

Chapter 37

Humoral Immunity and Complement

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REFERENCES

1. Flajnik MF, Kasahara M: Origin and evolution of the adaptive immune system: Genetic events and selective pressures. *Nat Rev Genet* **11**(1):47-59, 2010
2. Abbas AK, Lichtman AH, Pillai S: *Cellular and Molecular Immunology*, 6th edition. Philadelphia, Elsevier Saunders, 2010
3. LeBien TW, Tedder TF: B lymphocytes: How they develop and function. *Blood* **112**(5):1570-1580, 2008
4. Lund FE: Cytokine-producing B lymphocytes—key regulators of immunity. *Curr Opin Immunol* **20**(3):332-338, 2008
5. Alzari PM, Lascombe MB, Poljak RJ: Three-dimensional structure of antibodies. *Annu Rev Immunol* **6**:555-580, 1988
6. Davies DR, Metzger H: Structural basis of antibody function. *Annu Rev Immunol* **1**:87-117, 1983
7. Pan Y, Yuhasz SC, Amzel LM: Anti-idiotypic antibodies: Biological function and structural studies. *Faseb J* **9**(1):43-49, 1995
8. Preud'homme JL et al: Structural and functional properties of membrane and secreted IgD. *Mol Immunol* **37**(15):871-887, 2000
9. Chen K et al: Immunoglobulin D enhances immune surveillance by activating antimicrobial, proinflammatory and B cell-stimulating programs in basophils. *Nat Immunol* **10**(8):889-898, 2009
10. Mostov KE: Transepithelial transport of immunoglobulins. *Annu Rev Immunol* **12**:63-84, 1994
11. Ghetie V, Ward ES: Multiple roles for the major histocompatibility complex class I-related receptor FcRn. *Annu Rev Immunol* **18**:739-766, 2000
12. Honjo T: Immunoglobulin genes. *Annu Rev Immunol* **1**:499-528, 1983
13. Jung D et al: Mechanism and control of V(D)J recombination at the immunoglobulin heavy chain locus. *Annu Rev Immunol* **24**:541-570, 2006
14. Hardy RR, Hayakawa K: B cell development pathways. *Annu Rev Immunol* **19**:595-621, 2001
15. Ademokun A, Turner M: Regulation of B-cell differentiation by microRNAs and RNA-binding proteins. *Biochem Soc Trans* **36**(Pt 6):1191-1193, 2008
16. Norvell A, Mandik L, Monroe JG: Engagement of the antigen-receptor on immature murine B lymphocytes results in death by apoptosis. *J Immunol* **154**(9):4404-4413, 1995
17. Casellas R et al: Contribution of receptor editing to the antibody repertoire. *Science* **291**(5508):1541-1544, 2001
18. Chung JB, Silverman M, Monroe JG: Transitional B cells: Step by step towards immune competence. *Trends Immunol* **24**(6):343-349, 2003
19. Sanz I et al: Phenotypic and functional heterogeneity of human memory B cells. *Semin Immunol* **20**(1):67-82, 2008
20. Fairfax KA et al: Plasma cell development: From B-cell subsets to long-term survival niches. *Semin Immunol* **20**(1):49-58, 2008
21. Benjamin DC et al: The antigenic structure of proteins: A reappraisal. *Annu Rev Immunol* **2**:67-101, 1984
22. Kurosaki T, Hikida M: Tyrosine kinases and their substrates in B lymphocytes. *Immunol Rev* **228**(1):132-148, 2009
23. Mongini PK et al: The affinity threshold for human B cell activation via the antigen receptor complex is reduced upon co-ligation of the antigen receptor with CD21 (CR2). *J Immunol* **159**(8):3782-3791, 1997
24. Gerondakis S, Grumont RJ, Banerjee A: Regulating B-cell activation and survival in response to TLR signals. *Immunol Cell Biol* **85**(6):471-475, 2007
25. Mills DM, Cambier JC: B lymphocyte activation during cognate interactions with CD4+ T lymphocytes: molecular dynamics and immunologic consequences. *Semin Immunol* **15**(6):325-329, 2003
26. Wang S, Chen L: T lymphocyte co-signaling pathways of the B7-CD28 family. *Cell Mol Immunol* **1**(1):37-42, 2004
27. Stavnezer J, Amemiya CT: Evolution of isotype switching. *Semin Immunol* **16**(4):257-275, 2004

