Contents

The Main Histocompatibility System in Man. M. Jeannet. With 2 Tables ............................ 1
A. Introduction ................................................. 1
B. Historical Background ...................................... 1
C. Methodology and Serological Considerations .......... 3
   I. Leukoagglutination .................................... 3
   II. Lymphocyte Cytotoxicity ............................ 4
   III. Platelet Complement Fixation ..................... 4
   IV. Serum Sources .......................................... 4
       1. Polytransfused Patients ......................... 5
       2. Pregnancy ............................................ 5
       3. Immunization of Human Volunteers .............. 5
       4. After Organ Transplantation ..................... 6
       5. “Natural” Lymphocytotoxins ..................... 6
       6. Immunization of Animals ......................... 6
D. Genetics of the HL-A System .......................... 7
E. Heterogeneity and Cross-Reactivity of HL-A Antigens .... 9
F. HL-A, Mixed Lymphocyte Culture (MLC), Cell-Mediated Lympholysis (CML), and Cellular Immunity .... 10
G. HL-A System and Clinical Transplantation ............ 12
   I. Skin Graft Survival .................................. 12
   II. Kidney Transplantation ............................ 12
   III. Variability in the Host Immune Response ......... 15
   IV. Donor Selection for Kidney Transplantation .... 17
   V. Bone Marrow Transplantation ..................... 18
H. HL-A System and Human Diseases ....................... 20
   I. HL-A and Hematologic Malignant Diseases ......... 20
   II. HL-A and Cancer (other than Lymphomas) ........ 22
   III. HL-A and Immunopathic Diseases ............... 22
   IV. HL-A and Infectious Diseases .................... 23
   V. HL-A and Rheumatoid Diseases .................... 24
   VI. HL-A System and Various other Diseases ......... 25
I. HL-A System and Blood Transfusion .................... 25
J. HL-A System and Disputed Paternity Cases .......... 26
K. Conclusions ............................................... 27
References .................................................... 27

I. Introduction ............................................... 39
Phylogenetic Aspects of Transplantation. EDWIN L. COOPER. With 4 Figures

A. Introduction
B. Transplantation Reactions in Invertebrates Other than Annelids and Echinoderms
   1. Organelle Transplantation in Protozoans (Sarcodina, Ciliata)
   2. Metazoans—Specificity of Reaggregation in Porifera
   3. Incompatibility in Cnidaria (Hydrozoa, Anthozoa)
   4. Platychelminthes and Sipunculida
   5. Equivocal Incompatibilities in Mollusca (Pelecypoda, Gastropoda, Cephalopoda)
   6. Arthropoda
   7. Genetic Control in Urochordata
   8. Summary of Quasi Immunorecognition
C. Transplantation Reactions in Invertebrates that Reveal Primordial Cell-Mediated Immunity
   I. Short-term Immunologic Memory
   II. Cell and Tissue Responses that Indicate Self Recognition in Echinoderms
   III. Transplantation in Asteroidea
   IV. Short-term Memory
   V. The Earthworm Model
      1. First- and Second-Set Allograft Rejection in Lumbricus terrestris and Eisenia fetida
      2. Rejection of First- and Second-Set Xenografts Exchanged between Lumbricus and Eisenia
      3. Specificity and Anamnestic Response
      4. The Cellular Response
      5. The Role of Temperature in Earthworm Tissue Graft Rejection
      6. Summary
D. Transplantation Immunity in Fishes
   I. Introduction
   II. The Hagfish
   III. The Lamprey
   IV. Cartilaginous Fishes
   V. Bony Fishes (Holosteans; Teleosts)
E. Transplantation Immunity in Amphibians
   I. Adult Apodans
      1. Introduction
      2. General Description of Autografts and Allografts
      3. Histopathology
   II. Adult Urodeles
      1. The Latent Phase
      2. The Rejection Phase
      3. The Chronic Rejection Response to Xenografts
      4. Role of the Thymus in Graft Rejection
      5. Histologic Differences in Skin
      6. Suppression of Transplantation Immunity
   III. Anurans
      1. Larvae
      2. Bone Marrow Restoration of Transplantation Immunity in Adult Leopard Frogs
   IV. The Mexican Iguana
   V. The Garter Snake

