Protective Action of Aprotinin on the Intraoperative Histamine Liberation
Henning Harke and Salah Rahman ........................................... 959

Antithrombin III and Plasma Substitution in Septic Shock
Rainer Seitz, Martin Wolf, and Rudolf Egbring ............................ 965

Immunological Determination of Proteinase Inhibitor Complexes (PICs) and Their Behaviour During Plasma Derivate Treatment in Septic Infections
Rudolf Egbring, Rainer Seitz, Heiner Blanke, T. Menges, R. Südhoff, T. Stober, G. Kolb, and L. Lerch ................................................................. 971

Therapeutic Modalities to Ameliorate Endotoxin Induced DIC in the Rats
Soheyel Bahrami, Eva Paul, Heinz Redl, and Günther Schlag ............ 977

Endotoxin Shock in the Rat: Reduction of Arterial Blood Pressure Fall by the Bradykinin Antagonist B4148
Joachim Weipert, Hans Hoffmann, Matthias Siebeck, and Eric T. Whalley ... 983

3.5. Immune Therapy

First Experience With Immunomodulation in Septic Shock
Ch. Josten, G. Muhr, and R. Sistermann ........................................ 989
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thymopentin (TP-5) in the Treatment of the Postburn and Postoperative Immunodeficiency Syndrome</td>
<td>995</td>
</tr>
<tr>
<td>Gerhard Hamilton, Gerald Zöch, Thomas Rath, and Günther Meissl</td>
<td></td>
</tr>
<tr>
<td>Protection Against the Consequences of Intravascular Coagulation by Reticuloendothelial Stimulation</td>
<td>1001</td>
</tr>
<tr>
<td>George Lázár, Jr., Elizabeth Husztik, and George Lázár</td>
<td></td>
</tr>
<tr>
<td>Behavior of Leukocyte Elastase and Immunoglobulins in Septic Toxic Multiorgan Involvement: Observations on 5o Gas Gangrene Cases</td>
<td>1007</td>
</tr>
<tr>
<td>D. Tirpitz</td>
<td></td>
</tr>
<tr>
<td>Haemodynamic Effects During Treatment of Sepsis and Septic Shock With Immunoglobulins and Plasmapheresis</td>
<td>1025</td>
</tr>
<tr>
<td>Karl Werdan, Günter Pilz, and Stefan Kääb</td>
<td></td>
</tr>
<tr>
<td>Prediction and Prevention, by Immunological Means, of Septic Complications After Elective Cardiac Surgery</td>
<td>1031</td>
</tr>
<tr>
<td>Stimulation of Phagocytosis by Immunoglobulins in Animal Experiment</td>
<td>1037</td>
</tr>
<tr>
<td>Stefan W. Frick and Rolf Hartmann</td>
<td></td>
</tr>
<tr>
<td>Determination of Antibodies Against Bacterial Lipopolysaccharides and Lipid A by Immunoblotting</td>
<td>1043</td>
</tr>
<tr>
<td>Peter C. Fink, Gert Bokelmann, and Rainer Haeckel</td>
<td></td>
</tr>
<tr>
<td>3.6. Inotropic Agents—Calcium Antagonists</td>
<td></td>
</tr>
<tr>
<td>Diltiazem Prevents Endotoxin-Induced Disturbances in Intracellular Ca²⁺ Regulation</td>
<td>1053</td>
</tr>
<tr>
<td>Mohammed M. Sayeed</td>
<td></td>
</tr>
<tr>
<td>Calcium Antagonists in Shock—a Minireview of the Evidence</td>
<td>1065</td>
</tr>
<tr>
<td>James R. Parratt</td>
<td></td>
</tr>
<tr>
<td>Circulatory Responses to the Sepsis Syndrome</td>
<td>1075</td>
</tr>
<tr>
<td>William J. Sibbald</td>
<td></td>
</tr>
<tr>
<td>Therapy of Acute Respiratory Distress Syndrome With Nifedipine</td>
<td>1087</td>
</tr>
<tr>
<td>Peter Hoffmann, Michael Imhoff, and Ralf Gahr</td>
<td></td>
</tr>
<tr>
<td>Pharmacological Effects of RA 642 on Cerebrocortical Perfusion in Acute Hemorrhagic Shock in Rats</td>
<td>1091</td>
</tr>
<tr>
<td>Stefan Hergenröder and Richard Reichl</td>
<td></td>
</tr>
<tr>
<td>Long Term Administration of Dopamine: Is There a Development of Tolerance?</td>
<td>1097</td>
</tr>
<tr>
<td>G.G. Braun, F. Bahlmann, M. Brandl, and R. Knoll</td>
<td></td>
</tr>
<tr>
<td>Use of Systolic Time Intervals to Evaluate the Effect of Dopamine Infusion in Septic and Burn Shock</td>
<td>1101</td>
</tr>
<tr>
<td>Kornél Szabó</td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>1107</td>
</tr>
</tbody>
</table>
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THE PFI-INDEX ACCORDING TO AASEN FOR PROGNOSIS AND COURSE OF POLYTRAUMATIZED PATIENTS

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AASEN (1986) suggested the PFI-Index as a prognostic parameter for evaluation of the course of the disease in septic and polytraumatized patients. The index is defined as the sum of the deviations from controls of proenzyme and inhibitory activities of destinat factors of the coagulation, fibrinolytic and kallikrein-kinin systems. In a prospective clinical study which has been carried out since 1986 we were especially interested to evaluate the significance of the PFI-Index as a prognostic and diagnostic aid. The results obtained are compared with those seen for PMN elastase release. The clinical relevance of the measurement of the granulocytic (PMN) elastase was published repeatedly (DITTMER 1985, DUSWALD 1985).

During the first 2 years 57 polytraumatized patients (mean Injury Severity Score (BAKER 1974): 39 points) were included in the study. The patients were subdivided into 4 groups (table 1):

Table 1: Patients 1986 - 1987, n = 57
Group 1: early deceased, n = 8, mean ISS: 59 points (range: 34 - 75)
Group 2: secondarily deceased, n = 8, mean ISS: 42 points (range: 25 - 59)
Group 3: survived with organ failure, n = 17, mean ISS: 37 points (range: 17 - 57)
Group 4: survived without complications, n = 24, mean ISS: 32 points (range: 18 - 50)
Among the 49 patients who survived the primary phase in the shock room, 25 developed defined organ complications, 16 of them a multiorgan failure. The individual organ dysfunctions were distributed as follows: liver failure (43%), lung failure (35%), kidney failure (18%), DIC (8%), gastrointestinal disturbances (8%). The values for the PFI-Index and PMN elastase obtained upon hospital admission and after an intensive-care stabilization phase at day 4 are given in table 2:

Table 2: Mean values (±SEM) of PFI-Index (%) and PMN elastase (ng/ml) upon hospital admission and on day 4

<table>
<thead>
<tr>
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<th>Hospital admission</th>
<th>Day 4 after trauma</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>PFI-Index</td>
<td>Elastase</td>
</tr>
<tr>
<td>Group 1</td>
<td>-369 (±30)</td>
<td>1334 (±630)</td>
</tr>
<tr>
<td>Group 2</td>
<td>-205 (±38)</td>
<td>325 (±61)</td>
</tr>
<tr>
<td>Group 3</td>
<td>-189 (±19)</td>
<td>361 (±43)</td>
</tr>
<tr>
<td>Group 4</td>
<td>-167 (±24)</td>
<td>336 (±40)</td>
</tr>
</tbody>
</table>

Upon hospital admission PFI-Index (%) and PMN elastase (ng/ml) show the same pattern: Patients of group 1, who died primarily, differ significantly from those of the other 3 groups which cannot be discriminated by these parameters.

On day 4 after trauma the result is as follows: The difference between those patients who deceased secondarily (group 2) and those who survived (group 3 and 4) is significant for the PFI-Index with a p-value of only 0.033. No distinction can be made between group 3 and 4. PMN elastase behaves quite differently: The differences of all 3 groups among each other and of group 3 plus 4 patients (survivors) as compared to those of group 2 (non-survivors) and group 2 plus 3 patients (with complications) as compared to group 4 (no complications) proved to be significant with p ≤ 0.01.
To evaluate the prognostic relevance we checked how the different groups behave in view of a pathological PFI-Index (<-50%) or PMN elastase value (>250 ng/ml).

**Table 3:** Prognostic relevance of the PFI-Index and PMN elastase at day 4 after trauma regarding further development of complications

<table>
<thead>
<tr>
<th></th>
<th>PFI-Index</th>
<th>Elastase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>44%</td>
<td>68%</td>
</tr>
<tr>
<td>Specificity</td>
<td>54%</td>
<td>83%</td>
</tr>
<tr>
<td>Pos. Predictive Value</td>
<td>50%</td>
<td>81%</td>
</tr>
<tr>
<td>Neg. Predictive Value</td>
<td>48%</td>
<td>71%</td>
</tr>
</tbody>
</table>

In table 3 the prognostic relevance of the PFI-Index and PMN elastase for the development of further complications are shown at day 4 after trauma. With a positive predictive value (PPV) of 81% PMN elastase allows a good prediction of the development of complications in the further disease course. The negative predictive value (NPV) for PMN elastase is slightly lower. On the other hand the PFI-Index does not have prognostic relevance regarding further complications with a PPV of 50% and a NPV of 48%.

**Table 4:** Prognostic relevance of the PFI-Index and PMN elastase at day 4 for survival and non survival

<table>
<thead>
<tr>
<th></th>
<th>PFI-Index</th>
<th>Elastase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>75%</td>
<td>88%</td>
</tr>
<tr>
<td>Specificity</td>
<td>61%</td>
<td>66%</td>
</tr>
<tr>
<td>Pos. Predictive Value</td>
<td>27%</td>
<td>33%</td>
</tr>
<tr>
<td>Neg. Predictive Value</td>
<td>93%</td>
<td>96%</td>
</tr>
</tbody>
</table>

For the prediction of survival both PMN elastase as well as the PFI-Index are suitable. The NPV is 96% and 93%, respectively. In contrast, a reliable prediction of lethal outcome is not possible: Only 33% or 27% of patients with pathological PMN elastase or PFI-Index values at day 4 after trauma died.
Finally we checked to which extent the profile of the patterns of the compared parameters reflects the actual course of the disease (Figs. 1 and 2).

Fig. 1: Mean values (±SEM) of PFI-Index for group 2, 3 and 4

Fig. 2: Mean values (±SEM) of PMN elastase for groups 2, 3 and 4
At day 3, a difference between the later deceased and the surviving patients can be seen in the PFI-Index. Thereafter for the deceased patients the PFI-Index remains in the negative, pathological range, while the profile of the curve for the surviving patients rises to normal and remains there. The PMN elastase behaves accordingly and, in addition group differences can be already recognized at day 2. Also a trend for difference between the survivors with and without organ complications can be recognized.

Conclusions:

The PFI-Index does not allow any discrimination of the patients' state in the early phase of the trauma. Obviously the PFI-Index represents only the loss in blood-volume at this time. Upon admission to the hospital a good correlation between the PFI-Index and total plasma protein (coefficient of correlation: 0.80) is evident but after intensive care stabilization and balance of volume losses correlation is lost (coefficient of correlation: 0.31). Obviously in this phase the PFI-Index represents the actual consumption of factors of the plasmatic cascade systems. The PFI-Index has no prognostic value concerning the development of complications. However its sensitivity to predict fatal outcome of 75% is relatively high. The low PPV (27%) does not allow to predict outcome in patients with elevated PFI-Index. Normal PFI-Index values indicate survival. The same is true for normal PMN elastase levels. Elevated PMN elastase levels do also not allow prediction of fatal outcome, but in contrast to pathological PFI-Index values, indicate imminent complications.

Acknowledgements: Supported by a grant from the Schutzkommission beim Bundesministerium des Inneren. Thanks to Prof. H. Fritz for his continuous support.

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biochemical Alterations in Septicemia after Abdominal 
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Index

