Contents

Chapter 1: Role of the Innate Immune System 1
Friedrich Paulsen, Fabian Garreis, Lars Bräuer

Innate Host Defenses Against Infection 3
Phagocytosis and Intracellular Killing—Neutrophils and Macrophages 5
Determinants Recognized by the Innate Immune Response 10

Chapter 2: Microglial Homeostasis: Lessons from the Mouse Retina 12
Marcus Karlstetter, Thomas Langmann

Origin and Dynamics of Retinal Microglia 13
Microglia and Retinal Aging 14
Microglia and Inherited Retinal Degeneration 15
Microglia and Retinal Light Damage 15
Microglia as Therapeutic Targets 16

Chapter 3: Keratinocyte-Derived Antimicrobial Peptides as Effectors in Innate Skin Defense 20
Jens-M Schröder

The Epithelial Defense System in Nonmammalian Organisms 21
Epithelial Defense in Vertebrates 21
Regulation of Epithelial Antimicrobial Peptides 29
Antimicrobial Peptides and Skin Diseases 31

Chapter 4: The Role of Mucins in the Innate Immune System 37
Anthony Corfield

Structure of the Tear Film 38
The Mucin Family 38
Ocular Mucin Glycomics 41

Chapter 5: Natural Killer Cells 50
Doris Urlaub, Sebastian Stark, Carsten Watzl

Natural Killer Cell Development and Subsets 50
Natural Killer Cell Functions 52
Natural Killer Cell Recognition: "Missing" and "Induced-Self" 53
Natural Killer Cell Memory 60

Chapter 6: Role of T Cells and Dendritic Cells in Immune-Mediated Diseases 67
Christian Kurts

Role of T Cells and Dendritic Cells in Progression of Glomerulonephritis 68

CHAPTER 7: Toll-like Receptors: Structure and Ligand Specificities **74**
Renato Ostuni, Ivan Zanoni, Francesca Granucci

Toll-Like Receptors 75

CHAPTER 8: Macrophages, Autoimmunity and Control of Tissue Damage **89**
Andrew D Dick

Macrophage Activation During Ocular Inflammation 93
Macrophages and the Healing Response in the Retina 97

CHAPTER 9: The Innate Immune Response to Cancer **103**
Adelheid Cerwenka

The Innate Immune Response to Cancer 104

CHAPTER 10: Role of TNF in Host Resistance to Tuberculosis Infection: Membrane TNF is Sufficient to Control Infection **117**
Muazzam Jacobs, Bernhard Ryffel

The TNF Family 118
Molecular Mechanisms of Mycobacterial Killing/Resistance 124

CHAPTER 11: Innate Immunity of the External Eye **139**
Lars Bräuer, Fabian Garreis, Martin Schicht, Friedrich Paulsen

Ocular Surface Anatomy 140
Antimicrobial Peptides of the Tear Film and Ocular Surface 142

CHAPTER 12: Innate Immune System and its Impact on Immune Privilege in the Eye **153**
Jerry Y Niederkorn

Ocular Phase of ACAID 154
Thymic Phase of ACAID 155
Splenic Phase of ACAID 155
How do Thymus-Derived NKT Cells Contribute to ACAID? 156
Role of γδ T Cells in ACAID 156

CHAPTER 13: Myeloid-Derived Cells in the Eye—Distribution, Turnover and Functional Correlates **159**
PG McMenamin, J Kezic, HR Chinnery

Myeloid Cells in the Normal Cornea and their Role in Models of Disease 160
Myeloid Cells in the Uveal Tract—Iris, Ciliary Body and Choroid 164
Myeloid Cells in the Neural Retina 168

CHAPTER 14: Linking the Innate and Adaptive Immune Response during the Immunopathogenesis of Dry Eye Disease **176**
Michael E Stern, Chris S Schaumburg, Jerry Y Niederkorn, Margarita Calonge, Stephen C Pflugfelder

CHAPTER 15: Innate Immune Control of Herpes Simplex Virus Replication in the Cornea 185
Gregory M Frank, Kristine-Ann Buela, Robert L Hendricks

Bone Marrow Derived Cells in the Normal Mouse Cornea 186
Dendritic Cells—Depletion Model of the Cornea 187

CHAPTER 16: Role of the Innate Immune System in Corneal Transplantation 191
Jerry Y Niederkorn

Role of the Innate Immune System in Promoting Corneal Allograft Survival 193
Role of the Innate Immune System in Corneal Allograft Rejection 195

CHAPTER 17: The Innate Immune Response and Autoimmune Uveitis 199
Rachel R Caspi

Innate Immune Signals 201
Elements of the Innate Immune System 203
Innate Immune System Restrains the Adaptive Response 206

CHAPTER 18: Innate Immunity of the Eye Glaucoma 210
Rudolf Fuchshofer

Upstream Regulation of TGF-β: Bone Morphogenic Proteins 212
Downstream Mediator of TGF-β: Connective Tissue Growth Factor 213
Immunology and Glaucoma 214

CHAPTER 19: The Innate Immunity System and Age-Related Macular Degeneration 218
Ulrich Schraermeyer

Recognition of PAMPs and DAMPs 220
Role of the Complement System in AMD 221

Index 227