References
### Contents

#### Ontogenetic Aspects

**Osias Stutman and Catherine E. Calkins**

- **Introduction**
- **Ontogeny of Lymphoid Structures**
- **Ontogeny of Transplantation Immunity**
- **Ontogeny of Thymus-Dependent Functions**
- **Concluding Remarks**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Introduction</td>
<td>169</td>
</tr>
<tr>
<td>B. Ontogeny of Lymphoid Structures</td>
<td>170</td>
</tr>
<tr>
<td>C. Ontogeny of Transplantation Immunity</td>
<td>179</td>
</tr>
<tr>
<td>D. Ontogeny of Thymus-Dependent Functions</td>
<td>181</td>
</tr>
<tr>
<td>E. Concluding Remarks</td>
<td>186</td>
</tr>
</tbody>
</table>

#### References

- 187

#### Humoral and Cell-Mediated Mechanisms of Allograft Rejection

**K. Theodor Brunner and Jean-Charles Cerottini**

- **Introduction**
- **Assay Methods of Cell-Mediated Cytotoxicity (CMC)**
- **Cytotoxicity Mediated by Specifically Sensitized T-Cells**
- **In Vivo Formation of Cytotoxic T Lymphocytes**
- **In Vitro Formation of Cytotoxic T Lymphocytes**
- **Mechanism of T-Cell Cytotoxicity**
- **Specificity of Target Cell Destruction by Cytotoxic T Lymphocytes**
- **Antibody-Dependent Cytotoxicity Mediated by Normal Lymphoid Cells**
- **Cytotoxicity Mediated by Macrophages**
- **Relevance of CMC to Allograft Rejection**
- **The Role of Antibody in Allograft Rejection**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Introduction</td>
<td>195</td>
</tr>
<tr>
<td>B. Assay Methods of Cell-Mediated Cytotoxicity (CMC)</td>
<td>198</td>
</tr>
<tr>
<td>C. Cytotoxicity Mediated by Specifically Sensitized T-Cells</td>
<td>200</td>
</tr>
<tr>
<td>D. In Vivo Formation of Cytotoxic T Lymphocytes</td>
<td>201</td>
</tr>
<tr>
<td>E. In Vitro Formation of Cytotoxic T Lymphocytes</td>
<td>202</td>
</tr>
<tr>
<td>F. Mechanism of T-Cell Cytotoxicity</td>
<td>203</td>
</tr>
<tr>
<td>G. Specificity of Target Cell Destruction by Cytotoxic T Lymphocytes</td>
<td>204</td>
</tr>
<tr>
<td>H. Antibody-Dependent Cytotoxicity Mediated by Normal Lymphoid Cells</td>
<td>205</td>
</tr>
<tr>
<td>I. Cytotoxicity Mediated by Macrophages</td>
<td>207</td>
</tr>
<tr>
<td>K. Relevance of CMC to Allograft Rejection</td>
<td>209</td>
</tr>
<tr>
<td>L. The Role of Antibody in Allograft Rejection</td>
<td>210</td>
</tr>
</tbody>
</table>

#### References

- 212

#### Cell Systems Participating in Graft Rejections

**J. Hagmann, M.W. Hess, H.U. Keller and H. Cottier**

- **Introduction**
- **Lymphocytes**
  - Development of the Immune System and Lymphocyte Subclasses
    - Early Ontogenesis of Lymphoid Organs and Cells
    - Postnatal Development of the Lymphocytic Systems
    - The Central Role of the Thymus
  - Peripheral Lymphocytes
    - Lymphocyte Subclasses
    - The Functions of Peripheral Lymphocytes
      - Helper and Suppressor Activity
      - Cell-Mediated Cytotoxicity
      - Mixed Lymphocyte Cultures
      - Graft-Versus-Host Reaction (GVHR)
- **Macrophages**
- **Neutrophilic Granulocytes**
- **Other Cells and Structures**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Introduction</td>
<td>217</td>
</tr>
<tr>
<td>B. Lymphocytes</td>
<td>217</td>
</tr>
<tr>
<td>1. Development of the Immune System and Lymphocyte Subclasses</td>
<td>217</td>
</tr>
<tr>
<td>2. Postnatal Development of the Lymphocytic Systems</td>
<td>218</td>
</tr>
<tr>
<td>3. The Central Role of the Thymus</td>
<td>219</td>
</tr>
<tr>
<td>II. Peripheral Lymphocytes</td>
<td>223</td>
</tr>
<tr>
<td>1. Lymphocyte Subclasses</td>
<td>223</td>
</tr>
<tr>
<td>a) T Cells</td>
<td>223</td>
</tr>
<tr>
<td>b) B-cells</td>
<td>226</td>
</tr>
<tr>
<td>c) Null Cells</td>
<td>229</td>
</tr>
<tr>
<td>2. The Functions of Peripheral Lymphocytes</td>
<td>229</td>
</tr>
<tr>
<td>a) Helper and Suppressor Activity</td>
<td>229</td>
</tr>
<tr>
<td>b) Cell-Mediated Cytotoxicity</td>
<td>230</td>
</tr>
<tr>
<td>c) Mixed Lymphocyte Cultures</td>
<td>232</td>
</tr>
<tr>
<td>d) Graft-Versus-Host Reaction (GVHR)</td>
<td>233</td>
</tr>
<tr>
<td>C. Macrophages</td>
<td>234</td>
</tr>
<tr>
<td>D. Neutrophilic Granulocytes</td>
<td>235</td>
</tr>
<tr>
<td>E. Other Cells and Structures</td>
<td>235</td>
</tr>
</tbody>
</table>