A23187, 121
endothelium permeability and, 129, 131
AA-861, 131
Aasen index (PFI), polytrauma, 731–735
Acetylcholine, bradykinin antagonist B4148 administration with, 983, 984
Acetylcholinesterase, red blood cell, activated C3 in DIC, fulminant meningococcal meningitis, 272, 274
Acetylsalicylic acid, 131, 457, 459, 461
Acid glycoprotein, plasma, and sepsis prognosis, 634, 635, 716, 717
ACTH, sepsis, 753, 755
Acute phase reactants, 337
ADH. See Vasopressin (antidiuretic hormone)
Adherence, granulocyte-endothelial cell, bacterial endotoxin role, 123–124
ADP
- induced platelet aggregation, 367
ribosylation, Pseudomonas endotoxin A, elongation factor-2, 250
Adrenal glands, animal models for shock, 838–839
Age, antithrombin III and plasma substitution in septic shock, 966, 968
AH 23848, 366
Albumin, plasma, and abdominal sepsis prognosis, 720, 721
Allopurinol, 350
Alveolar
and C3a in ARDS, 43–47, 52
cell cytological changes, ARDS, 51–54
permeability, 323–329
see also under Permeability
Alveolo capillary interface
ARDS, 27–28
corticosteroid, nebulized, in experimental respiratory distress, 867
membrane permeability, cell interactions in septic shock, 116–117
Ambiguituous enzymes, 576
Amino acid clearance, prognostic index in sepsis, 634, 635
Amino acid concentrations, serum, experimental endotoxin shock, 595–599
gabexate mesilate administration, 596, 597
 glutamine and glutamic acid, 598
hyperalninea and lethality, 595, 597–599
tyrosine, 598
Amino acid metabolism, respiratory quotient (CO2/O2 exchange ratio) in shock, 619–621
Amino acid release, perfused liver, sepsis effect on metabolism, 590–592
21-Aminosteroid U74006F, 891–895
Anaphylactic lung reaction, guinea pig, WEB 2086 (PAF antagonist), 925–929
Anaphylatoxins. See C3a; C5a
Angiopathy, diabetic, 1008, 1009
Angiotensin, 379
Animal model development for shock, 835–840, 843–844, 851
application to humans, 839–840, 843–844
endotoxin shock, history, 836
methyprednisolone with gentamicin, dogs, E. coli shock, 836–837
adrenal gland role, 838–839
cf. baboons, 836–840
rationale, 837–838
Anipamil, traumatic shock, 1067, 1068
Antibiotics
burns, enteric translocation of microorganisms, 377, 378
and calcium antagonists in endotoxin shock, 1070
Antibodies, anti-LPS and anti-lipid A, determination with immunoblotting, 1043–1050
Antichymotrypsin cf. C-reactive protein as prognostic index, 725–727
Antigen, inhaled, WEB 2086 (PAF antagonist), anaphylactic lung reaction, 926, 928
Antigen-presenting cells, trauma-induced cascade of CMI effects, 495, 496
Antioxidant, MTDQ-DA, myocardial ischemia, 907–911; see also Free radical scavengers; Oxygen radicals
Antiplasmin
kallikrein-kinin system components in ARDS after polytrauma, 738, 741
methylprednisolone pretreatment, endotoxemia, 874, 875
α2-Antiplasmin
aprotinin membrane protective action, intraoperative histamine liberation, 961, 963
plasma, and abdominal sepsis prognosis, 720, 721
Anti-protease. See Protease inhibitor entries
Antithrombin III, 319, 384, 386, 940
dendotoxin and overwhelming inflammatory response of early sepsis, 372
kallikrein-kinin system components in ARDS after polytrauma, 738, 740–742
methylprednisolone pretreatment, endotoxemia, 874, 875
multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring, 652
neutrophils, thrombin-induced adhesion with endothelial cells, 103
plasma
and abdominal sepsis prognosis, 720
corticosteroid, nebulized, in experimental respiratory distress, 869–871
endotoxin-induced DIC, AT III-heparin complex therapy, 979
plasma substitution in septic shock, humans, 965–968
prognostic value in sepsis, 637
lethality, 639, 640
thrombocyte counts, 637–641
scintigraphic evaluation of posttraumatic liver function, 776, 777
Antithrombin III-heparin complex, DIC, endotoxin-induced, 977–981
α1-Antitrypsin
immune suppression, post-surgical or post-traumatic, 492
lymphocyte/monocyte ratio in polytrauma survival, 769
plasma, and abdominal sepsis prognosis, 716, 717, 720, 721
Aorta, vascular intima in endotoxin shock, 85, 86
Apache II scoring system, 280, 384, 386, 626–630, 635, 643, 645, 664, 716, 1026–1030
Aprotinin
immunoglobulin profiles and PMN-elastase in septic gas gangrene, 1008, 1012, 1014–1016
membrane protective action, intraoperative histamine liberation, 959–963
Arachidonate/arachidonic acid metabolism, 21, 351
in ARDS, pulmonary edema, 306–307, 309–311
burns, PAF inhibitor effect, scalded pig, 455, 461
cyclooxygenase metabolites, lung injury in E. coli endotoxicemia, 358, 362–364
early ventilatory support, 785
endotoxin effects, endothelium, 119–121, 121–123
hemofiltration and survival time, porcine acute endotoxic shock, 823–825
myocardial ischemia, 911
see also specific metabolites
ARDS, 7, 8, 13–14, 17–23, 27–33, 787, 788
alveoli, 31–33, 43–47, 51–54
alveoloalcapillary membrane damage, 27–28
arachidonic acid cascade in, and pulmonary edema, 306–307, 309–311
bronchoalveolar lavage, 13, 19, 20, 22, 23
C3a, 31–33, 43–47, 52, 299, 880
causes, 17–18
air-borne cf. blood-borne, 18, 19
ceruloplasmin changes, 331–337
C-reactive protein, 335, 336
number of organs involved, 333, 334, 336
complement activation, 43
pulmonary hypertension and vascular leakage, 283, 284, 286
diagnostic markers, 22–23
dopamine infusion, effect evaluation with systolic time intervals, 1102
eyearly cf. late, 18
exogenous surfactant, 791–795
exudate Organization, 27–29
hypovolemic shock, 32, 33
ischemia and circulatory system in MSOF, 1076, 1078, 1081, 1083
nifedipine, 1087–1090
pathogenesis, 19–22
pathophysiology, 27–28
phospholipase A as prognostic index, 757
PMN degranulation, 18–20, 31–33
polytrauma, kallikrein-kinin system, 737–742
postoperative organ failure, 133–136
posttraumatic, plasma levels of mediators, prognosis, 673–679
macrophages, 679
cf. non-ARDS, 676, 677, 679
septic, and multiple system organ failure, 57–60
prognosis, 59, 61–65
clinical conditions, 62
mortality, 63, 65
septicemia, pulmonary vascular resistance, 175–179
septic shock, 30–33
corticosteroids in, 857, 860–864
metabolic abnormality, 535, 537, 538
oxygen supply-uptake relationship, 181
shock as predisposing factor, 64
surfactant replacement, 29, 797
Arrhythmias, myocardial ischemia, 907
Arterial pressure, mean
α-mercaptopropionylglycine in hemorrhagic shock, 899–902
RA642, effects on cerebrocortical perfusion, acute hemorrhagic shock, 1091–1093
see also Pulmonary artery pressure
Arthroplasty, total hip, high-dose corticosteroids to prevent C3a and C5a formation, 879–882
Artifact rejection, heart performance during septic shock, awake sheep, 239–242
Aspiration trauma, experimental, exogenous surfactant, 797–800
Asthma, 486
ATPase, calcium antagonists in shock/ischemia, 1065, 1066
ATP MgCl₂, kidney metabolism in E. coli sepsis, 602, 605
Atrial pressure, left, pulmonary venous hemodynamics and gas exchange disturbances, E. coli septicemia, Gottingen pig, 185, 186
Autoradiography, in situ, hepatocyte protein kinase C and diacylglycerol accumulation, endotoxemia, 579, 583–584, 586
Autoregulation, hemorrhagic shock, phase-related vascular reactivity, cats, 147, 148
B4148, blood pressure maintenance, endotoxin shock, 983–987
Bacterial toxins, endothelium permeability effects, 127–131; see also specific bacteria and toxins
Bacteroides fragilis, 538
Base excess, respiratory quotient (CO$_2$/O$_2$ exchange ratio) in shock, 613, 614, 619
B cells(s)
  Ig synthesis suppression after multiple trauma, 513–515
  maturation, trauma-induced cascade of cell-mediated immune effects, 496, 497, 499, 501, 502
  multiple trauma, early events, 507–509
B-cell growth factor (IL-4), trauma-induced cascade of cell-mediated immune effects, 497
Beclometasondipropionate (BDP), nebulized corticosteroid, in experimental respiratory distress, 867, 868, 870, 871
Bilirubin
  ARDS, posttraumatic, prognosis, 675, 676, 678
  polytrauma, 743, 745
  lymphocyte/monocyte ratio in survival, 769
Biologically active site, C3a, 299
Biological response modifiers. See Immunomodulation
Blood flow redistribution, septic shock, 164
Blood volume redistribution, septic shock, 164–165
BM 13,177, 366, 367
BN 56,020, 428
BN 52,021, 426–433, 442–444, 485–488
  endotoxin shock effects, 931–935
  PAF effects in sheep, 448
BN 52,022, 428
BN 56,203, 429
Bombesin, 378–380
Bone, long, fracture, and pulmonary fat embolism, 39–41
Bradykinin antagonist B4148, blood pressure maintenance, endotoxin shock, 983–987
Brain, PAF antagonist inhibition of induced shock, 430
Branched chain amino acids, 617
  amino acid concentrations, serum, experimental endotoxin shock, 595, 598
metabolic abnormalities in sepsis, 539, 540
Bronchoalveolar lavage, ARDS, 13, 19, 20, 22, 23, 44
  exogenous surfactant, 795
Bronchoconstriction, WEB 2086 (PAF antagonist), anaphylactic lung reaction, 925, 926, 928
Burimamide, 362
Burn(s)
  dopamine infusion, effect evaluation with systolic time intervals, 1101–1105
  total burn surface estimation with Nine Rule, 1102–1103
  endotoxin and overwhelming inflammatory response of early sepsis, 372–374
  enteric translocation of microorganisms, 377–380
  scalded rats, 379
  sheep, 378
  PAF antagonist inhibition of induced shock, 431
  scalded pig, 455–461
  sepsis after, TP-5 immunomodulation, 995–998
Butyrophenones, 755
BW 755C, glucose turnover in sepsis, 552, 553
C3
  activated, DIC in septic shock, 271–274
  IgG breakdown in peritonitis exudate, 527–532
  lymphocyte/monocyte ratio in polytrauma survival, 769, 770
  plasma, and abdominal sepsis prognosis, 720, 721
C3a, 7, 204
  activation
  endotoxin role in sepsis, 278–280
  MSOF pathogenesis in septic shock, dogs, 296
  pulmonary hypertension and vascular leakage, 283
  alveoli in, post-trauma, 43–47, 52
  ARDS, 299, 880
  biologically active site, 299
  circulation, peripheral, septic shock, 170
corticosteroids to prevent formation, total hip arthroplasty, 879–882
ELISA quantitation with monoclonal antibodies, 299–303
cf. C3, 300–303
endotoxin and overwhelming inflammatory response of early sepsis, 372, 373
in MSOF, 296, 880
acute pancreatitis, 265–268
polytrauma, 414
postoperative/posttrauma, biochemical analysis and scoring, 650, 651
prognostic index in sepsis, 635
rheumatoid arthritis, 299
systemic lupus erythematosus, 299
C3c, complement activation, MSOF pathogenesis in septic shock, dogs, 292, 294–296
C4
complement activation, endotoxin role in sepsis, 279, 280
lymphocyte/monocyte ratio in polytrauma survival, 769, 770
plasma, and abdominal sepsis prognosis, 720, 721
C5a, 7, 13, 43, 44, 46, 115, 116, 204, 825
activation
endotoxin role in sepsis, 278–280
MSOF pathogenesis in septic shock, dogs, 292, 296
pulmonary hypertension and vascular leakage, 283, 284
corticosteroids to prevent formation, total hip arthroplasty, 879–882
MSOF in acute pancreatitis, 265–268
terminal complement complexes, 266, 267
and PAF, 366
C5b9, 266
Cachectin. See Tumor necrosis factor (TNF, cachetin) entries
Calcium
capillary endothelial cells, 159
endothelium permeability effects, 127–131
endotoxin-induced intracellular overload, 1053–1061
hepatocytes, protein kinase C and diacylglycerol accumulation, endotoxia, isolated heart, effect of LMW plasma fraction in hypovolemic traumatic shock, 234
overload in ischemic cell death, 1065–1066
and PAF, 366
rapid influx and toxic action, 68
Calcium antagonists in shock/ischemia, 1060, 1065–1073
ATPase, 1065, 1066
calcium overload in ischemic cell death, 1065–1066
endotoxin shock, 1068–1071
glucose deficiency, 1066
hemorrhagic shock, 1067
mechanisms of action, 1072
magnesium, 1072
mitochondrial function, 1066
muscle spasm, smooth, 1066
phospholipase, 1066, 1071
platelet aggregation, 1066
traumatic shock, 1067–1068
see also specific agents
Calcium gates, 119, 120
Calmodulin, 120
Calvin, John, 850
Cancer patients, 493–494
Candida tropicalis, in vitro phagocytosis assay, 508, 510
Candidiasis, systemic, 378
Capillary endothelium
contractile elements, 157–160
endotoxia and shock, impaired regulation, 157–160
lung, complement activation, MSOF pathogenesis in septic shock, dogs, 292, 294–296
Capillary permeability. See under Permeability
Capillary pressure, lung edema, 28
Capillary surface area reduction, ischemia and circulatory system in MSOF, 1082
Carbon dioxide, arterial, metabolic abnormalities in sepsis, 537, 538; see also Respiratory quotient (CO2/O2 exchange ratio) in shock
Carbon monoxide, α-
mercaptopropionylglycine in hemorrhagic shock, 899, 900, 902
Cardiac function
 heart cells, cultured, effects of Pseudomonas aeruginosa toxins, rat, 247–251
 muscle pO2 role, critically ill patients, 139
 see also Heart entries
Cardiac index, 625, 626
extravascular lung water
 altered fluid regimen, advanced septic shock with acute respiratory failure, 804–806
 large volume replacement with crystalloids, 810, 811
 hydroxyethyl starch, volume replacement in ovine endotoxemia, 818, 819
 immunoglobulin and plasmapheresis therapy, hemodynamic effects during treatment for septic shock, 1026, 1027
 pulmonary vascular resistance, ARDS in sepsis, 175–179
 pulmonary venous hemodynamics and gas exchange disturbances, E. coli septicemia, Goettingen pig, 185, 186
Cardiac output
 cardiopulmonary response to endotoxin, eicosanoids in, sheep, 202
 circulation, peripheral, septic shock, 163–166
 hemofiltration and survival time, porcine acute endotoxic shock, 822, 825
 ischemia and circulatory system in MSOF, 1076–1077, 1080, 1082
 oxygen supply-uptake relationship, septic shock, 183
 PAF effects in sheep, 448–449
 septic shock, chacma baboon (Papio ursinus), 207, 210–215, 219–222
Cardiac work, septic shock, heart overperformance in, 260–262
Cardiogenic shock, scoring systems, 625–630
 CI and SVR, 625, 626
Cardiopulmonary arrest, lipid peroxidation inhibition, 891–895
Cardiopulmonary response to endotoxin eicosanoids in, sheep, 201–204
 free radical scavengers, 885–888
 Catalase, 201–202, 887
 Catecholamines, 755, 756
 glucose turnover in sepsis, 552–553, 557, 559
 ischemia and circulatory system in MSOF, 1077
 see also specific catecholamines
 Cathepsin D, 431, 168
 Cathepsin G, 937, 941, 942
Cement, methylmethacrylate, 879, 880
Cerebrocortical perfusion, RA642 effects, hemorrhagic shock, 1091–1094
Ceruloplasmin, changes in MSOF and ARDS, 331–337
 C-reactive protein, 335, 336
 number of organs involved, 333, 334, 336
 C1-esterase inhibitor
circulation, peripheral, septic shock, 170–171
 complement activation, endotoxin role in sepsis, 278, 280
 lymphocyte/monocyte ratio in polytrauma survival, 769
 plasma, and abdominal sepsis prognosis, 720
Chemiluminescence-inducing radicals, 339–344; see also Oxygen radicals
Chemotactic factors, alveolar macrophages, 20
Chemotaxis, 4-hydroxy-nonenal, 351
Chloramphenicol, 852
Cholecystectomy, 493
Cholecystokinin, 380
Cholinesterase, scintigraphic evaluation of posttraumatic liver function, 777
Chromatography
 HPLC, PAF effects in sheep, 448–451
 ion exchange, positive inotropic factor as myocardial stimulant, 254–255
 Chronotropic effect, negative, α-mercaptopropionylglycine in hemorrhagic shock, 902
 Chymase, mast cell, 937, 941, 942
 Cimetidine, 755
Circulating immune complexes, and abdominal sepsis prognosis, 716
Circulation, peripheral, septic shock, 163–171
blood flow redistribution, 164
blood volume redistribution, 164–165
cardiac output, 163–166
oxygen utilization, 163, 167–169
pathogenesis, 169–171
peripheral vascular failure, 165–167
permeability, microvascular, 167
systemic vascular resistance, 163–166, 168, 170
Clostridium, 1008, 1020
sordelli, 1018
Clotting factor infusion, MSOF prognostic indices, logistic regression analysis, 644
Coagulation cascade, 31, 318–319
fibrinolysis, and kallikrein system, MSOF, postoperative/posttrauma, biochemical analysis and scoring, 652–654
lung, 6
microvascular bed, cell interactions in septic shock, 115
methylprednisolone pretreatment effects in porcine E. coli endotoxemia, 873
pulmonary vascular permeability, 305–307
septic patients, 383–387
see also Disseminated intravascular coagulation; specific components
Collagen III propeptide, 665
ARDS, posttraumatic, prognostic, 674–679
Colloid osmotic pressure, plasma, extravascular lung water, large volume replacement with colloids, 810–812
Compensated shock, hemorrhagic shock, phase-related vascular reactivity, cats, 144–148
Complement, 31
ARDS, 43
cascade
lung, microvascular bed, cell interactions in septic shock, 115, 116
MSOF, postoperative/posttrauma, biochemical analysis and scoring, 650–651
and endotoxin role in sepsis, 277–281
Igs, therapeutic, phagocytosis
stimulation, peritonitis, 1039, 1041
and immune suppression, post-surgical or post-traumatic, 492
lung in shock, 4, 5, 7, 13
hypertension and vascular leakage, rabbit, 283–286
vascular permeability, 305, 306
MSOF pathogenesis, septic shock, dogs, 291–296
pathway, classical cf. alternative, MSOF pathogenesis in septic shock, dogs, 293
PMNs, 20
prognostic index in sepsis, 633, 634
septic shock, 169–170
see also specific components
Complement complexes, terminal acute pancreatitis, 266, 267
pulmonary hypertension and vascular leakage, 283–286
Contractile elements, capillary endothelial cells, 157–160
Contractility
and cardiac function, Pseudomonas aeruginosa toxins, 247, 248
heart performance during septic shock, awake sheep, 238
Coronary artery disease, 1079, 1080
Corticosteroid(s)
nebulized, in experimental respiratory distress, 867–871
aveolo-capillary interface, 867
antithrombin III, plasma, 869–871
beclometasone dipropionate (BDP), 867, 868, 870, 871
crystalloid infusion, 868
superoxide, PMN production, 869, 870
for septic shock with ARDS, 857, 860–864
dexamethasone, 861
methylprednisolone, 861–863
severity of underlying disease, 858
VA comparative study of severe sepsis, 840–844, 847–855, 862–863
encephalopathy, 841, 843, 853–855
entry criteria, 853
inflammation pathways, 850–851
mortality, 842
cf. previous trials, 852
rationale of therapy, 851, 852
sepsis criteria, 841
trial design, 852–853
see also specific drugs
Cortisol, sepsis, 753, 755
C reactive protein, 665
serum osmotic changes in MSOF and ARDS, 335, 336
immune suppression, post-surgical or post-traumatic, 492
lymphocyte/monocyte ratio in polytrauma survival, 769
plasma, and abdominal sepsis prognosis, 716, 717
Creatinine

