

---

---

# *Bibliography*

---

---

- 
- A, S.K., Bansal, K., Holla, S., Verma-Kumar, S., Sharma, P. and Balaji, K.N. (2012). ESAT-6 induced COX-2 expression involves coordinated interplay between PI3K and MAPK signaling. *Mol Immunol* **49**, 655-663.
- Abbas, A.K., Murphy, K.M. and Sher, A. (1996). Functional diversity of helper T lymphocytes. *Nature* **383**, 787-793.
- Abebe, F. and Bjune, G. (2009). The protective role of antibody responses during *Mycobacterium tuberculosis* infection. *Clin Exp Immunol* **157**, 235-243.
- Abel, B., Thieblemont, N., Quesniaux, V.J., Brown, N., Mpagi, J., Miyake, K., *et al.* (2002). Toll-like receptor 4 expression is required to control chronic *Mycobacterium tuberculosis* infection in mice. *J Immunol* **169**, 3155-3162.
- Ackerman, A.L., Kyritsis, C., Tampe, R. and Cresswell, P. (2005). Access of soluble antigens to the endoplasmic reticulum can explain cross-presentation by dendritic cells. *Nat Immunol* **6**, 107-113.
- Adams, D.O. and Hamilton, T.A. (1984). The cell biology of macrophage activation. *Annu Rev Immunol* **2**, 283-318.
- Aderem, A. and Ulevitch, R.J. (2000). Toll-like receptors in the induction of the innate immune response. *Nature* **406**, 782-787.
- Aderem, A. and Underhill, D.M. (1999). Mechanisms of phagocytosis in macrophages. *Annu Rev Immunol* **17**, 593-623.
- Agrawal, S., Agrawal, A., Doughty, B., Gerwitz, A., Blenis, J., Van Dyke, T. and Pulendran, B. (2003). Cutting edge: different Toll-like receptor agonists instruct dendritic cells to induce distinct Th responses via differential modulation of extracellular signal-regulated kinase-mitogen-activated protein kinase and c-Fos. *J Immunol* **171**, 4984-4989.
- Akira, S. and Hoshino, K. (2003). Myeloid differentiation factor 88-dependent and -independent pathways in toll-like receptor signaling. *J Infect Dis* **187 Suppl 2**, S356-363.
- Akira, S., Uematsu, S. and Takeuchi, O. (2006). Pathogen recognition and innate immunity. *Cell* **124**, 783-801.
- Alberts, B. (2002). *Molecular biology of the cell*. New York, Garland Science.
- Albiger, B., Dahlberg, S., Henriques-Normark, B. and Normark, S. (2007). Role of the innate immune system in host defence against bacterial infections: focus on the Toll-like receptors. *J Intern Med* **261**, 511-528.
-

- Algood, H.M., Lin, P.L. and Flynn, J.L. (2005). Tumor necrosis factor and chemokine interactions in the formation and maintenance of granulomas in tuberculosis. *Clin Infect Dis* **41 Suppl 3**, S189-193.
- Altare, F., Durandy, A., Lammas, D., Emile, J.F., Lamhamedi, S., Le Deist, F., *et al.* (1998a). Impairment of mycobacterial immunity in human interleukin-12 receptor deficiency. *Science* **280**, 1432-1435.
- Altare, F., Lammas, D., Revy, P., Jouanguy, E., Doffinger, R., Lamhamedi, S., *et al.* (1998). Inherited interleukin 12 deficiency in a child with bacille Calmette-Guerin and *Salmonella enteritidis* disseminated infection. *J Clin Invest* **102**, 2035-2040.
- Amara, U., Rittirsch, D., Flierl, M., Bruckner, U., Klos, A., Gebhard, F., *et al.* (2008). Interaction between the coagulation and complement system. *Adv Exp Med Biol* **632**, 71-79.
- Ananthan, J., Goldberg, A.L. and Voellmy, R. (1986). Abnormal proteins serve as eukaryotic stress signals and trigger the activation of heat shock genes. *Science* **232**, 522-524.
- Anderson, K.V., Jurgens, G. and Nusslein-Volhard, C. (1985). Establishment of dorsal-ventral polarity in the *Drosophila* embryo: genetic studies on the role of the Toll gene product. *Cell* **42**, 779-789.
- Armstrong, J.A. and Hart, P.D. (1975). Phagosome-lysosome interactions in cultured macrophages infected with virulent tubercle bacilli. Reversal of the usual nonfusion pattern and observations on bacterial survival. *J Exp Med* **142**, 1-16.
- Arnon, T.I., Markel, G. and Mandelboim, O. (2006). Tumor and viral recognition by natural killer cells receptors. *Semin Cancer Biol* **16**, 348-358.
- Asea, A. (2008). Heat shock proteins and toll-like receptors. *Handb Exp Pharmacol*, 111-127.
- Asea, A., Kraeft, S.K., Kurt-Jones, E.A., Stevenson, M.A., Chen, L.B., Finberg, R.W., *et al.* (2000). HSP70 stimulates cytokine production through a CD14-dependant pathway, demonstrating its dual role as a chaperone and cytokine. *Nat med* **6**, 435-442.
- Aste-Amezaga, M., Ma, X., Sartori, A. and Trinchieri, G. (1998). Molecular mechanisms of the induction of IL-12 and its inhibition by IL-10. *J Immunol* **160**, 5936-5944.
-