#### References

- 235

#### General Tolerance Phenomena

**T. Hraba**

- **Introduction**
- **Tolerance Phenomena and Other Specific Inhibitions of Immune Reactions**
  - Inhibition States Classified as Immunologic Tolerance

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Introduction</td>
<td>247</td>
</tr>
<tr>
<td>B. Tolerance Phenomena and Other Specific Inhibitions of Immune Reactions</td>
<td>249</td>
</tr>
<tr>
<td>I. Inhibition States Classified as Immunologic Tolerance</td>
<td>250</td>
</tr>
</tbody>
</table>
1. The Sulzberger-Chase Phenomenon .................................................. 250
2. Immunologic Paralysis ................................................................. 250
3. Tolerance to Heterologous Serum Proteins ................................... 251
4. Tolerance to Other Antigens ......................................................... 253

II. Other Antigen-Induced States of Specific Inhibition of the Immune Response 253
1. Immunologic Enhancement ............................................................. 253
2. Immune Deviation ........................................................................... 254

C. Mechanisms of Immunologic Tolerance ........................................ 254
I. The Relation of Antibody-induced Suppression to Immunologic Tolerance 254
II. Cellular Processes in Immunologic Tolerance ............................... 256
III. Suppressor Cells ............................................................................ 258
IV. Transplantation Tolerance .............................................................. 260
V. Mechanism of Unresponsiveness to Self Components ........................ 262
D. Conclusions ..................................................................................... 264

References .......................................................................................... 265

Transplantation of Cells: Experimental and Clinical Observations. GERHARD R.F. KRUEGER. With 44 Figures and 3 Tables ............................................................................................. 275
A. Introduction ...................................................................................... 275
B. Historical Notes ................................................................................ 276
C. Cell Types Used for Transplantation and Indications for the Respective Procedure 278
I. Experimental Transplantation .......................................................... 278
II. Human Transplantation ................................................................. 284
1. Indications for Transplantation of Blood and its Components ............. 284
2. Indications for Transplantation of Bone Marrow ............................... 284
D. Techniques of Cell Transplantation ................................................... 287
I. Details of Patient Selection ............................................................... 287
1. Selection of the Host ........................................................................ 288
2. Selection of the Donor ..................................................................... 288
II. Preevaluation and Pretreatment of Host and Donor ........................... 288
1. Pretreatment of the Donor .............................................................. 288
2. Pretreatment of the Recipient ......................................................... 289
III. Procurement of Bone Marrow Cells ............................................... 294
IV. Cell Grafting ................................................................................... 296
V. Cells other than Bone Marrow Cells used for Transplantation in Man 296
VI. Posttransplant Clinical Investigation of Bone Marrow Recipient ...... 297
E. Demonstration and Localization of Engrafted Cells ............................ 300
F. Graft-Host Interactions ..................................................................... 311
I. Microenvironmental Influences ....................................................... 311
II. Graft Rejection ................................................................................ 312
III. Graft-Versus-Host Reaction (GVHR) ............................................ 318
IV. Therapeutic Intervention of Postengraftment Disease ....................... 320
G. Conclusions ..................................................................................... 321
References .......................................................................................... 322