dopamine and renal function, 1098
polytrauma, 743, 745
Crossed immunoelectrophoresis, C3 and IgG breakdown in peritonitis exudate, 529, 531
Crystalloids
corticosteroid, nebulized, in experimental respiratory distress, 868
cf. hydroxyethyl starch, volume replacement in ovine endotoxemia, 815–819
large volume replacement with, EVLW in septic shock, 809–813
c-sis, neutrophils, thrombin-induced adhesion with endothelial cells, 109
CTP:phosphocholine citidyl transferase, 576
Cutaneous thermal injury. See Burn(s)
CV-3988, 428, 430, 442, 485
CV-6209, 426
Cyclic nucleotides, lung, endotoxin-induced microvascular endothelial injury, 95, 97
Cycloheximide, 122
liver, perfused, sepsis effect on metabolism, 590, 591
Cyclooxygenase inhibition

cardiopulmonary response to endotoxin, eicosanoids in, 202, 203
lung injury in E. coli endotoxemia, 365–366
Cysts, honeycomb, 29, 32
Cytotoxic processes, effects, platelet activating factor antagonists, 443–444
Cytoxan, 377
Dazoxiben, 365
D-Dimer, fibrinolysis, 383–386
Decompensated shock, hemorrhagic shock, phase-related vascular reactivity, cats, 145–148
Decontamination, GI tract, multiple organ failure prevention, zymosan-induced peritonitis, 827–832
Delayed-type hypersensitivity
Ig prophylactic therapy after cardiac surgery, 1031–1033, 1035
T-cell-mediated immune suppression after polytrauma, 518, 519
2-Deoxyglucose tracer, metabolic abnormalities in sepsis, 549–551
Dexamethasone, 121, 122
corticosteroids for septic shock with ARDS, 861
Dextran sulfate, 653
Diabetic angiopathy, 1008, 1009
Diabetic microangiopathy, 1009
Diacylglycerol accumulation, hepatocytes, endotoxemia, rats, 575–586
in situ receptor autoradiography, 579, 583–584, 586
phorbol ester binding sites, 583–584
Dialysis, MSOF prognostic indices, logistic regression analysis, 644, 645
Dichloroacetic acid therapy, metabolic abnormalities in sepsis, 540, 541
Diiodotyrosine (DIT), sepsis, 752–754, 756
leucocyte phagocytic activity, marker for, 711–713
Diisouluorophosphate-α-thrombin, neutrophils, cf. thrombin-induced adhesion with endothelial cells, 103, 104
Diltiazem and endotoxin-induced intracellular Ca²⁺ overloads, 1053–1061
epinephrine, 1057–1059
hepatocytes, cytosolic Ca²⁺ in, 1055–1060
muscle, skeletal, 1054–1061
Dimethylthiourea, 887
Dipyrimadole (RA8), effects on
cerebrocortical perfusion, acute hemorrhagic shock, 1091–1094
Disseminated intravascular coagulation, 383, 386
endotoxin, dose-related effects on RES, 410
endotoxin-induced, antithrombin III-heparin complex, 977–981
fibrinolysis syndrome, 971, 972, 974
reticuloendothelial stimulation to protect against, 1001–1005
septic ARDS, 59
and multiple system organ failure, 62, 63
in septic shock, activated C3, 271–274
TNF, induction of organ changes in chronic lymph fistula, sheep, 479, 480
Dopamine
kidney function, 1097–1099
long-term administration and tolerance, 1097–1099
hemodynamics, 1098
cf. RA642, effects on cerebrocortical perfusion, acute hemorrhagic shock, 1091–1094
sepsis, 755
systolic time interval evaluation, 1101–1105
Doppler flowmetry, laser RA642 effects on cerebrocortical perfusion, acute hemorrhagic shock, 1091–1094
DPPC:egg PG, surfactant, exogenous, 798
DPPC in surfactant, C3a and alveoli in, post-trauma ARDS, 44, 45
DTPA and gamma-scintillation, alveolar permeability increased by PMA-stimulated neutrophils, rabbits, ARDS, 324–327
Edema, lung. See Pulmonary edema
Eglin C
endotoxin shock, ineffectiveness in, 953–957
pulmonary vascular permeability, 311
septic shock, 945–948
Eglin C/hirudin, recombinant, proteinase/protease inhibitor therapy, 937–942
Eicosanoids
cardiopulmonary response to endotoxin, sheep, 201–204
pulmonary vascular permeability, mediators, 305, 306, 308, 312
see also Arachidonate/arachidonic acid metabolism; specific eicosanoids
Elastase-α,-antiproteinase complex, 7, 8 with antithrombin (EAT), humans, 971–974
early indicator of pediatric systemic infection, 689–693
endotoxin and overwhelming inflammatory response of early sepsis, 372, 373
immunoassay, automated homogenous enzyme immunoassay, 707–710
cf. coated tube ELISA, 708–710
intensive care unit assay, validity, 701–705
correlation to MOF score, 704–705
correlation to physician’s classification, 703–704
ELISA, 701–702
IMAC assay, 702
kallikrein-kinin system components in ARDS after polytrauma, 737, 738, 741, 742
marker for perioperative infection risk monitoring, validity of ELISA, 695–700
total leukocyte counts, 699, 700
mediation of pulmonary vascular permeability, 308–310
MSOF, polytrauma, 414, 656–659
and neopterin, plasma levels in MSOF, 683–687
and prognostic index in sepsis, 634
TNF, induction of organ changes in chronic lymph fistula, sheep, 470, 477–478, 480
see also PMN elastase
Elebute and Stoner Sepsis Score, 626–630, 638, 664, 1026, 1027, 1029
Electrical stimulation, efferent, isolated intestinal vascular bed, hemorrhagic shock, phase-related vascular reactivity, cats, 145
ELISA, 695–700
coated-tube, 708–710
proteinase inhibitor, leukocyte neutral, 945–946
quantitation with monoclonal antibodies, C3a, 299–303
cf. C3, 300–303
Elongation factor-2, ADP ribosylation, *Pseudomonas* endotoxin A, 250
Emboli, fat, pulmonary, 10, 37–41
Hannover Polytrauma Score, 38
histologic appearance, 40
Injury Severity Score, 38
long-bone or pelvis fracture, 39–41
respiratory failure, 37, 41
Encephalopathy, corticosteroids (glucocorticoid), VA comparative study of severe sepsis, 841, 843, 853–855
Endobulin, 1048, 1050
Endocrine secretion patterns, sepsis, 751–756
ADH, 751, 753, 755, 756
prolactin, 751, 753–754, 756
thyroid hormones, 751–756
Endothelial cells, thrombin-induced adhesion with neutrophils, 101–109
Endothelial injury, endotoxin-induced, 91–97
grading, 84–85
Endothelial proliferation inhibiting capacity, endotoxin and overwhelming inflammatory response of early sepsis, 373, 374
Endothelial swelling, lung in shock, 8, 9, 11
Endothelium
arachidonate/arachidonic acid metabolism, 119–123
permeability in vitro, bacterial toxins and calcium effects, 127–131
*see also* Vascular intima in endotoxin shock
Endothelium-derived relaxing factors, 157
Endotoxia
HES volume replacement, 815–819
lung injury in, 357–368
failure, 12
phases I–III, 885–888
oxygen free radicals, 886–888
recombinant human SOD in, 913–917
and shock, impaired regulation, capillary endotheliala cells, 157–160
Endotoxin, 850
antithrombin III-heparin complex, DIC, 977–981
arachidonate/arachidonic acid metabolism, 119–123
complement activation, 277–281
MSOF pathogenesis in septic shock, dogs, 291
effect, healthy volunteers, heart dysfunction cf. septic shock, 196–197
free radical scavengers and cardiopulmonary response, 885–888
granulocyte effects, lung, microvascular bed, cell interactions in septic shock, 114–116, 118
granulocyte-endothelial cell adherence, 123–124
heart cells, cultured, effects of *Pseudomonas aeruginosa* toxins, rat, 247–251
inflammatory reaction, GI tract decontamination, MOF prevention, 832
inotropic effect in isolated rabbit heart, 225–230
oxygen delivery, 227
perfusion circuit, 226, 227
ventricular pressure cf. perfusion flows, 227, 228
metabolic abnormalities in sepsis, 550
microvascular endothelial injury, 91–97
MSOF, postoperative/posttrauma, biochemical analysis and scoring, 654–655
antibody levels, 645–655
no role in MSOF, 419–423
and overwhelming inflammatory response of early sepsis, 371–375
endothelial proliferation inhibiting capacity, 373, 374
oxygen supply-uptake relationship, septic shock, 181–183
plasma concentrations related to responses, pig, 389–393
plasma contact system factors, in vitro interactions, 401–405
arterial O$_2$ tension, 391–392
hemodynamics, 390–391
kallikrein-kinin system, 389, 390, 392, 393
prognostic value in sepsis, 634, 635, 637
lethality, 639, 640
thrombocyte counts, 637–641
proteases in MSOF due to septicemia, 315–321
renal microthrombosis, 916
reticuloendothelial system, dose-related effects, 407–411
structure and biological activity, 79–81 and TNF, 463, 464
see also Antibodies, anti-LPS and anti-lipid A, determination with immunoblotting; specific bacteria

Endotoxin shock
amino acid concentrations, serum, 595–599
animal model development for shock, 836
calcium antagonists in shock/ischemia, 1068–1071
egl C ineffectiveness, 953–957
fibrinolytic functional determinants, pig, 395–399
hemofiltration and survival time, 821–826
hirudin/eql C, recombinant, 937–942
PAF antagonists, 428–429, 931–935
proteinase/protease inhibitor therapy, 937–942
cf. traumatic shock, 941
vascular intima in, 77–87
WEB 2086 (PAF antagonist), cf. in anaphylactic lung reaction, 925, 927, 928

Enteric translocation of microorganisms, burns, 377–380
scalded rats, 379
sheep, 378
Enterobacteriaceae, 827–832
Eosinophil cationic protein, 22
Epidermal growth factor, 380
Epinephrine
diltiazem and endotoxin-induced intracellular Ca$^{2+}$ overload, 1057–1059
metabolic abnormalities in sepsis, 54, 548
Epithelial lining fluid, ARDS, C3a and alveoli in, post-trauma, 44
Escherichia coli, 420, 426, 429, 538, 539, 546, 547, 551, 557, 561, 723, 881, 940
animal models for shock, 836–837
antibodies, anti-LPS and anti-lipid A, determination with immunoblotting, 1043–1049
endotoxin, activated C3 in DIC in septic shock, fulminant meningococcal meningitis, 271, 273
hemolysin injury, septicemia in, lung, 67–70
transmembrane pores, 69
sepsis, kidney metabolism in, 601–605
see also Endotoxemia; Septicemia; Septic shock
Expired minute volume, respiratory quotient (CO$_2$/O$_2$ exchange ratio) in shock, 613, 614, 619–621

Extravascular lung water (EVLW)
altered fluid regimen, advanced septic shock with acute respiratory failure, 803–808
cardiac index, 804–806
microvascular integrity, 806
plasma colloidal osmotic pressure, 803–808
pulmonary artery pressure, mean, 804
pulmonary artery wedge pressure, 803–808
ARDS, posttraumatic, prognosis, 675 and chemiluminescence-inducing radicals, porcine septic shock, 340, 342
hemofiltration and survival time, porcine acute endotoxic shock, 822, 823, 825
large volume replacement with crystalloids, septic shock, 809–813
Index

MSOF, polytrauma, 414, 415
recombinant hirudin/eglin C, endotoxin shock, 938, 939, 941

