

Contents

Foreword	5	Antigen uptake	74
Abbreviations	6	Antigen processing and presentation	77
Preface	8	Antigen presentation by CD1	79
Key to Symbols	8	Antigen presentation by B cells and nonprofessional APCs	79
		Cytokines	80
		Key points	82
1 An Overview of the Immune System: Innate and Adaptive Immunity and the Inflammatory Response	9	8 The Biology of T Lymphocytes	83
Introduction	9	Introduction	83
History of immunology	9	The T-cell receptor	83
The immune system: an overview	10	T-cell development and maturation	86
The evolution of the immune system	16	T-cell activation	86
Key points	18	The role of CD4 ⁺ T lymphocytes	88
		Cytotoxicity	90
2 Antigens and Antibodies	19	Memory cells	94
Introduction	19	$\gamma\delta$ lymphocytes	95
Antigens	19	Natural killer T cells	95
Antibodies	22	Key points	96
Immunoglobulin classes	22		
Antigen–antibody interaction	28	9 The Biology of B Lymphocytes	97
Key points	29	Introduction	97
		Antigen recognition by B cells	97
3 The Complement System	30	Development and maturation of B lymphocytes	98
Introduction	30	Activation of the B lymphocyte	98
The classical and lectin pathways	31	B-cell receptor diversity	100
The alternative pathway	32	The immunoglobulin class switch	102
The terminal pathway	34	Affinity maturation	102
Biological consequences of complement activation	34	Kinetics of the humoral immune response	103
Tests of complement function	37	B1 and B2 lymphocytes	103
Key points	38	Memory B lymphocytes	104
		Monoclonal antibodies	104
		Key points	106
4 Serological Testing	39		
Introduction	39	10 Testing of Cellular Immune Function	107
Serological tests	40	Introduction	107
Key points	48	Lymphocyte stimulation tests	108
		Tests of cytotoxic function	109
		Tests of phagocytic cell function	110
		Key points	111
5 Cells and Tissues of the Immune System	49		
Introduction	49	11 Immune Suppression	112
Primary lymphoid tissue	49	Introduction	112
Secondary lymphoid tissue	51	Antigen usage	112
Lymphocytes	54	Antibody-mediated suppression	113
Distinguishing between immune cells	56	The neuroendocrine–immunological loop	114
Lymphocyte recirculation	60	Regulatory (suppressor) T lymphocytes	115
The common mucosal system	64	Key points	119
Key points	64		
		12 Hypersensitivity Mechanisms	120
6 The Major Histocompatibility Complex	65	Introduction	120
Introduction	65	The Gell and Coombs classification of hypersensitivity	120
Graft rejection	65	Type I hypersensitivity	121
Major histocompatibility antigens	66	Type II hypersensitivity	123
The major histocompatibility complex	67	Type III hypersensitivity	125
The inheritance of MHC	68	Type IV hypersensitivity	127
MHC disease associations	69	Key points	130
Other applications of tissue typing	70		
Key points	71		
7 Antigen Presentation and Cytokines	72		
Introduction	72		
Antigen presenting cells	72		

13 The Immune Response to Infectious Agents	131	19 Immunodeficiency	183
Introduction	131	Introduction	183
The immune response to viral infection	131	Primary immunodeficiency	183
The immune response to bacterial infection	134	Secondary immunodeficiency	189
The immune response to helminth infection	135	Key points	191
The immune response to protozoal infection	136	20 Vaccination	192
The immune response to fungal infection	138	Introduction	192
Key points	140	Passive immunization	192
14 Cancer Immunology and Immune System Neoplasia	141	Active immunization	193
Introduction	141	Types of vaccine	193
Tumour antigens	142	Future vaccine developments	197
The antitumour immune response	142	Basic principles of vaccination	198
Immunotherapy to enhance the antitumour immune response	142	Adverse consequences of vaccination	199
Tumours of the immune system	143	Key points	202
Key points	150	21 Immunotherapy	203
15 Immunological Tolerance	151	Introduction	203
Introduction	151	Immunosuppressive agents	203
Neonatal tolerance	151	Immunostimulatory agents	207
Adult tolerance	152	Allergen-specific immunotherapy	208
Oral tolerance	152	Intravenous immunoglobulin therapy	209
Oral tolerance as immunotherapy	153	Recombinant cytokine therapy	209
Self-tolerance	153	Cytokine gene therapy	210
Key points	154	Monoclonal antibody therapy	210
16 Autoimmunity and Autoimmune Disease	155	Antigen-specific immunotherapy	211
Introduction	155	Parasite therapy	212
Autoimmune disease	156	Gene therapy	212
The genetic basis for autoimmunity	156	Stem cell therapy	212
Age susceptibility to autoimmune disease	157	Adjunct immunotherapy	212
Hormonal influence on autoimmunity	157	Key points	214
Primary versus secondary autoimmune disease	158	22 Case Studies in Clinical Immunology	215
Immunodiagnostic tests for autoimmunity	162	Introduction	215
Key points	165	The basis of immune-mediated disease	215
17 Allergy	166	How common is immune-mediated disease?	216
Introduction	166	Immunodiagnosis	216
Factors predisposing to allergic disease	167	Case 1. Canine immune-mediated haemolytic anaemia	217
The hygiene hypothesis	168	Case 2. Canine immune-mediated thrombocytopenia	218
Allergic diseases in animals	169	Case 3. Canine systemic lupus erythematosus	220
Diagnosis of allergic disease	172	Case 4. Feline blood transfusion	222
Key points	174	Case 5. Feline multiple myeloma	224
18 Immune System Ontogeny and Neonatal Immunology	175	Case 6. Equine purpura haemorrhagica	226
Introduction	175	Case 7. Bovine thymic lymphoma	227
Immune system ontogeny	175	Case 8. Canine atopic dermatitis	228
Passive transfer of maternal immune protection	175	Case 9. Equine severe combined immunodeficiency	229
Neonatal vaccination	177	Case 10. Canine lymphocytic thyroiditis	230
Failure of passive transfer	178	Case 11. Canine immune-mediated polyarthritis	232
Primary immunodeficiency	179	Case 12. Canine drug reaction	233
Neonatal isoerythrolysis	180	Case 13. Canine trapped neutrophil syndrome	235
Early life immune development	181	Case 14. Feline lymphoid leukaemia	236
Key points	181	Case 15. Equine neonatal isoerythrolysis	238
		Glossary	239
		Index	251