28. Fagarasan S, Honjo T: Intestinal IgA synthesis: Regulation of front-line body defences. *Nat Rev Immunol* **3**(1):63-72, 2003
29. Martin A, Scharff MD: Immunology. Antibody alterations. *Nature* **412**(6850):870-871, 2001
30. Peled JU et al: The biochemistry of somatic hypermutation. *Annu Rev Immunol* **26**:481-511, 2008
31. Longerich S et al: AID in somatic hypermutation and class switch recombination. *Curr Opin Immunol* **18**(2):164-174, 2006
32. Shapiro-Shelef M, Calame K: Regulation of plasma-cell development. *Nat Rev Immunol* **5**(3):230-242, 2005
33. Mond JJ, Lees A, Snapper CM: T cell-independent antigens type 2. *Annu Rev Immunol* **13**:655-692, 1995
34. Boes M: Role of natural and immune IgM antibodies in immune responses. *Mol Immunol* **37**(18):1141-1149, 2000
35. Ravetch JV, Bolland S: IgG Fc receptors. *Annu Rev Immunol* **19**:275-290, 2001
36. Daeron M: Fc receptor biology. *Annu Rev Immunol* **15**:203-234, 1997
37. Cambier JC, Fong D, Tamir I: The unexpected complexity of Fc gamma RIIb signal transduction. *Curr Top Microbiol Immunol* **244**:43-55, 1999
38. Paller AS: Genetic immunodeficiency disorders. *Clin Dermatol* **23**(1):68-77, 2005
39. Cerroni L, Kerl H: New concepts in cutaneous B-cell lymphomas. *Curr Top Pathol* **94**:79-91, 2001
40. Hjelmstrom P: Lymphoid neogenesis: De novo formation of lymphoid tissue in chronic inflammation through expression of homing chemokines. *J Leukoc Biol* **69**(3):331-339, 2001
41. Kay AB: Allergy and allergic diseases. Second of two parts. *N Engl J Med* **344**(2):109-113, 2001
42. Fiorentino DF: Cutaneous vasculitis. *J Am Acad Dermatol* **48**(3):311-340, 2003
43. Payne AS et al: Desmosomes and disease: Pemphigus and bullous impetigo. *Curr Opin Cell Biol* **16**(5):536-543, 2004
44. Manjarrez-Orduno N, Quach TD, Sanz I: B cells and immunological tolerance. *J Invest Dermatol* **129**(2):278-288, 2009
45. James JA, Harley JB, Scofield RH: Epstein-Barr virus and systemic lupus erythematosus. *Curr Opin Rheumatol* **18**(5):462-467, 2006
46. Walport MJ: Complement. First of two parts. *N Engl J Med* **344**(14):1058-1066, 2001
47. Walport MJ: Complement. Second of two parts. *N Engl J Med* **344**(15):1140-1144, 2001
48. Nonaka M, Kimura A: Genomic view of the evolution of the complement system. *Immunogenetics* **58**(9):701-713, 2006
49. Krushkal J, Kemper C, Gigli I: Ancient origin of human complement factor H. *J Mol Evol* **47**(5):625-630, 1998
50. Janssen BJ et al: Structures of complement component C3 provide insights into the function and evolution of immunity. *Nature* **437**(7058):505-511, 2005
51. Liddington R, Bankston L: Structural biology: Origins of chemical biodefence. *Nature* **437**(7058):484-485, 2005
52. Kim DD, Song WC: Membrane complement regulatory proteins. *Clin Immunol* **118**(2-3):127-136, 2006
53. Holmskov U, Thiel S, Jensenius JC: Collections and ficolins: Humoral lectins of the innate immune defense. *Annu Rev Immunol* **21**:547-578, 2003
54. Rossi V et al: Substrate specificities of recombinant mannan-binding lectin-associated serine proteases-1 and -2. *J Biol Chem* **276**(44):40880-40887, 2001
55. Cole DS, Morgan BP: Beyond lysis: How complement influences cell fate. *Clin Sci (Lond)* **104**(5):455-466, 2003
56. Viedt C et al: The terminal complement complex C5b-9 stimulates interleukin-6 production in human smooth muscle cells through activation of transcription factors NF-kappa B and AP-1. *Faseb J* **14**(15):2370-2372, 2000
57. Hansch GM et al: Macrophages release arachidonic acid, prostaglandin E2, and thromboxane in response to late complement components. *J Immunol* **133**(4):2145-2150, 1984
58. Takano T et al: Complement C5b-9 induces cyclooxygenase-2 gene transcription in glomerular epithelial cells. *Am J Physiol Renal Physiol* **281**(5):F841-850, 2001
59. Holers VM: Complement receptors and the shaping of the natural antibody repertoire. *Springer Semin Immunopathol* **26**(4):405-423, 2005
60. Hummelshoj T et al: Molecular organization of human Ficolin-2. *Mol Immunol* **44**(4):401-411, 2007. Epub Apr 1 2006.
61. Guo RF, Ward PA: Role of C5a in inflammatory responses. *Annu Rev Immunol* **23**:821-852, 2005
62. Dovezenski N, Billetta R, Gigli I: Expression and localization of proteins of the complement system in human skin. *J Clin Invest* **90**(5):2000-2012, 1992