Factor XII (Hageman factor), 384
and endotoxin
interactions with plasma contact system factors, 402, 404
overwhelming inflammatory response of early sepsis, 372
kallikrein-kinin system components in ARDS after polytrauma, 737, 738, 741
Factor XIIa, circulation, peripheral, septic shock, 171
Fat embolism after bone fracture, 10, 37–41
Fat metabolism
respiratory quotient (CO₂/O₂ exchange ratio) in shock, 619–621
in sepsis, 536–539, 545
Fentanyl, 755
Fibrin
endotoxic shock, fibrinolytic functional determinations, pig, 395, 399
lung organ failure, 10, 11
Fibrinogen
consumption, recombinant hirudin/eglin C, endotoxin shock, 937–942
endotoxin shock, fibrinolytic functional determinations, pig, 395–399
plasma
endotoxin-induced DIC, AT III-heparin complex therapy, 979, 980
recombinant human SOD in endotoxemia, 915, 917
RES stimulation to protect against DIC, 1002, 1005
scintigraphic evaluation of posttraumatic liver function, 776
Fibrinolysis
aprotinin membrane protective action, intraoperative histamine liberation, 961
cascade, 318
lung, microvascular bed, cell interactions in septic shock, 115
functional determinants, pig, endotoxic shock, 395–399
kallikrein-kinin system components in ARDS after polytrauma, 737
methylprednisolone pretreatment effects in porcine E. coli endotoxemia, 873, 877
pulmonary vascular permeability, 305–307
septic patients, 383–387
syndrome, DIC, 971, 972, 974
tests for, 383–386
Fibrinopeptide A, endotoxin and overwhelming inflammatory response of early sepsis, 372, 373
Fibrinopeptides, specific, and proteinase inhibitor complex, immunologic determination, humans, 971, 972, 974
Fibrin split products, 395, 654
Fibronectin, 886
capillary endothelial cells, 158
determination, pig, endotoxin and overwhelming inflammatory response of early sepsis, 372
plasma, and abdominal sepsis prognosis, 716, 720, 722, 723
Fluid substitution, hemorrhagic shock, phase-related vascular reactivity, cats, 147–148
Fluorescent products, lipid peroxidation, hypovolemic-traumatic shock, dogs, 345–349
Flurbiprofen, 365
FMLP, 508, 510
Free radical scavengers
C3 and IgG breakdown in peritonitis exudate, 527
cardiopulmonary response to endotoxin, sheep, 885–888
α-mercaptotropionyl glycine in hemorrhagic shock, 897–903
Fructose infusion, kidney function in sepsis, 603
Gabexate mesilate, 309
amino acid concentrations, serum, experimental endotoxin shock, 596, 597
D-Galactosamine, 1070, 1071
Gamma-scintillation with DTPA, alveolar permeability, 324–327
Gangrene, gas. See Immunoglobulin profiles and PMN-elastase in septic gas gangrene

Gas exchange
alveolar permeability increased by PMA-stimulated neutrophils, rabbits, ARDS, 326, 327
hemofiltration and survival time, porcine acute endotoxic shock, 823, 825
septicemia (E. coli), Goettingen pig, 185–188

Gas gangrene. See Immunoglobulin profiles and PMN-elastase in septic gas gangrene

Gastric mucosa ulceration
ultrastructure after septic shock, rat, 151–155
irreversible changes, 154–155
parietal cells, 152, 153
stress ulcer diseases, correlation with, 151
surface epithelial cells, 153, 154
WEB 2086 (PAF antagonist) and, 919

Gastrin, 380

Gastrointestinal tract
decontamination, 827–832
endotoxin-induced damage, and WEB 2086 (PAF antagonist), 919–922
PAF antagonist inhibition of induced shock, 430
Gel filtration, positive inotropic factor as myocardial stimulant, 254
Gentamicin and methylprednisolone, animal models for shock, 836–840
Glasgow Coma Scale, 644–646
Global Index, polytrauma, 744–746
Glucagon, glucose turnover in sepsis, 552–553, 556, 559
Glucocorticoids, glucose turnover in sepsis, 552–553, 559

Glucose
concentrations, kidney metabolism in E. coli sepsis, 602, 604
deficiency, calcium antagonists in shock/ischemia, 1066
metabolism
liver dysfunction in MSOF, altered cell-cell interactions, 563–565
polytrauma, 744
respiratory quotient (CO₂/O₂ exchange ratio) in shock, 619–621
oxidation, metabolic abnormalities in sepsis, 536–539, 545
turnover, metabolic abnormalities in sepsis, 547–552
mediators, 552–557
Glucose-insulin-potassium infusions, kidney metabolism in E. coli sepsis, 604

β-Glucuronidase, platelet, activated C3 in DIC in septic shock, fulminant meningococcal meningitis, 272, 273
Glutamate pyruvate transaminase activity, endotoxin, dose-related effects on RES, 408, 410, 411
Glutamine and glutamic acid concentrations, serum, experimental endotoxin shock, 598
alpha₁-acid Glycoprotein, prognostic index in sepsis, 634, 635, 716, 717
Goris multiple organ failure score, 626–628, 664, 1026, 1027, 1029
Granulocytes. See PMN entries
Growth hormone, 380
Gut decontamination, early ventilatory support, 786
H7, 122
HA 1004, 122
Hageman factor. See Factor XII (Hageman factor)
Haldane effect, 615
Hannover Polytrauma Score, 38
Haptoglobin, and abdominal sepsis prognosis, 716
Heart
inotropic plasma factor
positive, hypovolemic shock, 253–257
isolated, effect of LMW plasma fraction, hypovolemic traumatic shock, 231–234
LV systolic pressure, 233, 234
negative inotropism, shock plasma ultrafiltrates, 231–234
isolated, rabbit, endotoxin inotropic effects, 225–230
overperformance in septic shock, 259–263
in septic shock, awake sheep, 237–245
artifact rejection, 239–242
contractility, 238
hemodynamic parameters, respiratory influence, 243
pressure/volume loop, 238, 244
sonomicrometer LV dimension, 237–243
see also Cardiac entries; Myocardial entries
Heart cells, cultured, effects of 
Pseudomonas aeruginosa toxins, rat, 247–251
and cardiac function, 247–251
endotoxins, 247, 249
type A, 247–251
immunoglobulins, Pseudomonas, protection, 247–249, 251
Heart dysfunction, septic shock, human, 191–197
cf. dog, 196
end diastolic volume index, 193, 194, 197
cf. endotoxin effect on healthy volunteers, 196–197
hemodynamic profiles, 192–193
interleukin-2, 197
left ventricular ejection fraction, 193–196
mechanisms, 194–196
myocardial depressant substance/factor, 194–196
right ventricle, 194
stroke volume index, 193, 194, 196, 197
TNF, 197
Heart function changes, septic shock, chacma baboon (Papio ursinus),
207–215, 217–222
cardiac output, 207, 210–215, 219–222
heart rate, 208, 210–215
tachycardia and cardiac volume, 214–215, 217–222
left ventricular compliance, 221, 222
left ventricular ejection fraction, 207, 210, 211, 213–215
left ventricular end diastolic volume, 207, 209–214, 217, 219–222
left ventricular end systolic volume, 207, 209–214, 219–222
pulmonary capillary wedge pressure, 217, 219–222
stroke volume, 207, 210–214, 219, 221–222
systemic vascular resistance, 219, 220
ventriculography, radionuclide, 209–210, 218, 219
Heart rate
heart function changes, septic shock, chacma baboon (Papio ursinus), 208, 210–215, 217–222
α-mercaptopyrrolylglycine in hemorrhagic shock, 899, 900
RA 642 effects on, acute hemorrhagic shock, 1094
Hematocrit, recombinant human SOD in endotoxemia, 914–916
Hemodynamics