Skin Grafts in Animals and Man. ZOLTAN J. LUCAS. With 4 Figures and 3 Tables 329
A. Introduction ...................................................................................... 329
B. Operational Definition of Transplant Antigens ................................ 330
C. Morphologic Changes Occurring in Skin Allografts ................. 332
I. Sequential Changes in Gross and Microscopic Appearance .......... 333
II. Characterization and Quantitation of the Infiltrating Cells .............. 335
III. Comparison of Morphologic Events in the Homograft Reaction and in other Hypersensitivity Reactions 335
D. The Immune Responses Induced by Skin Grafting

I. Afferent Phase—Antigen Recognition

II. Central Phase—Clonal Proliferation, Yielding both Memory and Differentiated Effector Cells

III. Effector Phase—the Expression of Immunity

1. Specific Immune Cytotoxic Mechanisms

2. Recruitment of Nonsensitized Effector Cells by Lymphokines Secreted by Sensitized T-Cells

3. Local Activation of the Host's General Inflammatory Response

4. Correlation of Immunologic and Pathophysiologic Events with Clinical Skin Graft Rejection Syndromes

IV. Autoregulatory Phase

1. Complete or Partial Tolerance

   a) Conditions Affecting Induction, Maintenance, and Reversal of Immunologic Tolerance

   b) The Absence of Reactive Cells or the Presence of Nonreactive Cells

   c) The Presence of Immunologically Active Lymphocytes Blocked by Serum Factors

   d) Other Alternatives: Suppressive or Regulatory Events Mediated by Lymphocytes on Immune Reactions

2. Immunologic Enhancement

   a) General Features of Graft Survival

   b) Relationship Between Organ Vascularity and Immunologic Enhancement

References

Transplantation of Connective Tissue. M. Jäger and C.J. Wirth. With 16 Figures

A. Introduction

B. General Section

I. Anatomic Structure of Connective-Tissue Types as it Affects Suitability for Transplantation

II. Viability and Nonviability: Denaturation of the Graft as it Affects Primary Healing and Restructuring

III. Biological and Mechanical Merits of Auto-, Homo-, and Heterologous Transplants

IV. Changes with Age in Connective Tissue as they Affect Transplantation

V. Immune Reactions in the Transplantation of Living and Preserved Connective Tissue

VI. Preservation

VII. Healing

C. Specific Section

I. Tendon

II. Cutis

III. Fascia

IV. Dura

D. Future Prospects

References


I. Introduction and Historical Background

II. Basic Principles of Keratoplasty

References
A. Terminology ................................................. 404
B. Indications for Keratoplasty ............................. 405
C. Criteria for Donor Material and Storage .......... 407
  1. General .............................................. 407
  2. Donor-Cornea Evaluation (Laboratory and Clinical) 408
  3. Storage ............................................. 409
D. Surgical Techniques in Keratoplasty .............. 411
E. Factors Determining Prognosis of Keratoplasty .... 412
  1. Quality of the Donor-Cornea ...................... 412
  2. State of the Recipient Cornea ................. 413
  3. Other Ocular Disease ............................ 414
  4. Quality of Surgery .............................. 415
F. Healing of the Corneal Wound in Keratoplasty .... 415
G. Fate of Donor Cells in Keratoplasty .............. 416
III. Unsuccessful Keratoplasty ............................ 417
A. Nonimmunologic Factors for Graft Failure ........ 418
B. Immunologic Reasons for Graft Failure ........... 421
IV. Experimental Keratoplasty and Heterografting .... 431