63. Dempsey PW et al: C3d of complement as a molecular adjuvant: Bridging innate and acquired immunity. *Science* **271**(5247):348-350, 1996
64. Mayadas TN, Cullere X: Neutrophil beta2 integrins: Moderators of life or death decisions. *Trends Immunol* **26**(7):388-395, 2005
65. Kang YS et al: A dominant complement fixation pathway for pneumococcal polysaccharides initiated by SIGN-R1 interacting with C1q. *Cell* **125**(1):47-58, 2006
66. Gorgani NN et al: Complement receptor of the Ig superfamily enhances complement-mediated phagocytosis in a subpopulation of tissue resident macrophages. *J Immunol* **181**(11):7902-7908, 2008
67. Podack ER, Preissner KT, Muller-Eberhard HJ: Inhibition of C9 polymerization within the SC5b-9 complex of complement by S-protein. *Acta Pathol Microbiol Immunol Scand Suppl* **284**:89-96, 1984
68. Willemse JL, Hendriks DF: A rapid and sensitive assay for the quantitation of carboxypeptidase N, an important regulator of inflammation. *Clin Chim Acta* **371**(1-2):124-129, 2006.
69. Campbell WD et al: Inactivation of C3a and C5a octapeptides by carboxypeptidase R and carboxypeptidase N. *Microbiol Immunol* **46**(2):131-134, 2002
70. Sjöholm AG et al: Complement deficiency and disease: An update. *Mol Immunol* **43**(1-2):78-85, 2006
71. Worthley DL, Bardy PG, Mullighan CG: Mannose-binding lectin: Biology and clinical implications. *Intern Med J* **35**(9):548-555, 2005
72. Sorensen R, Thiel S, Jensenius JC: Mannan-binding-lectin-associated serine proteases, characteristics and disease associations. *Springer Semin Immunopathol* **27**(3):299-319, 2005
73. Gelfand JA: The role of complement in urticaria and angioedema. *Clin Immunol Rev* **1**(2):257-309, 1981
74. Miyata T et al: Abnormalities of PIG-A transcripts in granulocytes from patients with paroxysmal nocturnal hemoglobinuria. *N Engl J Med* **330**(4):249-255, 1994
75. Atkinson JP et al: Hemolytic uremic syndrome: An example of insufficient complement regulation on self-tissue. *Ann N Y Acad Sci* **1056**:144-152, 2005
76. Patel N, Adewoyin T, Chong NV: Age-related macular degeneration: A perspective on genetic studies. *Eye (Lond)* **22**(6):768-776, 2008
77. Molina H: Update on complement in the pathogenesis of systemic lupus erythematosus. *Curr Opin Rheumatol* **14**(5):492-497, 2002
78. Carroll MC: A protective role for innate immunity in systemic lupus erythematosus. *Nat Rev Immunol* **4**(10):825-831, 2004
79. Wilson JG et al: Decreased expression of the C3b/C4b receptor (CR1) and the C3d receptor (CR2) on B lymphocytes and of CR1 on neutrophils of patients with systemic lupus erythematosus. *Arthritis Rheum* **29**(6):739-747, 1986
80. Norsworthy P, Davies KA: Complement components and their autoantibodies. *Mol Biotechnol* **23**(3):259-270, 2003
81. Moroni G et al: Anti-C1q antibodies may help in diagnosing a renal flare in lupus nephritis. *Am J Kidney Dis* **37**(3):490-498, 2001
82. Niculescu F, Rus H. The role of complement activation in atherosclerosis. *Immunol Res* **30**(1):73-80, 2004
83. Szeplaki G et al: Role of complement in the pathomechanism of atherosclerotic vascular diseases. *Mol Immunol* **46**(14):2784-2793, 2009
84. Acosta J et al: Molecular basis for a link between complement and the vascular complications of diabetes. *Proc Natl Acad Sci U S A* **97**(10):5450-5455, 2000
85. Blom AM, Hallstrom T, Riesbeck K: Complement evasion strategies of pathogens-acquisition of inhibitors and beyond. *Mol Immunol* **46**(14):2808-2817, 2009
86. Stoiber H, Clivio A, Dierich MP: Role of complement in HIV infection. *Annu Rev Immunol* **15**:649-674, 1997