dopamine infusion, effect evaluation with systolic time intervals, 1104–1105
endotoxin, 390–391
liver dysfunction in MSOF, altered cell-cell interactions, 565
methylprednisolone pretreatment effects in porcine E. coli endotoxemia, 874, 876–877
PVR, 874, 876–877
PAF antagonists in endotoxin shock, 933, 935
PAF effects in sheep, 448–449
septic shock/septicemia, 192–193
immunoglobulin and plasmapheresis therapy, 1025–1030
pulmonary venous hemodynamics and gas exchange disturbances, Goettingen pig, 186
respiratory influence, awake sheep, 243
TNF, induction of organ changes in chronic lymph fistula, sheep, 472, 479
see also specific parameters
Hemofiltration and survival time, porcine acute endotoxic shock, 821–826
arachidonic acid metabolites, 823–825
cardiac output, 822, 825
extravascular lung water, 822, 823, 825
gas exchange, 823, 825
6-keto-PGF₁α, 823, 825
peripheral resistance, total, 822, 825
thromboxane, 823–825
Hemoglobin, respiratory quotient (CO₂/O₂ exchange ratio) in shock, 608
Hemolysin, *Escherichia coli*, 67–70
Hemorrhagic shock
calcium antagonists in shock/ischemia, 1067
cerebrocortical perfusion, RA642 effects, 1091–1094
α-mercaptopropionylglycine, 897–903
Hemorrhagic shock, phase-related vascular reactivity, cats, 143–149
autoregulation, 147, 148
compensated shock, 144–148
decompensated shock, 145–148
electrical stimulation, efferent, isolated intestinal vascular bed, 145
fluid substitution, 147–148
noradrenaline, 146
oxygen free radicals, 144, 148, 149
permeability, capillary and postcapillary, 143
PMNs, 148, 149
vascular tone, 143
Heparin, 940
Hepatocytes
cystolic Ca²⁺ in, diltiazem and endotoxin-induced intracellular Ca²⁺ overload, 1055–1060
endotoxin, dose-related effects on RES, 408, 411
liver dysfunction in MSOF, altered cell-cell interactions, 563, 567, 568
phorbol ester binding sites, 583–584
protein kinase C and diacylglycerol accumulation, entodoxemia, rats, 575–586
in situ receptor autoradiography, 579, 583–584, 586
phorbol ester binding sites, 583–584
see also Liver entries
Hepatotoxin D-galactosamine, 1070, 1071
Hernioraphy, 493
Herniotomy, 1018, 1020
HETE, cardiopulmonary response to endotoxin, eicosanoids in, sheep, 203
5-HETE, 351
15-HETE, 351
Hetrazepine, WEB 2086 (PAF antagonist), 925, 928
High-density lipoproteins, 81
Hip arthroplasty, total, high-dose corticosteroids to prevent C3a and C5a formation, 879–882
Hirudin, neutrophils, thrombin-induced adhesion with endothelial cells, 103
Hirudin/eglin C, recombinant, endotoxin shock, proteinase/protease inhibitor therapy, 937–942
*Hirudo medicinalis*, 937
HIS scoring system, 626–628, 645, 1026, 1027, 1029
Histamine, 941
intraoperative liberation, aprotinin membrane protective action, 959–963
WEB 2086 (PAF antagonist), anaphylactic lung reaction, 926, 927
Histologic appearance, pulmonary fat embolism, 40
Honeycomb cysts, 29, 32
5-HT (serotonin)
lung injury in *E. coli* endotoxemia, 362, 368
platelet, activated C3 in DIC in septic shock, fulminant meningococcal meningitis, 272, 273
Hyaline membrane disease, 29
elastase-α₁-PI as early indicator, 690, 691
Hydrocortisone, 121, 122
Hydrogen peroxide, 886, 888, 950
eglin C ineffectiveness in endotoxin shock, 954–956
lipid peroxidation, hypovolemic-traumatic shock, dogs, 346
Hydroxyethyl starch, volume replacement in ovine endotoxemia, 815–819
cardiac index, 818, 819
cf. crystalloids, 815–819
lung lymph, 817, 818
plasma colloid osmotic pressure, 816–819
pulmonary artery pressure, main, 816, 817
Hydroxyl radical, 887, 950
alveolar permeability increased by PMA-stimulated neutrophils, rabbits, ARDS, 328
eglin C ineffectiveness in endotoxin shock, 954–956
4-Hydroxynonenal (HNE), 662, 663
inflammation in surgical trauma, human, 351–355
lipid peroxidation, hypovolemic-traumatic shock, dogs, 345–348
PMNs in Sephadex inflammation model, rats, 351–355
chemotaxis, 351
superoxide anion production, 354, 355
Hydroxyurea, 887, 888
Hyperalaninemia and lethality, endotoxin shock, 595, 597–599
Hyperbaric oxygenation, 1008, 1010, 1013, 1020
Hypersensitivity, delayed-type. See Delayed type hypersensitivity
Hypertension, pulmonary
PAF effects in sheep, 450, 451
thromboxane-mediated, E. coli hemolysin injury to, septicemia, 67, 70
vascular leakage, and complement activation, 283–286
cf. pore-forming, Staphylococcus alpha-toxin, 286
Hyperthermia, metabolic abnormalities in sepsis, 547
Hyperventilation, respiratory quotient (CO₂/O₂ exchange ratio) in shock, 615, 619–621
Hypovolemic shock
ARDS, 32, 33
positive inotropic factor as myocardial stimulant, 253–257
Hypovolemic traumatic shock, 228, 229
lipid peroxidation, dogs, 345–350
plasma fraction, LMW, effect on isolated heart, 231–234
LV systolic pressure, 233, 234
negative inotropism, shock plasma ultrafiltrates, 231–234
Hypoxanthine levels, lipid peroxidation,
IgM-enriched Igs (Pentaglobin), 1031–1033, 1035, 1046, 1050
in immune suppression, post-surgical or post-traumatic, 492
lymphocyte/monocyte ratio in polytrauma survival, 769, 770
plasma, and abdominal sepsis prognosis, 716
Pseudomonas, protection of cultured heart cells from effects of Pseudomonas aeruginosa toxins, rat, 247–249, 251
synthesis and plasmapheresis therapy, hemodynamic effects during treatment for septic shock, 1025–1030
suppression after multiple trauma, 513–516
trauma-induced cascade of cell-mediated immune effects, 496, 497, 499, 501, 502
therapeutic
phagocytosis stimulation, peritonitis, 1037–1041
prophylactic, sepsis prevention after cardiac surgery, 1031–1035
Immunoglobulin profiles and PMN-elastase in septic gas gangrene, 1007–1022
aprotinin administration, 1008, 1012, 1014–1016
IgA, 1009, 1011
IgG, 1009, 1011, 1012–1021
IgG-deficiency substitution, 1007, 1012, 1018–1020
dosage, 1018
IgM, 1009, 1011
primary cf. secondary, 1008
Immunologic determination, humans, proteinase inhibitor complexes, 971–974
Immunomodulation
septic shock, 989–993
thymopentin (TP-5), post-burn and postoperative sepsis, 995–998
Indomethacin, 120, 122, 131, 203, 365, 502
immune/cytotoxic processes, role in, 442
Infarction, myocardial, 910, 972, 973
Infection
DIT marker in, 711–713
lymphocyte/monocyte ratio in polytrauma survival, 769, 770, 772
Inflammation
autodestructive, complement activation, MSOF pathogenesis in septic shock, dogs, 296
early, schema, 456, 457
pharmacologic intervention points, 457
overwhelming, endotoxin role, 371–375
pathways, corticosteroids, VA comparative study of severe sepsis, 850–851
vs. sepsis as trigger, MSOF, 413–416
in surgical trauma, 4-hydroxy-nonenal, 351–355
see also specific cell types and mediators
Inflammatory cell activation, multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring, 655–661
Inhaled antigen, WEB 2086 (PAF antagonist), anaphylactic lung reaction, 926, 928
Injury Severity Score, 731
dopamine infusion, effect evaluation with systolic time intervals, 1102
embolism, fat, pulmonary, 38
phospholipase A as prognostic index, 764
polytrauma, 744, 745
scintigraphic evaluation of posttraumatic liver function, 776
Insulin, 1060–1061, 1066
infusion, kidney function in sepsis, 604
metabolic abnormalities in sepsis, 538, 547
Intensive care unit assay, validity, elastase-α1-antiproteinase complex, 701–705
correlation to MOF score, 704–705
correlation to physician's classification, 703–704
ELISA, 701–702
IMAC assay, 702
γ-Interferon, 772
trauma-induced cascade of cell-mediated immune effects, 495, 497–504
Interleukin-1, 11, 13, 114, 368, 428, 432, 443, 467, 479, 486, 536, 850
Ig synthesis suppression after multiple trauma, 513
liver dysfunction in MSOF, altered cell-cell interactions, 564, 568, 569
pulmonary vascular permeability, 305
serum, and sepsis, prognosis/prognostic indices, 715–718
trauma-induced cascade of cell-mediated immune effects, 495, 497–503
Interleukin-2, 772, 990, 995, 996
heart dysfunction, septic shock, human, 197
Ig synthesis suppression after multiple trauma, 513, 515
immune/cytotoxic processes, role in, 442
trauma-induced cascade of cell-mediated immune effects, 496–503
Interleukin-2 receptors
immune suppression, post-surgical or post-traumatic, 492, 494
multiple trauma, early events, 508, 509
trauma-induced cascade of cell-mediated immune effects, 496, 501, 502
Interleukin-4 (BCGF), trauma-induced cascade of cell-mediated immune effects, 497
Intestinal transit velocity, WEB 2086 (PAF antagonist), 919–922
Intima. See Vascular intima in endotoxin shock
Intraglobin, 1047, 1050
Intra-tracheal pressure, lung injury in E. coli endotoxemia, 360, 361, 365
Inverse ratio ventilation
early ventilatory support, 788, 789
nifedipine for ARDS, 1087, 1090
IP3, hepatocytes, protein kinase C and diacylglycerol accumulation, endotoxemia, 575
Iron-dependent lipid peroxidation in cardiopulmonary arrest, 895
Ischemia, myocardial
acute, dynamics of prostacyclin and thromboxane, 907–911
arrhythmias, 907
Ischemia and circulatory system in MSOF, 1075–1083
ARDS, 1076, 1078, 1081, 1083
pulmonary hypertension, 1078
catecholamines, 1077
central mechanisms, 1075–1079
cardiac output, 1076–1077, 1080, 1082
myocardial depressant factor, 1076, 1077
myocardium, reperfused, 1077
oxygen delivery, 1075–1083
peripheral mechanisms, 1079–1082
capillary surface area reduction, 1082
oxygen extraction, 1079–1083
regional blood flow, 1080–1081, 1083
see also Calcium antagonists in shock/ischemia
Isoprinosine, 502
Kadsurenone, 428, 485
Kallikrein, 738, 741, 983
circulation, peripheral, septic shock, 171
endotoxin interactions with plasma contact system factors, 401–404
TNF, induction of organ changes in chronic lymph fistula, sheep, 469, 474, 479
Kallikrein-kinin system, 318
in ARDS after polytrauma, 737–742
endotoxin, 389, 390, 392, 393
pulmonary vascular permeability, 305–307
Ketanserin, 362
Kidney
complement activation, MSOF pathogenesis in septic shock, dogs, 294–296
and dopamine, 1097–1099
plasma flow, 1098
failure, postoperative, 133–136
metabolism in E. coli sepsis, 601–605
ATP MgCl2, 602, 605
glucose concentrations, 602, 604
glucose-insulin-potassium infusions, 604
lactate or fructose infusion, 603
TAN concentrations, 601, 602, 604
microthrombosis, endotoxin-induced, 916
PAF antagonist inhibition of induced shock, 429
RES stimulation to protect against DIC, 1002, 1003
Kininase II, 941
Kinins, 983, 986
Kininase II, 941
Kininogen, 983, 986
Kinins, 986–987
cascade, lung microvascular bed, cell interactions in septic shock, 115
see also Kallikrein-kinin system
Kupffer cells, 78, 81, 294, 779, 1002, 1004
endotoxin, dose-related effects on RES, 408
liver dysfunction in MSOF, altered cell-cell interactions, 563, 564, 566–571
zymosan-induced MSOF, endotoxin plays no key role, 422
L-652,731, 426, 428, 442, 485
L-653,150, 428
Lactate
or fructose infusion, kidney metabolism in E. coli sepsis, 603
hypovolemic-traumatic shock, dogs, 346–349
metabolism, liver, 744
polytrauma, 743, 745, 747
Lactate dehydrogenase, lung, endotoxin-induced microvascular endothelial injury, 93, 96
Lactoferrin, pulmonary vascular permeability, 307, 308
Laser Doppler flowmetry, RA642, effects on cerebrocortical perfusion, acute hemorrhagic shock, 1091–1094
Lavage therapy, C3 and IgG breakdown in peritonitis exudate, 530, 531
Leukocyte(s)
count
methylprednisolone pretreatment, endotoxemia, 875, 876
recombinant human SOD in endotoxemia, 914, 915, 917
total, 699, 700
-induced injury with zymosan, lung, 73–76
phagocytic activity in sepsis/infection, diiodotyrosine (DIT) as marker for, 711–713
and TNF, induction of organ changes in chronic lymph fistula, sheep, 469, 470, 475–477, 480
see also specific types
Leukocyte neutral proteinase inhibitor, 945–950
Leukopenia, WEB 2086 (PAF antagonist), anaphylactic lung reaction, 926
Leukostasis
alveolar permeability increased by PMA-stimulated neutrophils, rabbits, ARDS, 325, 326
lipid peroxidation in hypovolemic shock, 349–350
lung in shock, 4–5, 7–8
TNF, induction of organ changes in chronic lymph fistula, sheep, 473, 474, 480
Leukotrienes, 70, 351
cardiopulmonary response to endotoxin, eicosanoids in, sheep, 203, 204
complement activation, pulmonary hypertension and vascular leakage, 286
ey early ventilatory support, 785
LTB₄, sepsis, 535, 536
LTC₄, 432
lung injury in E. coli endotoxemia, 362
synthesis, RA642 effects on cerebrocortical perfusion, acute hemorrhagic shock, 1094
Lipid A. See Antibodies, anti-LPS and anti-lipid A, determination with immunoblotting
Lipid peroxidation, 662, 663
hypovolemic-traumatic shock, dogs, 345–350
inhibition in cardiopulmonary arrest, dogs, 891–895
see also Oxygen radicals
Lipocortin, 123
Lipoxygenase inhibition, AA-861, 131
Lipopolysaccharide, S. abortus equi, 119, 121; see also Antibodies, anti-LPS
and anti-lipid A, determination with immunoblotting
Lipoprotein, high-density, 81
Lipoprotein lipase suppression, TNF, 464
Liver
complement activation, MSOF pathogenesis in septic shock, dogs, 293–294, 296
enzymes, serum, scintigraphic evaluation of posttraumatic liver function, 776–779
failure, complement activation and endotoxin role, sepsis, 277
lactate metabolism, 744
leukostasis, TNF induction of organ changes in chronic lymph fistula, 473, 474, 480
perfused, sepsis effect on metabolism, 589–592
scintigraphic evaluation of posttraumatic function, 775–780
SGOT, TNF induction of changes in chronic lymph fistula, sheep, 469, 474, 475, 480
sinusoidal macrophages, endotoxin, dose-related effects on RES, 408
see also Hepatocytes; Kupffer cells
Liver dysfunction in MSOF, altered cell-cell interactions, 563–571
glucose metabolism, 563–565
hemodynamics, 565
hepatocytes, 563, 567, 568
interleukin-1, 564, 568, 569
Kupffer cells, 563, 564, 566–571
paracrine amplification, 563, 569
polyunsaturated fatty acids, 569–571
prostaglandins, 564, 568, 569
protein metabolism, 565, 567, 568
thromboxane, 569
TNF, 564, 568–570
Low-flow states, respiratory quotient (CO₂/O₂ exchange ratio) in shock, 615, 616
Luminol-dependent chemiluminescence, 339–344
cf. zymosan-activated, 341
Lung(s), 3–10
anaphylactic reaction, WEB 2086 (PAF antagonist), 925–929
endothelial swelling, 8, 9, 11
endotoxin-induced microvascular endothelial injury, 91–97
Escherichia coli hemolysin injury, septicemia in, 67–70
transmembrane pores, 69
injury, PMA, SOD after, 945–949
isolated, pulmonary vascular permeability, 309–311
leukocyte-induced injury with zymosan, 73–76
leukostasis, 4–5, 7–8
microvascular bed, cell interactions in septic shock, 113–118
organ failure, 10–14; see also ARDS
PAF antagonist inhibition of induced shock, 429
perfusion, decreased, 5–6
platelet activation, 6, 7
zymosan-induced MSOF, endotoxin plays no key role, 421–423
Lung edema. See Pulmonary edema in shock
Lung injury in E. coli endotoxemia, 357–368
cats, vagotomized, 361
intra-tracheal pressure, 360, 361, 365
mediators, 358, 362–366
pulmonary artery pressure, 360, 364, 365
pulmonary compliance, 358–361, 367
pulmonary resistance, 358, 359
transpulmonary pressure, 358–361
Lung lymph flow
cardiopulmonary response to endotoxin, eicosanoids in, sheep, 202–204
free radical scavengers and cardiopulmonary response to endotoxin, 885
hydroxyethyl starch, volume replacement in ovine endotoxemia, 817, 818
PAF antagonists in endotoxin shock, 933–935
PAF effects in endotoxin shock, 447, 450
permeability, pulmonary vascular, mediators, 308
TNF, induction of organ changes in chronic lymph fistula, sheep, 469, 473, 475, 479
Lung water, extravascular. See Extravascular lung water (EVLW)
Lupus erythematosus cells, 52, 53
Lymph fistula. See TNF, induction of organ changes in chronic lymph fistula, sheep
Lymphocyte(s) counts, immune suppression, post-surgical or post-traumatic, 492
/monocyte ratio in polytrauma survival, prognosis/prognostic indices, 769–772
see also B cell(s); T cell(s)
Lysolecithin acyl-transferase (LAT), 122, 123, 455
α2-Macroglobulin, plasma, and abdominal sepsis prognosis, 716, 717, 720
Macrophage(s) activation/induction elastase-α1-PI complex and neopterin, plasma levels, 687
and TNF productin in shock, PAF, 485–488
alveolar, chemotactic factors, 20
ARDS, posttraumatic, prognosis, 679 hepatic. See Kupffer cells
multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring, 657, 659, 660
origins of, lung, microvascular bed, cell interactions in septic shock, 113–114, 118
phospholipase A source, 757, 763, 767 pulmonary intravascular endotoxin-induced microvascular endothelial injury, 92
endotoxin shock, 78, 80, 81 vascular intima in endotoxin shock, 78, 80, 81
Macrophage-activating factor, trauma-induced cascade of cell-mediated immune effects, 497
Magnesium and calcium antagonists in shock/ischemia, 1072
Magnesium chloride, ATP-, kidney function in sepsis, 602, 605
Major basic protein, 432, 488
Malondialdehyde, 662, 663, 910
leukocyte-induced lung injury, 74, 75
lipid peroxidation, hypovolemic-traumatic shock, dogs, 346–348
Mannheim Peritonitis Index, 723
Mast cell chymase, 937, 941, 942
Meclophenamate, 203
Meconium aspiration, elastase-α1-PI as early indicator, 690, 691
Membrane protective action, intraoperative histamine liberation, aprotinin, 959–963
Meningitis elastase-α1-PI as early indicator, 690–692
fulminant meningococcal, activated C3 in DIC in septic shock, 271–274
Mepacrine, 120
Mepyramine, 362, 926
α-Mercaptopropionyl glycine, hemorrhagic shock, 897–903
Mesenteric blood flow, burns, enteric translocation of microorganisms, 377–380
Metabolic abnormalities in sepsis, 535–542, 545–559
ARDS, 535, 537, 538
branched-chain amino acids, 539, 540, 617
carbon dioxide, arterial, 537, 538
dichloracetic acid therapy, 540, 541
glucose turnover, 547–552 mediators, 552–557
hyperthermia, 547
insulin, 538, 547
LTB4, 535, 536
mitochondrial pyruvate dehydrogenase, 538–540, 549, 550
MOSF, 535–542
oxidation of glucose cf. fats, 536–539, 545
PGF2α/PGE2 ratio, 535, 536
proteolysis, excessive, 540–542
rat experimental model, 546–547 superoxides, 535, 536
TPN, 537, 538
Metabolic imbalance, multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring, 663–664
Metabolic rate, septic shock, heart overperformance in, 260–262