- 
- Ausiello, C.M., Fedele, G., Palazzo, R., Spensieri, F., Ciervo, A. and Cassone, A. (2006). 60-kDa heat shock protein of *Chlamydia pneumoniae* promotes a T helper type 1 immune response through IL-12/IL-23 production in monocyte-derived dendritic cells. *Microbes Infect* **8**, 714-720.
- Bafica, A., Scanga, C.A., Feng, C.G., Leifer, C., Cheever, A. and Sher, A. (2005). TLR9 regulates Th1 responses and cooperates with TLR2 in mediating optimal resistance to *Mycobacterium tuberculosis*. *J Exp Med* **202**, 1715-1724.
- Bagai, R., Valujskikh, A., Canaday, D.H., Bailey, E., Lalli, P.N., Harding, C.V. and Heeger, P.S. (2005). Mouse endothelial cells cross-present lymphocyte-derived antigen on class I MHC via a TAP1- and proteasome-dependent pathway. *J Immunol* **174**, 7711-7715.
- Balcewicz-Sablinska, M.K., Keane, J., Kornfeld, H. and Remold, H.G. (1998). Pathogenic *Mycobacterium tuberculosis* evades apoptosis of host macrophages by release of TNF-R2, resulting in inactivation of TNF- $\alpha$ . *J Immunol* **161**, 2636-2641.
- Baldwin, A.S., Jr. (1996). The NF- $\kappa$ B and I $\kappa$ B proteins: new discoveries and insights. *Annu Rev Immunol* **14**, 649-683.
- Baliko, Z., Szereday, L. and Szekeres-Bartho, J. (1998). Th2 biased immune response in cases with active *Mycobacterium tuberculosis* infection and tuberculin anergy. *FEMS Immunol Med Microbiol* **22**, 199-204.
- Barnes, P.F., Fong, S.J., Brennan, P.J., Twomey, P.E., Mazumder, A. and Modlin, R.L. (1990). Local production of tumor necrosis factor and IFN- $\gamma$  in tuberculous pleuritis. *J Immunol* **145**, 149-154.
- Barry, M. and Bleackley, R.C. (2002). Cytotoxic T lymphocytes: all roads lead to death. *Nat Rev Immunol* **2**, 401-409.
- Barton, G.M. and Medzhitov, R. (2004). Toll signaling: RIPping off the TNF pathway. *Nat Immunol* **5**, 472-474.
- Basu, D., Khare, G., Singh, S., Tyagi, A., Khosla, S. and Mande, S.C. (2009). A novel nucleoid-associated protein of *Mycobacterium tuberculosis* is a sequence homolog of GroEL. *Nucleic Acids Res* **37**, 4944-4954.
- Basu, S., Binder, R.J., Suto, R., Anderson, K.M. and Srivastava, P.K. (2000). Necrotic but not apoptotic cell death releases heat shock proteins, which deliver a partial maturation signal to dendritic cells and activate the NF- $\kappa$ B pathway. *Int Immunol* **12**, 1539-1546.
-