References ................................................. 432

General Pathology of the Transplantation Reaction in Experimental and Clinical Organ Grafts. CHRISTOPH R. JERUSALEM and PAUL H.K. JAP. With 61 Figures .......................... 439
A. The Many Facets of the Transplantation Reaction ........ 439
I. Introduction ............................................. 439
II. Terminology ............................................. 440
  1. Donor-Recipient Relationship .................. 440
  2. Chronologies of Rejection ..................... 441
III. Elements of the Transplantation Reaction ........ 442
  1. Dichotomy of the Immune Response .............. 442
  2. T-Helper Cell Mechanisms ....................... 446
  3. Effector Mechanisms of Cell-Mediated Cytotoxicity 447
     a) Autonomy of T-Lymphocyte Cytotoxicity .......... 448
     b) Mediators of the Cellular Immune Reaction .......... 449
     c) Cell-Mediated Cytotoxicity Independent of Thymus 451
IV. Humoral Factors Involved in Graft Rejection .......... 456
B. Effector Cells and the Target Cell Injury .......... 457
I. Morphology of Infiltrating “Lymphoid Cells” ....... 457
  1. Small Lymphocytes ................................... 458
  2. Medium-Sized Lymphocytes ....................... 458
  3. Atypical Lymphocytes ............................. 458
  4. Large Lymphocytes .................................. 459
  5. Transformed Lymphocytes ....................... 459
  6. Lymphoid Killer Cells ............................. 460
  7. Monocytes ......................................... 460
  8. Macrophages ...................................... 461
II. Morphology of the Cell-Mediated Target Cell Destruction in vitro .... 464
  1. Membrane Contact ................................... 464
  2. Morphology of Cell-Mediated Target Cell Lysis .... 465
  3. Morphology of Antibody-Dependent Cell-Mediated Cytotoxicity 466
  4. Other Mechanisms of Cell-Mediated Target Cell Destruction 467
III. Features of Antibody-Mediated Injury ............... 467
  1. Morphology of the Complement-Dependent Immune Cytolysis .... 468
  2. Relationship Between Immune Complexes and Clotting .... 468
  3. Pathogenesis of Tissue Injury Mediated by Immune Complexes 469
C. Pathways of Host Sensitization

I. Cellular Mechanisms
   1. Central Reactions
   2. Recirculation of Immunocompetent Cells

II. Pathways of Sensitization to Solid Organ Grafts
   1. Soluble Antigens
   2. Macrophage-Processed Antigen
   3. Peripheral Sensitization
   4. Passenger Leukocytes

D. Hyperacute Rejection

I. Pathogenesis

II. Pathology of the Hyperacute Rejection
   1. Kidney
      a) Course of Events
      b) Cellular Mechanisms and Mediators Involved in Hyperacute Rejection
   2. Heart
   3. Liver
   4. Lungs
   5. Pancreas

III. Nonimmunologically Caused Primary Graft Failure and Damage
   1. Pretransplantation Anoxemic Lesion
   2. Mechanical Traumatization
   3. Morphology of the Pretransplantation Ischemic and Mechanical Damage
      a) Kidney
      b) Heart
      c) Liver
      d) Lung
      e) Pancreas

E. Accelerated (Delayed Hyperacute) Rejection

F. Acute (Intermediate) Rejection

I. Pathogenesis

II. Particular Patterns of Acute Rejection
   1. Kidney
   2. Heart
   3. Liver
   4. Lung
   5. Pancreas
   6. Small Bowel

G. Chronic or Late Rejection

I. Arterial Obliterative Lesion

II. Interstitial Fibrosis, Parenchymal Atrophy and Chronic Cellular Infiltration

III. Chronic Glomerulopathy

H. Future Prospects of Organ Transplantation

I. Current Experience in Organ Transplantation

II. Histocompatibility Typing

III. Organ Preservation and Storage
   1. Simple Hypothermic Storage
   2. Short-Term Preservation
   3. Intermediate-Term Storage and Long-Term Preservation

IV. Artificial Organs

V. Modification of the Immune Response
   1. Immunosuppression
   2. Immunologic Enhancement
   3. Immunosuppressive Antibodies
   4. Immunologic Tolerance
Contents

C. Cellular Immunity .................................................. 660
I. Bone Marrow Grafting .............................................. 660
  1. Irradiation Dose ............................................... 662
     a) Injury .................................................... 662
        α) Hematopoietic ........................................ 662
        β) Gastrointestinal ...................................... 662
        γ) Central Nervous System (CNS) ...................... 663
     b) Conditioning of Recipients for Hematopoietic Grafting 663
        α) The Midlethal Dose (MLD) Effect .................. 663
        β) Rejection of the Marrow Graft and "Reversal" .. 663
        γ) Exposure Rate Effects ................................ 664
        δ) Conditioning by Irradiation Other Than Total Body (TBI) 664
        ζ) Time of Marrow Infusion in Relation to Irradiation 664
  2. Histocompatibility Differences Between the Host and Donor 665
  3. The Presensitized Recipient .................................. 668
  4. Successful Hematopoietic Engraftment ....................... 669
     a) Evidence of Chimerism ................................... 669
     b) GVHD ..................................................... 670
        α) Pathology .............................................. 670
        β) The Prevention and Treatment of GVHD ........... 671
     c) Immunologic Reconstitution of Chimeras ............... 673
     d) Long-Term Survivors as Examples of Irradiation Induced Immunologic Unresponsiveness: "True Tolerance" or "Enhancement Phenomenon"? 676
     e) Clinical Marrow Grafting Studies ....................... 680
        α) Marrow Grafting in Hematologic Malignancy ..... 681
        β) Marrow Grafting in Aplastic Anemia ............... 684
        γ) Conclusions and Summary of Outstanding Problems in the Field of Irradiation and Clinical Marrow Grafting 685
II. Other Organ Grafts ................................................ 686
References .............................................................. 687