Methylmethacrylate cement, 879, 880
Methylprednisolone, pretreatment effects in porcine *E. coli* endotoxemia, 873–877
coaulation, 873
fibrinolysis, 873, 877
hemodynamics, 874, 876–877
PVR, 874, 876–877
proteolysis cascades, 873, 877
VA study, 873
Methylprednisolone for septic shock with ARDS, 861–863
with gentamicin, dogs, *E. coli* shock, animal model development for shock, 836–837
adrenal gland role, 838–839
cf. baboons, 836–840
rationale, 837–838
Methysergide, 362
Microangiopathy, diabetic, 1009
Microatelectasis, early ventilatory support, 787
α₂-Microglobulin
  immune suppression, post-surgical or post-traumatic, 492
  kallikrein-kinin system components in ARDS after polytrauma, 738, 739, 742
Microvascular integrity, extravascular lung water, altered fluid regimen, advanced septic shock with acute respiratory failure, 806
Microvascular permeability. See under Permeability
Milano Sepsis Score, 634–636
  complement activation, endotoxin role in sepsis, 278–280
Minimal pulmonary dysfunction, 52
Mitochondrial function
calcium antagonists in shock/ischemia, 1066
pyruvate dehydrogenase, metabolic abnormalities in sepsis, 538–540, 549, 550
Monocyte(s), 989, 991, 993
count, multiple trauma, early events, 508, 509
-dependent Ig synthesis suppression after multiple trauma, immune suppression/dysfunction, 513–516
lymphocyte ratio as prognostic factor, polytrauma, 769–772
synthesis, α₁-protease inhibitor, 948
see also Macrophage(s)
Monokine synthesis factor, 499
Monolayer-filter membrane system, endothelium permeability and, 128–131
MPP
  pulmonary vascular resistance, ARDS in septicemia, 175–178
  pulmonary venous hemodynamics and gas exchange disturbances, *E. coli* septicemia, Goettingen pig, 185, 186
MTDQ-DA antioxidant, myocardial ischemia, 907–911
Mucosal integrity, burns, enteric translocation of microorganisms, 377–380
Multiple system organ failure (MOF, MOSF, MSOF)
in acute pancreatitis, C3a and C5a, 265–268
terminal complement complexes, 266, 267
ARDS, septic, 57–60
  prognosis, 59
C3a, 880
ceruloplasmin changes, 331–337
  C-reactive protein, 335, 336
  number of organs involved, 333, 334, 336
complement activation in, septic shock, 291–296
elastase-α₁-PI complex and neopterin, plasma levels, 683–687
endotoxin and proteases, septicemia, 315–321
diagnostic criteria for MSOF, 316
PFI index, 317–321
epidemiology, 783–784
Goris score, 1026, 1027, 1029
ischemia and circulatory system in, 1075–1083
liver dysfunction, 563-571
lymphocyte/monocyte ratio in polytrauma survival, 769, 770
metabolic abnormalities in sepsis, 535-542
muscle pO2 role, critically ill patients, 138-140
phospholipase A as prognostic index, 766
prevention, zymosan-induced peritonitis, decontamination, GI tract, 827-832
prognostic indices, 643-647
sepsis vs. inflammation as trigger, polytrauma, 413-416
ventilatory support, early, 784-789
zymosan-induced, no endotoxin role, 419-423
Multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring, 649-665
coagulation cascade, fibrinolysis, and kallikrein system, 652-654
complement cascade, 650-651
endotoxin, 654-655
immune suppression/dysfunction, 661-662
inflammatory cell activation, 655-661
metabolic imbalance, 663-664
organ function parameters, 664-665
stages, 649
target structure degradation, 662-663
Multiple trauma. See Polytrauma; Trauma
Muscle
pO2 role, critically ill patients, MOF, 137-142
MOF scores, 138-140
survival, 139, 141
skeletal, diltiazem and endotoxin-induced intracellular Ca2+ overload, 1054-1061
smooth, spasm, calcium antagonists in shock/ischemia, 1066
Mycostatin, 378
Mycotoxin-induced shock, PAF antagonist inhibition of induced shock, 431
Myeloperoxidase, pulmonary vascular permeability, 307, 308
Myocardial contractility, depressed, dopamine infusion effect evaluation with systolic time intervals, 1101
Myocardial depressant factor, 253, 261, 262, 431, 1068
heart dysfunction, septic shock, human, 194-196
ischemia and circulatory system in MSOF, 1076, 1077
Myocardial infarction, 910, 972, 973
Myocardial ischemia acute, dynamics of prostacyclin and thromboxane, 907-911
arrhythmias, 907
Myocardium, reperfused, ischemia and circulatory system in MSOF, 1077
Negative chronotropic effect, α-mercaptopropionylglycine in hemorrhagic shock, 902
Neonatal respiratory distress syndrome, exogenous surfactant, 797
Neopterin, 477, 657, 659, 660
ARDS, posttraumatic, prognosis, 674-679
and elastase-α1-PI complex, plasma levels in MSOF, 683-687
immune suppression, post-surgical or post-traumatic, 492-494
polytrauma, 745, 747
Neuroleptics, 755
Neurologic function and lipid peroxidation inhibition in cardiopulmonary arrest, 891-895
Neutrophils. See PMN entries
Nicardipine, endotoxin shock, 1071
Nifedipine, 1060
ARDS, 1087-1090
endotoxin shock, 1070, 1071
Nimodipine, traumatic shock, 1067, 1068
Nine Rule, total burn surface estimation, 1102, 1103
Nitrogen mustard, 887
Nivadipine, endotoxin shock, 1070
NK cells, 989, 991
PAF antagonist effects, 443-444
Noradrenaline/norepinephrine hemorrhagic shock, phase-related vascular reactivity, cats, 146
metabolic abnormalities in sepsis, 547, 548

ONO, 6240, 428, 931

Opsonins, C3 and IgG breakdown in peritonitis exudate, 527–532

Organ failure, multiple. See Multiple system organ failure (MOF, MOSF, MSOF)

Organ failure, postoperative, tissue oxygen debt (VO₂ deficit) as determinant, 133–136

survivors cf. nonsurvivors, 136

Osmotic pressure. See Plasma colloid osmotic pressure

Oxidation of glucose cf. fats, metabolic abnormalities in sepsis, 536–539, 545

Oxygen

arterial tension, endotoxin effect, 391–392
delivery
endotoxin, inotropic effect in isolated rabbit heart, 227
ischemia and circulatory system in MSOF, 1075–1083

extraction
ischemia and circulatory system in MSOF, 1079–1083
peripheral, septic shock, heart overperformance in, 260–262

see also Respiratory quotient (CO₂/O₂ exchange ratio) in shock
hypoxia, early ventilatory support, 784–787
and leukocyte-induced lung injury, 74, 75
skeletal muscle pO₂ and multiple organ failure, 137–142

supply
peripheral, pulmonary vascular resistance, ARDS in septicemia, 175, 177, 179
-uptake relationship, septic shock, 181–183
tissue oxygen debt (VO₂) deficit and postoperative organ failure, 133–136

survivors cf. nonsurvivors, 136

utilization, circulation, peripheral, septic shock, 163, 167–169

Oxygen, hyperbaric, 1008, 1010, 1013, 1020

Oxygen radicals
ARDS, exogenous surfactant, 791, 793
ceruloplasmin changes in MSOF and ARDS, 331–332, 337
endotoxemia, 886–888
hemorrhagic shock, phase-related
vascular reactivity, cats, 144, 148, 149
leukocyte-induced lung injury, 73, 75, 76

lung
endotoxin-induced microvascular endothelial injury, 95
microvascular bed, cell interactions in septic shock, 114
multiple organ failure,
postoperative/posttrauma, biochemical analysis and scoring, 656, 661
permeability, pulmonary vascular,
mediators, 305–306, 311, 312
PMN activation, 850
scavenging. See Free radical scavengers
TNF, induction of organ changes in chronic lymph fistula, sheep, 470, 476, 477

see also Lipid peroxidation; specific types

Pancreatic cysts, C-reactive protein as prognostic index, 726

Pancreatitis
C3a and C5a in MSOF, 265–268
terminal complement complexes, 266, 267
C-reactive protein as prognostic index, 725–728
extravascular lung water, large volume replacement with crystalloids, 809

Papillary muscle, guinea pig, 231–233

Papio ursinus, septic shock, heart function changes, 207–215, 217–222

Paracrine amplification, liver dysfunction in MSOF, altered cell-cell interactions, 563, 569

Parietal cells, gastric mucosa ulceration,
ultrastructure after septic shock, rat, 152, 153
Passive sensitization, WEB 2086 (PAF antagonist), anaphylactic lung reaction, 926, 928
Pediatric systemic infection, elastase-α₁-PI as early indicator, 689–693
PEEP
nifedipine for ARDS, 1087, 1090
ventilatory support, early, 788–789
Pelvis fracture and pulmonary fat embolism, 39–41
Pentaglobin, 1031–1033, 1035, 1046, 1050
Perfusion, decreased, lung in shock, 5–6
Perfusion circuit, endotoxin, inotropic effect in isolated rabbit heart, 226, 227
Peripheral circulation. See Circulation, peripheral, septic shock
Peripheral resistance, total
hemofiltration and survival time, porcine acute endotoxic shock, 822, 825
septic shock, heart overperformance in, 260, 262
Peritoneal exudate cells, therapeutic Iggs, phagocytosis stimulation in peritonitis, 1038
Peritonitis
C-reactive protein as prognostic index, 725–728
endotoxin and overwhelming inflammatory response of early sepsis, 372–374
exudate, C3 and, immunoglobulin G breakdown, 527–532
therapeutic Ig stimulation of phagocytosis, exudate cells, 1038
zymosan-induced, decontamination, GI tract, 827–832
Peritonitis Index, 643
Permeability
alveolar
cf. capillary permeability, 323, 328–329
gamma-scintillation with DTPA, detection, 324–327
PMA-stimulated neutrophils, rabbit ARDS, 323–329
capillary endothelial cells, 157, 159
and postcapillary, hemorrhagic shock, phase-related vascular reactivity, cats, 143
complement and pulmonary hypertension, 283–286
endothelial, bacterial toxins and calcium effects, 127–131
microvascular, 92–93, 96
circulation, peripheral, septic shock, 167
free radical scavengers and cardiopulmonary response to endotoxin, 885, 886, 888
TNF, induction of organ changes in chronic lymph fistula, sheep, 472, 473, 479–481
Permeability, pulmonary vascular, mediators, 305–312
E. coli hemolysin injury, septicemia, 67, 69–70
eicosanoids/arachidonic acid cascade, 305, 306, 308, 312
lung lymph flow, 308 thromboxane, 310
granulocytes (PMNs) and macrophages as source, 307–311
isolated rabbit lung, 309–311
oxygen radicals, 305–306, 311, 312
PAF effects, sheep, 447, 451
PMN-elastase-α₁-protease inhibitor, 308–310
proteases, 306, 309, 312
inhibitor Eglin C, 311
PFI index, 317–321, 653, 731–735
pH
isolated heart, effect of LMW plasma fraction in hypovolemia traumatic shock, 234
respiratory quotient (CO₂/O₂ exchange ratio) in shock, 608, 609, 615–617
Phagocytosis index, RES stimulation to protect against DIC, 1004
Phagocytosis assay, 508, 510
Phagocytosis stimulation, peritonitis, therapeutic immunoglobulins, 1037–1041
IgG, 1041
IgM, 1039, 1041
Phentolamine, 553, 555, 557, 558
Phenylephrine, protein kinase C and diacylglycerol accumulation in hepatocytes, endotoxemia, 579–581

Phorbol esters, protein kinase C and diacylglycerol accumulation in hepatocytes, endotoxemia, 576, 578, 579, 582, 586

Phorbol myristate acetate, 123

lung injury, superoxide dismutase, 945–949

-stimulated neutrophils, rabbit ARDS, permeability, alveolar, 323–329

Phosphatidate phosphohydrolyase, 576

Phosphatidylcholine and phosphatidyl glycerol, exogenous Surfactant, 792

Phospholipase A

lethality correlation, 759–761, 764, 765

severely ill patients, prognosis/prognostic indices, 757–761, 763–768

sources, 757, 763, 767

Phospholipase A₂, 123, 432

C, protein kinase C and diacylglycerol accumulation in hepatocytes, endotoxemia, 575, 576
calcium antagonists in shock/ischemia, 1066, 1071

PMN activation, 850, 851, 855

Phospholipid reacylation, burns, PAF inhibitor effect, scalded pig, 455, 459, 461

Pia arterioles, RA642, effects on cerebrocortical perfusion, acute hemorrhagic shock, 1093

PIP₂, hepatocytes, protein kinase C and diacylglycerol accumulation, endotoxemia, 575

Plasma colloid osmotic pressure and extravascular lung water altered fluid regimen, advanced septic shock with acute respiratory failure, 803–808

large volume replacement with crystalloids, 810–812

hydroxyethyl starch, volume replacement in ovine endotoxemia, 816–819

Plasma contact system factors, in vitro interactions, endotoxin, 401–405

Plasma flow, renal, dopamine and renal function, 1098

Plasma fraction, LMW, effect on isolated heart, hypovolemic traumatic shock, dog, 231–234

LV systolic pressure, 233, 234

negative inotropism, shock plasma ultrafiltrates, 231–234

Plasmapheresis, 1025–1030

Plasma proteins, abdominal sepsis, prognosis/prognostic indices, 719–724

Plasma substitution in septic shock, humans, antithrombin III, 965–968

Plasma suppressive activity, thymopentin (TP-5) in post-burn and postoperative sepsis and immunodeficiency syndrome, 996–998

Plasmin, methylprednisolone pretreatment, endotoxemia, 874, 875

Plasmin-α₂-antiplasmin complex, immunologic determination, humans, 971

Plasminogen consumption, aprotinin membrane protective action, intraoperative histamine liberation, 961, 962
kallikrein-kinin system components in ARDS after polytrauma, 738, 740

Plasminogen activator, 654 inhibitor, and fibrinolysis, 383–386, 395–399

urokinase-type, neutrophils, thrombin-induced adhesion with endothelial cells, 109