- 
- Basu, S., Pathak, S.K., Banerjee, A., Pathak, S., Bhattacharyya, A., Yang, Z., *et al.* (2007). Execution of macrophage apoptosis by PE\_PGRS33 of *Mycobacterium tuberculosis* is mediated by Toll-like receptor 2-dependent release of tumor necrosis factor- $\alpha$ . *J Biol Chem* **282**, 1039-1050.
- Bauer, S., Kirschning, C.J., Hacker, H., Redecke, V., Hausmann, S., Akira, S., *et al.* (2001). Human TLR9 confers responsiveness to bacterial DNA via species-specific CpG motif recognition. *Proc Natl Acad Sci U S A* **98**, 9237-9242.
- Ben Bacha, A. and Abid, I. (2013). Secretory phospholipase A2 in dromedary tears: a host defense against staphylococci and other gram-positive bacteria. *Appl Biochem Biotechnol* **169**, 1858-1869.
- Bhat, K.H., Chaitanya, C.K., Parveen, N., Varman, R., Ghosh, S. and Mukhopadhyay, S. (2012). Proline-proline-glutamic acid (PPE) protein Rv1168c of *Mycobacterium tuberculosis* augments transcription from HIV-1 long terminal repeat promoter. *J Biol Chem* **287**, 16930-16946.
- Biggar, W.D. and Sturgess, J.M. (1977). Role of lysozyme in the microbicidal activity of rat alveolar macrophages. *Infect Immun* **16**, 974-982.
- Blom, A.M., Hallstrom, T. and Riesbeck, K. (2009). Complement evasion strategies of pathogens-acquisition of inhibitors and beyond. *Mol Immunol* **46**, 2808-2817.
- Blumenthal, A., Ehlers, S., Ernst, M., Flad, H.D. and Reiling, N. (2002). Control of mycobacterial replication in human macrophages: roles of extracellular signal-regulated kinases 1 and 2 and p38 mitogen-activated protein kinase pathways. *Infect Immun* **70**, 4961-4967.
- Boehm, U., Klamp, T., Groot, M. and Howard, J.C. (1997). Cellular responses to interferon- $\gamma$ . *Annu Rev Immunol* **15**, 749-795.
- Bold, T.D. and Ernst, J.D. (2009). Who benefits from granulomas, mycobacteria or host? *Cell* **136**, 17-19.
- Bonecini-Almeida, M.G., Ho, J.L., Boechat, N., Huard, R.C., Chitale, S., Doo, H., *et al.* (2004). Down-modulation of lung immune responses by interleukin-10 and transforming growth factor beta (TGF- $\beta$ ) and analysis of TGF- $\beta$  receptors I and II in active tuberculosis. *Infect Immun* **72**, 2628-2634.
- Bonizzi, G. and Karin, M. (2004). The two NF- $\kappa$ B activation pathways and their role in innate and adaptive immunity. *Trends Immunol* **25**, 280-288.
-

- 
- Borriello, F., Sethna, M.P., Boyd, S.D., Schweitzer, A.N., Tivol, E.A., Jacoby, D., *et al.* (1997). B7-1 and B7-2 have overlapping, critical roles in immunoglobulin class switching and germinal center formation. *Immunity* **6**, 303-313.
- Boussiotis, V.A., Tsai, E.Y., Yunis, E.J., Thim, S., Delgado, J.C., Dascher, C.C., *et al.* (2000). IL-10-producing T cells suppress immune responses in anergic tuberculosis patients. *J Clin Invest* **105**, 1317-1325.
- Bowie, J.U., Luthy, R. and Eisenberg, D. (1991). A method to identify protein sequences that fold into a known three-dimensional structure. *Science* **253**, 164-170.
- Brandstadter, J.D. and Yang, Y. (2011). Natural killer cell responses to viral infection. *J Innate Immun* **3**, 274-279.
- Brandt, E., Woerly, G., Younes, A.B., Loiseau, S. and Capron, M. (2000). IL-4 production by human polymorphonuclear neutrophils. *J Leukoc Biol* **68**, 125-130.
- Brogden, K.A., Ackermann, M., McCray, P.B., Jr. and Tack, B.F. (2003). Antimicrobial peptides in animals and their role in host defences. *Int J Antimicrob Agents* **22**, 465-478.
- Broz, P., Ohlson, M.B. and Monack, D.M. (2012). Innate immune response to *Salmonella typhimurium*, a model enteric pathogen. *Gut microbes* **3**, 62-70.
- Bulut, Y., Faure, E., Thomas, L., Karahashi, H., Michelsen, K.S., Equils, O., *et al.* (2002). Chlamydial heat shock protein 60 activates macrophages and endothelial cells through Toll-like receptor 4 and MD2 in a MyD88-dependent pathway. *J Immunol* **168**, 1435-1440.
- Bulut, Y., Michelsen, K.S., Hayrapetian, L., Naiki, Y., Spallek, R., Singh, M. and Arditi, M. (2005). *Mycobacterium tuberculosis* heat shock proteins use diverse Toll-like receptor pathways to activate pro-inflammatory signals. *J Biol Chem* **280**, 20961-20967.
- Cabo-Bilbao, A., Spinelli, S., Sot, B., Agirre, J., Mechaly, A.E., Muga, A. and Guerin, D.M. (2006). Crystal structure of the temperature-sensitive and allosteric-defective chaperonin GroELE461K. *J Struct Biol* **155**, 482-492.
- Cambi, A., Koopman, M. and Figdor, C.G. (2005). How C-type lectins detect pathogens. *Cell Microbiol* **7**, 481-488.
- Campbell, R.M. and Scanes, C.G. (1995). Endocrine peptides 'moonlighting' as immune modulators: roles for somatostatin and GH-releasing factor. *J Endocrinol* **147**, 383-396.
-