Immunosuppression by Antibodies. K. Wonigeit and R. Pichlmayr. With 4 Figures . 695

A. Introduction ....................................................... 695
B. Concepts of Immunosuppression by Antibodies ............... 695
C. Xenogeneic Antilymphocyte Sera ............................... 698
   I. General Aspects ............................................. 698
   II. Types of Xenogeneic Antilymphocyte Sera ............... 699
   III. Effects on Lymphoid Cells in vitro ..................... 701
   IV. Effects on the Lymphatic System ......................... 702
   V. Immunosuppressive Activity of ALS ....................... 706
      1. Humoral Immunity ....................................... 706
      2. Delayed Hypersensitivity ............................. 706
      3. Transplantation Immunity ............................. 706
      4. Autoimmune Phenomena ................................ 707
      5. Graft-Versus-Host Immunity ........................... 707
   VI. Cooperative Effects With Other Immunosuppressive Regimens 708
   VII. Assays for Immunosuppressive Potency .................. 709
   VIII. Mode of Action ............................................ 710
   IX. Side-Effects and Complications ............................ 711
      1. Toxic Effects .......................................... 712
      2. Hyperergic Reactions ................................... 713
      3. Infections .............................................. 713
      4. Neoplasms ............................................... 714
   X. Immunosuppression with ALS in Humans .................... 715
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.4.</td>
<td>The Intra-Ocular Form</td>
<td>807</td>
</tr>
<tr>
<td>2.3.</td>
<td>In-Vitro Analogies</td>
<td>808</td>
</tr>
<tr>
<td>2.3.1.</td>
<td>The Mixed Lymphocyte Culture</td>
<td>808</td>
</tr>
<tr>
<td>2.3.2.</td>
<td>The Spleen Explant Test</td>
<td>809</td>
</tr>
<tr>
<td>3.</td>
<td>Clinical Observations</td>
<td>809</td>
</tr>
<tr>
<td>3.1.</td>
<td>&quot;Spontaneous&quot; GVHD in Humans</td>
<td>811</td>
</tr>
<tr>
<td>3.2.</td>
<td>GVHD After Bone Marrow Transplantation</td>
<td>812</td>
</tr>
<tr>
<td>3.2.1.</td>
<td>In Case of Primary Immuninsufficiency or Aplastic Anemia</td>
<td>812</td>
</tr>
<tr>
<td>3.2.2.</td>
<td>In Leukemias</td>
<td>812</td>
</tr>
<tr>
<td>3.2.3.</td>
<td>After Blood Transfusions</td>
<td>813</td>
</tr>
<tr>
<td>4.</td>
<td>Histopathology</td>
<td>814</td>
</tr>
<tr>
<td>4.1.</td>
<td>Mice</td>
<td>814</td>
</tr>
<tr>
<td>4.1.1.</td>
<td>Spleen</td>
<td>814</td>
</tr>
<tr>
<td>4.1.2.</td>
<td>Lymph Nodes</td>
<td>815</td>
</tr>
<tr>
<td>4.1.3.</td>
<td>Liver</td>
<td>816</td>
</tr>
<tr>