Plasminogen activator, tissue (tPA), 576, 578, 579, 582, 586, 938

binding sites, hepatocytes, 583–584
diabetic shock, fibrinolytic function determinations, pig, 395–399

fibrinolysis, 383–386

neutrophils, thrombin-induced adhesion with endothelial cells, 109

Platelet(s)

activation, lung in shock, 6, 7

aggregation, calcium antagonists in shock/ischemia, 1066

aprotinin membrane protective action, intraoperative histamine liberation, 960, 961
count methylprednisolone pretreatment, endotoxemia, 875, 876
RES stimulation to protect against DIC, 1002, 1005
endotoxin-induced DIC, AT III-heparin complex therapy, 980
β-glucuronidase, activated C3 in DIC in septic shock, fulminant meningococcal meningitis, 272, 273
5-HT, activated C3 in DIC in septic shock, fulminant meningococcal meningitis, 272, 273
recombinant human SOD in endotoxemia, 914–915, 917
Platelet activating factor (PAF), 13, 14, 481, 660
antagonists, inhibition of induced shock, 427–433
C5a and, 366
calcium, 366
chronically instrumented sheep, effect on, 447–451
generation during shock, 426–427
glucose turnover in sepsis, 556–558
immune/cytotoxic processes, role in, 441–443
infusion in animals, cf. shock, 425–426
lung injury in E. coli endotoxemia, 358, 366–368
macrophage/monocyte induction and TNF production in shock, 485–488
PAF antagonist effects, 485, 486
neutrophil aggregation, 108, 109, 367
Platelet activating factor antagonists
burns, 455–461
cytotoxic processes, effects, 443–444
endotoxic shock, 931–935
inhibition of induced shock, inhibition of PAF-generated feedback cycles, 432–433
neutrophils, thrombin-induced adhesion with endothelial cells, 108
ONO-6240, 428, 931
see also BN 52021; WEB 2086 (PAF antagonist); specific antagonists
Platelet-derived growth factor, neutrophils,

thrombin-induced adhesion with endothelial cells, 109
PMN(s) (neutrophils, granulocytes), 20–22, 972
activation, 21, 850
and leukostasis, lipid peroxidation, hypovolemic-traumatic shock, dogs, 349–350
see also specific activation products
aggregation, PAF, 367
ARDS, 18–20, 31–33
posttraumatic, prognosis, 673, 674, 678, 679
ceruloplasmin changes in MSOF and ARDS, 331
complement, 20
MSOF pathogenesis in septic shock, dogs, 293, 296
pulmonary hypertension and vascular leakage, 283, 284
ey early ventilatory support, 784
ceruloplasmin changes in MSOF and ARDS, 331
complement, 20
MSOF pathogenesis in septic shock, dogs, 293, 296
pulmonary hypertension and vascular leakage, 283, 284
ey early ventilatory support, 784
-endothelial cell adherence, 157, 159
bacterial endotoxin role, 123–124
proadherent factor, 106–107, 109
thrombin-induced, 101–109
generation, chemiluminescence-inducing radicals, porcine septic shock, 339, 341
hemorrhagic shock, phase-related vascular reactivity, cats, 148, 149
4-hydroxy-nonenal, 351–355
Igs, therapeutic, phagocytosis stimulation in peritonitis, 1039–1041
lung injury, 11–12, 74, 75
MSOF polytrauma, 414
postoperative/posttrauma, biochemical analysis and scoring, 653, 655, 657–660
multiple trauma, early events, 507, 508, 510, 511
phospholipase A source, 757, 763, 767
and pulmonary vascular permeability, 307–311
superoxide radical production by, recombinant human SOD in endotoxemia, 913, 917
zymosan-induced MSOF, endotoxin plays no key role, 422
see also Elastase-\(\alpha_1\)-antiproteinase complex; Oxygen radicals; PMN elastase
PMN elastase, 331, 731–735, 937, 941, 942
ARDS, post-traumatic, prognosis, 674–679
eglin C ineffectiveness in endotoxin shock, 953–957
porcine shock, proteinase inhibitor, leukocyte neutral, 945–950
eglin C in septic shock, 945–948
PMA lung injury, SOD after, 945–949
prognostic index in sepsis, 634, 635
see also Elastase-\(\alpha_1\)-antiproteinase complex; Immunoglobulin profiles and PMN-elastase in septic gas gangrene
PMN elastase-\(\alpha_1\)-antitrypsin complex, antithrombin III and plasma substitution in septic shock, 966–968
Pneumocytes, type II, 52, 53
Pneumonia
Ig prophylactic therapy after cardiac surgery, 1034
pediatric, elastase-\(\alpha_1\)-PI as early indicator, 690–692
phospholipase A as prognostic index, 765–768
Polyphloretin, 363
Polytrauma
ARDS, kallikrein-kinin system, 737–742
biochemical and hormonal parameters, 743–745, 746–749
monocyte/lymphocyte ratio as prognostic factor, 769–772
PFI index, 731–735
phospholipase A as prognostic index, 763–768
Polytrauma Score, T-cell-mediated immune suppression after polytrauma, 517
Polyunsaturated fatty acids, liver dysfunction in MSOF, altered cell-cell interactions, 569–571
Positive inotropic factor as myocardial stimulant, ion exchange chromatography, 254–255
Potassium
and cardiac function, Pseudomonas aeruginosa toxins, 247–249
infusion, kidney, function in sepsis, 604
PR 1501, 443
PR 1502, 443
Prealbumin, plasma, and abdominal sepsis prognosis, 720, 722
Predictors. See Prognosis/prognostic indices
Prednisone, 377
Prekallikrein, 986
in ARDS after polytrauma, 737, 738
and endotoxin interactions with plasma contact system factors, 402–404
and overwhelming inflammatory response of early sepsis, 372
TNF, induction of organ changes in chronic lymph fistula, sheep, 469, 474, 475, 479
Pressure/volume loop, heart performance during septic shock, awake sheep, 238, 244
Proadherent factor, neutrophils, thrombin-induced adhesion with endothelial cells, 106–107, 109
Proenzyme Functional Inhibition (PFI) Index, 317–321, 653, 731–735
Progesterone, 122
Prognosis/prognostic indices
ARDS, posttraumatic, plasma levels of mediators, 673–679
macrophages, 679
cf. non-ARDS, 676, 677, 679
C-reactive protein in pancreatitis and peritonitis, 725–728
elastase-\(\alpha_1\)-PI, early indicator of pediatric systemic infection, 689–693
interleukin-1, serum, and sepsis, 715–718
lymphocyte/monocyte ratio in polytrauma survival, 769–772
MSOF, logistic regression analysis, 643–647
PFI index, polytrauma, 731–735
cf. elastase, 731–735
phospholipase A in severely ill patients, 757–761, 763–768
plasma proteins, abdominal sepsis, 719-724
scintigraphic evaluation of posttraumatic liver function, 775-780
sepsis, 633-636
  TNF, serum, 715-718
Prolactin, sepsis, 751, 753, 754, 756
Promethazine, 1070
Properdin factor B, plasma, and abdominal sepsis prognosis, 720
Propranolol, 553, 555, 557, 558
Prostacyclin (PGI₂), 119-123
cardiopulmonary response to endotoxin, eicosanoids in, sheep, 202, 203
circulation, peripheral, septic shock, 168
complement activation, pulmonary hypertension and vascular leakage, 285-286
liver dysfunction in MSOF, altered cell-cell interactions, 589
lung injury, endotoxin-induced, 366
microvascular endothelium, 92-94, 96, 97
myocardial ischemia, 907-911
neutrophils, thrombin-induced adhesion with endothelial cells, 109
Prostaglandin(s), 380, 660-661
burns, PAF inhibitor effect, scalded pig, 455, 459, 460
D₂, lung injury in E. coli endotoxemia, 362, 365, 366
E₂, 429, 661, 662
Ig synthesis suppression after multiple trauma, 513, 515
liver dysfunction in MSOF, altered cell-cell interactions, 564, 568, 569
lung, endotoxin-induced injury, 92-94, 96, 97, 359, 363
trauma-mediated cascade of cell-mediated immune effects, 497-504
F₂₀
  lung injury in E. coli endotoxemia, 359, 362-366
/PGE₂ ratio, metabolic abnormalities in sepsis, 535, 536
  glucose turnover in sepsis, 552
H₂, 122
6-keto-PGF₁α, hemofiltration and survival time, porcine acute endotoxin shock, 823, 825
Prostaglandin endoperoxide synthetase, 910
Prostaglandin synthetase, 1071
Protease(s)
in MSOF due to septicemia, endotoxin, 315-321
permeability, pulmonary vascular, mediators, 306, 309, 312
inhibitor Eglin C, 311
see also specific proteases
α₁-Protease inhibitor, 331, 725-726
ARDS, posttraumatic, prognosis, 674, 676
kallikrein-kinin system components in ARDS after polytrauma, 738, 740
monocyte synthesis, 948
and PAF antagonist in induced shock, 431-432
Proteinase inhibitor complexes immunologic determination, humans, 971-974
leukocyte neutral, ELISA, 945-946
PMN elastase complex, porcine shock, 945-950
PMN-derived, eglin C ineffectiveness in endotoxin shock, 954-956
see also Elastase-α₁-antiproteinase complex; specific proteinase inhibitors
Proteinase/protease inhibitor therapy, hirudin/eglin C, recombinant, endotoxin shock, 937-942
Protein C, 654
Protein kinase C, 122, 123
and diacylglycerol accumulation, endotoxemia, rat hepatocytes, 575-586
in situ receptor autoradiography, 579, 583-584, 586
phorbol ester binding sites, 583-584
Protein metabolism, liver dysfunction in MSOF, altered cell-cell interactions, 565, 567, 568
perfused, sepsis effect on metabolism, 589-592
Proteolysis
cascades, methylprednisolone, pretreatment effects in porcine E. coli endotoxemia, 873, 877
excessive, metabolic abnormalities in sepsis, 540–542
Prothrombin, 319
methylprednisolone pretreatment, endotoxemia, 874, 875
Providencia pettgeri, 420
Pseudomonas, 831
  aeruginosa
cytotoxin, 68, 119, 120, 128, 129
cytotoxin, effect on cultured heart cells, rat, 247–251
protection by Pseudomonas Igs, 247–249, 251
septic shock, chemiluminescence-inducing radicals, pig, 339–334
immunoglobulin and plasmapheresis therapy, hemodynamic effects during treatment for septic shock, 1025–1029
oxygen supply-uptake relationship, septic shock, 182
Pulmonary. See also Cardiopulmonary entries; Lung entries
Pulmonary artery, sheep, neutrophils, thrombin-induced adhesion with endothelial cells, 102
Pulmonary artery pressure
cf. blood flow, pulmonary vascular resistance, ARDS in septicemia, 175–179
cardiopulmonary response to endotoxin, eicosanoids in, sheep, 202
extravascular lung water, altered fluid regimen, advanced septic shock with acute respiratory failure, 804
hydroxyethyl starch, volume replacement in ovine endotoxemia, 816, 817
lung injury in E. coli endotoxemia, 360, 364, 365, 368
TNF, induction of organ changes in chronic lymph fistula, sheep, 471
Pulmonary artery wedge pressure and extravascular lung water
altered fluid regimen, advanced septic shock with acute respiratory failure, 803–808
large volume replacement with crystalloids, 809–812
Pulmonary capillary pressure, pulmonary venous hemodynamics and gas exchange disturbances, E. coli septicemia, Goettingen pig, 185, 186
Pulmonary capillary wedge pressure, heart function changes, septic shock, chacma baboon (Papio ursinus), 217, 219–222
Pulmonary circulation, ARDS C3a and alveoli in, post-trauma, 45
Pulmonary contusion, ARDS, C3a and alveoli in, post-trauma, 46, 47
Pulmonary dysfunction, minimal, 52
Pulmonary edema in shock, 9, 28–29, 31
arachidonic acid cascade in ARDS, 306–307, 309–311
capillary pressure, 28
see also Extravascular lung water; Permeability
Pulmonary failure prediction, elastase-α1-PI complex and neopterin, plasma levels, 683, 684, 687
Pulmonary function, muscle pO2 role, critically ill patients, 139
Pulmonary hypertension. See Hypertension, pulmonary
Pulmonary resistance, lung injury in E. coli endotoxemia, 358, 359
Pulmonary vascular pressure, nifedipine for ARDS, 1089
Pulmonary vascular resistance
ARDS in septicemia, 175–179
CI, 175–179
MPP, 175–178
oxygen supply, peripheral, 175, 177, 179
pulmonary artery pressure cf. blood flow, 175–179
endotoxin response, 390
α-mercaptopyrrolylglycine in hemorrhagic shock, 901, 902
recombinant hirudin/eglin C, endotoxin shock, 939, 941
Pulmonary venous hemodynamics and gas exchange disturbances, E. coli septicemia, Goettingen pig, 185–188
atrial pressure, left, 185, 186
CI, 185, 186
hemodynamic parameters, 186
MPP, 185, 186
pulmonary capillary pressure, 185, 186

Quin 2, 1055–1056

RA642, acute hemorrhagic shock, rats, cerebrocortical perfusion, 1091–1904

Radicals, chemiluminescence-inducing, septic shock, pigs, 339–344; see also Oxygen radicals

Reanimation, MSOF prognostic indices, logistic regression analysis, 644, 646

Receptor autoradiography, in situ, hepatocyte protein kinase C and diacylglycerol accumulation, endotoxiaemia, 579, 583–584, 586

Red blood cell acetylcholinesterase, activated C3 in DIC in septic shock, fulminant meningococcal meningitis, 272, 274

Regional blood flow, ischemia and circulatory system in MSOF, 1080–1081, 1083

Relaxing factors, endothelium-derived, 157

Respiratory distress, nebulized corticosteroid, 867–871

Respiratory distress syndrome, neonatal, exogenous surfactant, 797; see also ARDS

Respiratory failure
early ventilatory support, 784–789
embolism, fat, pulmonary, 37, 41
extravascular lung water, altered fluid regimen, 803–808

Respiratory quotient (CO₂/O₂ exchange ratio) in shock, 607–610, 613–617, 619–621

amino acid metabolism, 619–621
base excess, 613, 614, 619
expired minute volume, 613, 614, 619–621
fat metabolism, 619–621
glucose metabolism, 619–621
hemoglobin, 608
hyperventilation, 615, 619–621
low-flow states, 615, 616
pH, 608, 609, 615–617
RRE, 613–617
TBRE, 613–617

Reticuloendothelial system
endotoxin, dose-related effects, 407–411
liver clearance, scintigraphic evaluation of posttraumatic function, 775–780
stimulation to protect against DIC, 1001–1005

Rhematoid arthritis, 332
C3a, 299

Right ventricle, heart dysfunction, septic shock, human 194

RO-193,430, 704

Ronipamil, traumatic shock, 1067, 1068

Salmonella
abortus equi, 408
antibodies, anti-LPS and anti-lipid A, determination with immunoblotting, 1044, 1046
LPS, 119, 121
enteritidis, 426–428, 430, 1054
minnesota, antibodies, anti-LPS and anti-lipid A, determination with immunoblotting, 1044–1049
typhimurium, 428

Sanarelli-Schwartzman reaction, 1003, 1005
SAPS scoring system, 626–628, 1026, 1027, 1029
dopamine infusion, effect evaluation with systolic time intervals, 1102
Scintigraphic evaluation of posttraumatic liver function, prognosis/prognostic indices, 775–780

Scoring systems
cardiogenic/septic shock, 625–630
CI and SVR, 625, 626
elastase α,-PI complex and neopterin, plasma levels in MSOF, 683–687
prognostic value of antithrombin III and endotoxin in sepsis, 637
lethality, 639, 640
thrombocyte counts, 637–641
see also Multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring; Prognosis/prognostic indices; specific systems