- 
- Carpenter, S. and O'Neill, L.A. (2007). How important are Toll-like receptors for antimicrobial responses? *Cell Microbiol* **9**, 1891-1901.
- Carsetti, R. (2000). The development of B cells in the bone marrow is controlled by the balance between cell-autonomous mechanisms and signals from the microenvironment. *J Exp Med* **191**, 5-8.
- Carta, S., Tassi, S., Pettinati, I., Delfino, L., Dinarello, C.A. and Rubartelli, A. (2011). The rate of interleukin-1 $\beta$  secretion in different myeloid cells varies with the extent of redox response to Toll-like receptor triggering. *J Biol Chem* **286**, 27069-27080.
- Carty, M., Goodbody, R., Schroder, M., Stack, J., Moynagh, P.N. and Bowie, A.G. (2006). The human adaptor SARM negatively regulates adaptor protein TRIF-dependent Toll-like receptor signaling. *Nat Immunol* **7**, 1074-1081.
- Cavalli, V., Corti, M. and Gruenberg, J. (2001). Endocytosis and signaling cascades: a close encounter. *FEBS Lett* **498**, 190-196.
- Chacon-Salinas, R., Serafin-Lopez, J., Ramos-Payan, R., Mendez-Aragon, P., Hernandez-Pando, R., Van Soolingen, D., *et al.* (2005). Differential pattern of cytokine expression by macrophages infected *in vitro* with different *Mycobacterium tuberculosis* genotypes. *Clin Exp Immunol* **140**, 443-449.
- Chan, J. and Flynn, J. (2004). The immunological aspects of latency in tuberculosis. *Clin Immunol* **110**, 2-12.
- Chaplin, D.D. (2010). Overview of the immune response. *J Allergy Clin Immunol* **125**, S3-23.
- Chapman, H.A. (1998). Endosomal proteolysis and MHC class II function. *Curr Opin Immunol* **10**, 93-102.
- Chen, X., Liang, H., Zhang, J., Zen, K. and Zhang, C.Y. (2013). microRNAs are ligands of Toll-like receptors. *RNA* **19**, 737-739.
- Chi, H., Barry, S.P., Roth, R.J., Wu, J.J., Jones, E.A., Bennett, A.M. and Flavell, R.A. (2006). Dynamic regulation of pro- and anti-inflammatory cytokines by MAPK phosphatase 1 (MKP-1) in innate immune responses. *Proc Natl Acad Sci U S A* **103**, 2274-2279.
- Chuang, T. and Ulevitch, R.J. (2001). Identification of hTLR10: a novel human Toll-like receptor preferentially expressed in immune cells. *Biochim Biophys Acta* **1518**, 157-161.
-