<td>4.1.4.</td>
<td>Skin</td>
<td>817</td>
</tr>
<tr>
<td>4.1.5.</td>
<td>Bone Marrow</td>
<td>817</td>
</tr>
<tr>
<td>4.1.6.</td>
<td>Other Tissues</td>
<td>817</td>
</tr>
<tr>
<td>4.2.</td>
<td>Rats</td>
<td>818</td>
</tr>
<tr>
<td>4.2.1.</td>
<td>Spleen</td>
<td>818</td>
</tr>
<tr>
<td>4.2.2.</td>
<td>Lymph Nodes</td>
<td>819</td>
</tr>
<tr>
<td>4.2.3.</td>
<td>Liver</td>
<td>819</td>
</tr>
<tr>
<td>4.2.4.</td>
<td>Skin</td>
<td>820</td>
</tr>
<tr>
<td>4.2.5.</td>
<td>Bone Marrow</td>
<td>821</td>
</tr>
<tr>
<td>4.2.6.</td>
<td>Other Tissue</td>
<td>824</td>
</tr>
<tr>
<td>4.3.</td>
<td>Chickens</td>
<td>825</td>
</tr>
<tr>
<td>4.4.</td>
<td>Other Animals</td>
<td>826</td>
</tr>
<tr>
<td>4.5.</td>
<td>Humans</td>
<td>827</td>
</tr>
<tr>
<td>4.5.1.</td>
<td>Spleen</td>
<td>827</td>
</tr>
<tr>
<td>4.5.2.</td>
<td>Lymph Nodes</td>
<td>828</td>
</tr>
<tr>
<td>4.5.3.</td>
<td>Liver</td>
<td>829</td>
</tr>
<tr>
<td>4.5.4.</td>
<td>Skin</td>
<td>830</td>
</tr>
<tr>
<td>4.5.5.</td>
<td>Gastrointestinal Tract</td>
<td>833</td>
</tr>
<tr>
<td>4.5.6.</td>
<td>Bone Marrow</td>
<td>834</td>
</tr>
<tr>
<td>4.5.7.</td>
<td>Remaining Tissue</td>
<td>834</td>
</tr>
<tr>
<td>4.5.8.</td>
<td>Remaining Tissue</td>
<td>834</td>
</tr>
<tr>
<td>5.</td>
<td>Hematology</td>
<td>835</td>
</tr>
<tr>
<td>5.1.</td>
<td>Mice</td>
<td>835</td>
</tr>
<tr>
<td>5.2.</td>
<td>Rats</td>
<td>836</td>
</tr>
<tr>
<td>5.3.</td>
<td>Other Species of Animals</td>
<td>836</td>
</tr>
<tr>
<td>5.4.</td>
<td>Humans</td>
<td>836</td>
</tr>
<tr>
<td>6.</td>
<td>Causal Pathogenesis</td>
<td>837</td>
</tr>
<tr>
<td>6.1.</td>
<td>Immunologic Factors</td>
<td>837</td>
</tr>
<tr>
<td>6.2.</td>
<td>Unspecific Factors</td>
<td>837</td>
</tr>
<tr>
<td>7.</td>
<td>Formal Pathogenesis</td>
<td>838</td>
</tr>
<tr>
<td>7.1.</td>
<td>Trigger Antigens</td>
<td>838</td>
</tr>
<tr>
<td>7.2.</td>
<td>Immunocompetent Lymphocytes</td>
<td>839</td>
</tr>
<tr>
<td>7.3.</td>
<td>Behaviour of Donor Lymphocytes</td>
<td>839</td>
</tr>
<tr>
<td>7.3.1.</td>
<td>Nidation</td>
<td>839</td>
</tr>
<tr>
<td>7.3.2.</td>
<td>Proliferation</td>
<td>840</td>
</tr>
<tr>
<td>7.3.3.</td>
<td>Cellular Interactions</td>
<td>840</td>
</tr>
<tr>
<td>7.4.</td>
<td>Behaviour of Host Cells</td>
<td>841</td>
</tr>
<tr>
<td>7.4.1.</td>
<td>Damages</td>
<td>841</td>
</tr>
<tr>
<td>7.4.2.</td>
<td>Reactive Hyperplasia and Allogeneic Effect</td>
<td>842</td>
</tr>
<tr>
<td>7.4.3.</td>
<td>Immune Suppression</td>
<td>843</td>
</tr>
<tr>
<td>7.5.</td>
<td>Mechanisms of Immune Regulations</td>
<td>844</td>
</tr>
<tr>
<td>8.</td>
<td>Therapeutic Influence</td>
<td>846</td>
</tr>
<tr>
<td>8.1.</td>
<td>Results of Experiments with Animals</td>
<td>846</td>
</tr>
</tbody>
</table>