S-creatinine, MSOF prognostic indices, logistic regression analysis, 644, 645
SDZ 63-441, 429
Secretin, 380
Sensitization, passive, WEB 2086 (PAF antagonist), anaphylactic lung reaction, 926, 928
Sensorium, altered, corticosteroids in severe sepsis, 841, 843, 853–855
Sephadex inflammation model, rats, 4-hydroxy-nonenal, 351–355
Sepsis
DIT marker in, 711–713
early, overwhelming inflammatory response, endotoxin role, 371–375
elastase-\(\alpha\_\text{I}-\text{PI}\) as early indicator, 690–692
endocrine secretion patterns, 751–756
ADH, 751, 753, 755, 756
prolactin, 751, 753–754, 756
thyroid hormones, 751–756
endotoxin in complement activation, 277–281
kidney metabolism in, 601–605
metabolic abnormalities, See Metabolic abnormalities in sepsis
multiple organ system failure, 413–416
ARDS, 61–65
prognostic indexes, 633–636
IL-1, 715–718
plasma proteins, 719–724
proteinase inhibitor complex, immunologic determination, humans, 972–974
scintigraphic evaluation of posttraumatic function, liver, 775–780
severe, corticosteroids in, 840–844, 847–855
see also Immunoglobulin profiles and PMN-elastase in septic gas gangrene
Septicemia
antibodies, anti-LPS and anti-lipid A, determination with immunoblotting, 1048–1050
ARDS, pulmonary vascular resistance, 175–179
coagulation cascade, 383–387
E. coli hemolysin injury to lung, 67–70 transmembrane pores, 69
fibrinolysis, 383–387
gas exchange, disturbed, 185–188
MSOF and, endotoxin and proteases in, 315–321
T cell changes, 989, 990
Septic shock
antithrombin III and plasma substitution, 965–968
ARDS, 30–33
corticosteroids in, 857, 860–864
PMN migration, 30–31
cardiac work, 260–262
chemiluminescence-inducing radicals, pig, 339–344
complement activation in MSOF, 291–296
DIC in, and C3, 271–274
dopamine infusion, effect evaluation with systolic time intervals, 1101–1105
eglin C, 945–948
extravascular lung water altered fluid regimen, 803–808
large volume replacement with crystalloids, 809–813
immunoglobulin therapy after cardiac surgery, 1034
and plasmapheresis, 1025–1030
immunomodulation, 989–993
lung microvascular bed, cell interactions, 113–118
metabolic rate, 260–262
oxygen extraction, peripheral, 260–262
oxygen supply-uptake relationship, 181–183
peripheral circulation, 163–171
peripheral resistance, total, 260, 262
scoring systems, 625–630
CI and SVR, 625, 626
TNF, 463–465
Septic syndrome, definition, 857–860
Serotonin. See 5-HT (serotonin)
Serratia marcescens, anti-LPS and anti-lipid A antibodies, determination with immunoblotting, 1044–1048
SGOT, liver, TNF induction of organ changes in chronic lymph fistula, 469, 474, 475, 479
SH-groups, α-mercaptopropionylglycine in hemorrhagic shock, 897, 902, 903
Silver sulfadiazine, 378
Simplified Acute Physiologic Score, 280, 635
c-sis, neutrophils, thrombin-induced adhesion with endothelial cells, 109
Small intestine, complement activation, MSOF pathogenesis in septic shock, dogs, 293–294, 296
Sodium excretion, dopamine and renal function, 1097–1099
Sodium polyanethol sulfonate-induced shock, 1001–1005
Somatomedin C, polytrauma, 743, 745, 747
Somatostatin, glucose turnover in sepsis, 553, 556
Sonomicrometer LV dimension, heart performance during septic shock, awake sheep, 237–243
Spleen, zymosan-induced MSOF, endotoxin plays no key role, 421
SRI 63-072, 428, 485
SRI 63-441, 368, 428, 485
SRI 63-675, 557
SSS scoring system, 626–628, 664, 1026, 1027, 1029

dopamine infusion, effect evaluation with systolic time intervals, 1102
polytrauma, 744–746
Staphylococcus aureus, 420, 868
alpha toxin, 68, 69, 119, 120, 123, 124, 127–130, 286
Streptococcus, 831
Streptomycin, Gl tract decontamination, MOF prevention, 828–832
Stress ulcer diseases, correlation with, gastric mucosa ulceration, ultrastructure after septic shock, rat, 151
Stroke volume
heart function changes, septic shock, chacma baboon (Papio ursinus), 207, 210–214, 219, 221–222
α-mercaptopropionylglycine in hemorrhagic shock, 900, 902
RA642, effects on cerebrocortical perfusion, acute hemorrhagic shock, 1094
septic shock, human, 193, 196, 197
Superoxide anion, 886
generation, PAF and, 488
4-hydroxy-nonenal, 354, 355
lipid peroxidation, hypovolemic-traumatic shock, dogs, 346
metabolic abnormalities in sepsis, 535, 536
PMN production
corticosteroid, nebulized, in experimental respiratory distress, 869, 870
recombinant human SOD in endotoxemia, 913, 917
Superoxide dismutase, 887
PMA lung injury, 945–949
recombinant human, in E. coli endotoxemia, rat, 913–917
Surface epithelial cells, gastric mucosa ulceration, ultrastructure after septic shock, rat, 153, 154
Surfactant, ARDS C3a and alveoli in, post-trauma, 44, 45
Surfactant, exogenous
acute high-permeability lung edema, 791–795
ARDS, 29
cf. neonatal RDS, 797
aspiration trauma, experimental, rabbit, 797–800
phosphatidylcholine and phosphatidyl glycerol, 792, 798
porcine, 798
Surfactometer, bubble, 792
Systemic lupus erythematosus, C3a, 299
Systemic vascular resistance, 625, 626
and heart function changes, septic shock, chacma baboon (Papio ursinus), 219, 220
immunoglobulin and plasmapheresis therapy, hemodynamic effects during treatment for septic shock, 1026–1029
α-mercaptopropionylglycine in hemorrhagic shock, 900–902
septic shock, 163–166, 168, 170
Tachycardia and cardiac volume, heart
function changes, septic shock, chacma baboon \( (Papio\ ursinus)\), 214–215, 217–222

TAN concentrations, kidney metabolism in \( E.\ coli\) sepsis, 601, 602, 604

Target structure degradation, multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring, 662–663

T cell(s)
- immune suppression/dysfunction, polytrauma, 517–521
- multiple trauma, early events, 507, 508
- septicemia/septic shock, 989, 990
- subsets, 508, 510, 518–520
- Ig synthesis suppression after multiple trauma, 513–514, 516
- MSOF, postoperative/posttrauma, biochemical analysis and scoring, 661
- PAF and, 442
  - in septic shock, 989, 991, 993
- thymopentin (TP-5), post-burn and postoperative sepsis and immunodeficiency syndrome, 995, 998
- trauma-induced cascade of cell-mediated immune effects, 496–505

T-cell replacing factor, 497

Tebonin, effect in burns, 455–461

Terminal complement complex
- acute pancreatitis, 266, 267
- pulmonary hypertension and vascular leakage, 283–286

Theophylline, 755

Thiobarbituric acid reactive material, lipid peroxidation, hypovolemic-traumatic shock, dogs, 345, 346

Thiol groups, \( \alpha\)-mercaptoacetylglutamine in hemorrhagic shock, 897, 902, 903

Thrombin, 367, 937, 941, 942

- MSOF, postoperative/posttrauma, 653
- Thrombin-antithrombin III complex
  - antithrombin III and plasma substitution in septic shock, 966–968
  - immunologic determination in humans, 971–974

Thrombin-induced adhesion with endothelial cells, neutrophils, 101–109

Thromboocyte counts, prognostic value in sepsis, 637–641

Thromboplastin, aprotinin membrane protective action, intraoperative histamine liberation, 961, 962

Thromboxane, 429
  - alveolar permeability increased by PMA-stimulated neutrophils, rabbits, ARDS, 328

burns
  - enteric translocation of microorganisms, 379
  - PAF inhibitor effect, scalded pig, 455, 459, 460
  - cardiopulmonary response to endotoxin, eicosanoids in, sheep, 201–204
  - circulation, peripheral, septic shock, 168
  - complement activation, pulmonary hypertension and vascular leakage, 285
  - early ventilatory support, 786
  - eglin C ineffectiveness in endotoxin shock, 955
  - hemofiltration and survival time, porcine acute endotoxic shock, 823–825
  - liver dysfunction in MSOF, altered cell-cell interactions, 569
  - lung, endotoxin-induced microvascular endothelial injury, 92
  - lung injury in \( E.\ coli\) endotoxemia, 359, 362–367
  - and hypertension, 67, 70
  - myocardial ischemia, 907–911
  - PAF antagonists in endotoxin shock, 935
  - permeability, pulmonary vascular, mediators, 310

TNF, induction of organ changes in chronic lymph fistula, sheep, 469, 474, 475, 479

Thromboxane receptor blockade, lung injury in \( E.\ coli\) endotoxemia, 366, 367

Thromboxane synthetase inhibition, lung injury in \( E.\ coli\) endotoxemia, 365–366

Thymopentin (TP-5) immunomodulation, post-burn and postoperative sepsis and immunodeficiency syndrome, 995–998
Thymostimulin (TP-1), immunomodulation in septic shock, 990–993

Thyroid hormones
- and leukocyte phagocytic activity, DIT and $T_3$, 712
- $T_4$, 711–712
- polytrauma, 743, 745
- $T_3$, 745, 748
- $T_4$, 744, 745, 748
- TBG, 744, 745, 749
- TSH, 744, 745, 749
- sepsis, 751–756
- $T_3$, 751–756
- $T_4$, 752–754
- TSH, 752, 753, 755

TISS, 643, 645

Tissue oxygen debt (VO$_2$ deficit) as determinant, organ failure, postoperative, 133–136 survivors cf. nonsurvivors, 136

Total parenteral nutrition, 377
- metabolic abnormalities in sepsis, 537, 538

Transfer factor, immunomodulation in septic shock, 990–993

Transferrin, plasma, and abdominal sepsis prognosis, 720, 721

Transpulmonary pressure, lung injury in $E. coli$ endotoxemia, 358–361

Trauma
- endotoxin and overwhelming inflammatory response of early sepsis, 372–374
- induced cascade of cell-mediated immune effects, immune suppression/dysfunction, 495–505
- immunorestitution, 504–505
- schema, 501, 503
- cf. multiple system organ failure, 58–60
- see also Multiple system organ failure, postoperative/posttrauma, biochemical analysis and scoring; Polytrauma

Trauma score, 643

Traumatic shock
- calcium antagonists in shock/ischemia, 1067–1068
- hypovolemic, 228, 229

PAF antagonist inhibition of induced shock, 431

Trifluoroperazine, 120, 122, 1070

Trimethoprim, GI tract decontamination, MOF prevention, 828–832

Tumor necrosis factor (TNF, cachectin), 13, 14, 114, 368, 432, 444, 536, 661, 850, 851
- administration, metabolic abnormalities in sepsis, 550, 551
- circulation, peripheral, septic shock, 169 discovery, 463
- endotoxin as stimulus, 463, 464
- glucose turnover in sepsis, 555
- heart dysfunction, septic shock, human, 197
- lipoprotein lipase suppression, 464
- liver dysfunction in MSOF, altered cell-cell interactions, 564, 568–570
- lung injury, endotoxin-induced microvascular endothelial, 91, 95–96
- production and macrophage/monocyte induction in shock, PAF, 485–488
- PAF antagonist effects, 485, 486
- pulmonary vascular permeability, 305
- in septic shock, 463–465
- serum, and sepsis, prognosis/prognostic indices, 715–718
- WEB 2086 (PAF antagonist), 919–921
- window phenomenon with PAF, 921–922

Tumor necrosis factor, induction of organ changes in chronic lymph fistula, sheep, 467–481
- disseminated intravascular coagulation, 479, 480
- elastase-a, anti-proteinase complex, 470, 477–478, 480
- hemodynamics, 472, 479
- cf. human, 470, 477
- cf. in vitro, 470, 477
- kallikrein, 469, 474, 479
- leucocyte role, 469, 470, 475–477, 480
- leucostasis, liver, 473, 474, 480
- liver SGOT, 469, 474, 475, 480
- lung lymph, 469, 473, 475, 479
- oxygen radicals, 470, 476, 477
permeability, microvascular, 472, 473, 479–481
prekallikrein, 469, 474, 475, 479
pulmonary artery pressure, 471
thromboxane, 469, 474, 475, 479
Typhoid fever, 852
Tyrosine, amino acid concentrations, serum, experimental endotoxin shock, 598

-U46619, 362, 368
U74006F, 891–895

Ulceration, gastric mucosa
ultrastructure after septic shock, 151–155
and stress ulcer disease, 151
and WEB 2086 (PAF antagonist), 919

Ultraviolet-absorption spectra, positive inotropic factor as myocardial stimulant, 255, 256

Urea, MSOF prognostic indices, logistic regression analysis, 644–646

Urokinase-type plasminogen activator, neutrophils, thrombin-induced adhesion with endothelial cells, 109

U.S. Veterans Administration, sepsis studies, corticosteroids, 840–844, 847–855, 873

Vascular intima in endotoxin shock, 77–87
cell origins and replacement, 78–80
endothelial injury, grading, 84–85
endothelin transport and elimination, 81
generalized inflammation, 85–87
aorta, 85, 86
non-endothelial cells, 77–78
macrophages, 78, 80, 81
ultrastructural alterations, early, 82–84

Vascular permeability. See Permeability
Vascular tone, hemorrhagic shock, phase-related vascular reactivity, cats, 143

Vasopressin (antidiuretic hormone), 379
hepatocytes, protein kinase C and diacylglycerol accumulation in endotoxemia, 576, 579–581, 584–586
sepsis, 751, 753, 755, 756
Ventilatory support, early
inversed ratio ventilation, 788, 789
multiple organ failure with acute respiratory failure, 784–789
PEEP, 788–789

Ventricular pressure cf. perfusion flows, endotoxin, inotropic effect in isolated rabbit heart, 227, 228

Ventriculography, radionuclide, heart function changes in septic shock, chacma baboon (Papio ursinus), 209–210, 218, 219

Verapamil, 1060
endotoxin shock, 1068, 1069
pretreatment, calcium antagonists in shock/ischemia, 1067

Virchow’s triad, 851
Vitamin E
leukocyte-induced lung injury, 74–76
lipid peroxidation inhibition in cardiopulmonary arrest, 893–895

W7, 120
WEB 2086 (PAF antagonist), 426, 428, 429, 442, 485
anaphylactic lung reaction, guinea pig, 925–929
endotoxin shock effects, 931–933, 935
gastrointestinal tract damage, endotoxin-induced, 919–922
hetrazepine, 925

WEB 2170, 928
Weibel-Palade bodies, 83
White blood cell count, 725, 728
Wilhelmy tensiometer, 800

Xanthine-oxidase, 349

Zymosan
-induced peritonitis, decontamination, GI tract, 827–832
leukocyte-induced lung injury 73–76