- 
- Chuang, T.H. and Ulevitch, R.J. (2000). Cloning and characterization of a sub-family of human toll-like receptors: hTLR7, hTLR8 and hTLR9. *Eur Cytokine Netw* **11**, 372-378.
- Clark, A.C., Ramanathan, R. and Frieden, C. (1998). Purification of GroEL with low fluorescence background. *Methods Enzymol* **290**, 100-118.
- Coban, C., Igari, Y., Yagi, M., Reimer, T., Koyama, S., Aoshi, T., *et al.* (2010). Immunogenicity of whole-parasite vaccines against *Plasmodium falciparum* involves malarial hemozoin and host TLR9. *Cell Host Microbe* **7**, 50-61.
- Coban, C., Ishii, K.J., Kawai, T., Hemmi, H., Sato, S., Uematsu, S., *et al.* (2005). Toll-like receptor 9 mediates innate immune activation by the malaria pigment hemozoin. *J Exp Med* **201**, 19-25.
- Collins, H.L. and Kaufmann, S.H. (2001). The many faces of host responses to tuberculosis. *Immunology* **103**, 1-9.
- Constant, S.L. and Bottomly, K. (1997). Induction of Th1 and Th2 CD4<sup>+</sup> T cell responses: the alternative approaches. *Annu Rev Immunol* **15**, 297-322.
- Cooper, A.M. (2009). Cell-mediated immune responses in tuberculosis. *Annu Rev Immunol* **27**, 393-422.
- Cooper, A.M., Dalton, D.K., Stewart, T.A., Griffin, J.P., Russell, D.G. and Orme, I.M. (1993). Disseminated tuberculosis in interferon  $\gamma$  gene-disrupted mice. *J Exp Med* **178**, 2243-2247.
- Cooper, A.M., Magram, J., Ferrante, J. and Orme, I.M. (1997). Interleukin 12 (IL-12) is crucial to the development of protective immunity in mice intravenously infected with *Mycobacterium tuberculosis*. *J Exp Med* **186**, 39-45.
- Cosma, C.L., Sherman, D.R. and Ramakrishnan, L. (2003). The secret lives of the pathogenic mycobacteria. *Annu Rev Microbiol* **57**, 641-676.
- Cresswell, P., Ackerman, A.L., Giodini, A., Peaper, D.R. and Wearsch, P.A. (2005). Mechanisms of MHC class I-restricted antigen processing and cross-presentation. *Immunol Rev* **207**, 145-157.
- Crozat, K. and Beutler, B. (2004). TLR7: A new sensor of viral infection. *Proc Natl Acad Sci U S A* **101**, 6835-6836.
- Cusson-Hermance, N., Khurana, S., Lee, T.H., Fitzgerald, K.A. and Kelliher, M.A. (2005). Rip1 mediates the Trif-dependent toll-like receptor 3- and 4-induced NF-
-



- 
- $\kappa$ B activation but does not contribute to interferon regulatory factor 3 activation. *J Biol Chem* **280**, 36560-36566.
- D'Andrea, A., Aste-Amezaga, M., Valiante, N.M., Ma, X., Kubin, M. and Trinchieri, G. (1993). Interleukin 10 (IL-10) inhibits human lymphocyte interferon  $\gamma$ -production by suppressing natural killer cell stimulatory factor/IL-12 synthesis in accessory cells. *J Exp Med* **178**, 1041-1048.
- Daigneault, M., Preston, J.A., Marriott, H.M., Whyte, M.K. and Dockrell, D.H. (2010). The identification of markers of macrophage differentiation in PMA-stimulated THP-1 cells and monocyte-derived macrophages. *PLoS One* **5**, e8668.
- Dale, D.C., Boxer, L. and Liles, W.C. (2008). The phagocytes: neutrophils and monocytes. *Blood* **112**, 935-945.
- Davies, P.J., Davies, D.R., Levitzki, A., Maxfield, F.R., Milhaud, P., Willingham, M.C. and Pastan, I.H. (1980). Transglutaminase is essential in receptor-mediated endocytosis of  $\alpha$ 2-macroglobulin and polypeptide hormones. *Nature* **283**, 162-167.
- Davis, J.M. and Ramakrishnan, L. (2009). The role of the granuloma in expansion and dissemination of early tuberculous infection. *Cell* **136**, 37-49.
- Davis, K.M. and Weiser, J.N. (2011). Modifications to the peptidoglycan backbone help bacteria to establish infection. *Infect Immun* **79**, 562-570.
- del Cerro-Vadillo, E., Madrazo-Toca, F., Carrasco-Marin, E., Fernandez-Prieto, L., Beck, C., Leyva-Cobian, F., *et al.* (2006). Cutting edge: a novel nonoxidative phagosomal mechanism exerted by cathepsin-D controls *Listeria monocytogenes* intracellular growth. *J Immunol* **176**, 1321-1325.
- Doz, E., Lombard, R., Carreras, F., Buzoni-Gatel, D. and Winter, N. (2013). Mycobacteria-infected dendritic cells attract neutrophils that produce IL-10 and specifically shut down Th17 CD4 T cells through their IL-10 receptor. *J Immunol* **191**, 3818-3826.
- Doz, E., Rose, S., Nigou, J., Gilleron, M., Puzo, G., Erard, F., *et al.* (2007). Acylation determines the toll-like receptor (TLR)-dependent positive versus TLR2-, mannose receptor-, and SIGNR1-independent negative regulation of pro-inflammatory cytokines by mycobacterial lipomannan. *J Biol Chem* **282**, 26014-26025.
-

- 
- Drennan, M.B., Nicolle, D., Quesniaux, V.J., Jacobs, M., Allie, N., Mpagi, J., *et al.* (2004). Toll-like receptor 2-deficient mice succumb to *Mycobacterium tuberculosis* infection. *Am J Pathol* **164**, 49-57.
- Du, X., Poltorak, A., Wei, Y. and Beutler, B. (2000). Three novel mammalian toll-like receptors: gene structure, expression, and evolution. *Eur Cytokine Netw* **11**, 362-371.
- Dutton, R.W., McCarthy, M.M., Mishell, R.I. and Raidt, D.J. (1970). Cell components in the immune response. IV. Relationships and possible interactions. *Cell Immunol* **1**, 196-206.
- Dybdahl, B., Wahba, A., Lien, E., Flo, T.H., Waage, A., Qureshi, N., *et al.* (2002). Inflammatory response after open heart surgery: release of heat-shock protein 70 and signaling through toll-like receptor-4. *Circulation* **105**, 685-690.
- Echchannaoui, H., Frei, K., Schnell, C., Leib, S.L., Zimmerli, W. and Landmann, R. (2002). Toll-like receptor 2-deficient mice are highly susceptible to *Streptococcus pneumoniae* meningitis because of reduced bacterial clearing and enhanced inflammation. *J Infect Dis* **186**, 798-806.
- Edwards, J.P., Zhang, X., Frauwirth, K.A. and Mosser, D.M. (2006). Biochemical and functional characterization of three activated macrophage populations. *J Leukoc Biol* **80**, 1298-1307.
- Elhelu, M.A. (1983). The role of macrophages in immunology. *J Natl Med Assoc* **75**, 314-317.
- Elliott, T. and Williams, A. (2005). The optimization of peptide cargo bound to MHC class I molecules by the peptide-loading complex. *Immunol Rev* **207**, 89-99.
- Ellner, J.J. (1996). Immunosuppression in tuberculosis. *Infect Agents Dis* **5**, 62-72.
- Ellner, J.J., Hirsch, C.S. and Whalen, C.C. (2000). Correlates of protective immunity to *Mycobacterium tuberculosis* in humans. *Clin Infect Dis* **30 Suppl 3**, S279-282.
- Ernst, J.D. (1998). Macrophage receptors for *Mycobacterium tuberculosis*. *Infect Immun* **66**, 1277-1281.
- Erwig, L.P. and Henson, P.M. (2007). Immunological consequences of apoptotic cell phagocytosis. *Am J Pathol* **171**, 2-8.
- Eswar, N., Webb, B., Marti-Renom, M.A., Madhusudhan, M.S., Eramian, D., Shen, M.Y., *et al.* (2007). Comparative protein structure modeling using MODELLER. *Curr Protoc Protein Sci* **Chapter 2**, Unit 2 9.
-

- 
- Fabbri, M. (2012). TLRs as miRNA receptors. *Cancer Res* **72**, 6333-6337.
- Fabbri, M., Paone, A., Calore, F., Galli, R. and Croce, C.M. (2013). A new role for microRNAs, as ligands of Toll-like receptors. *RNA Biol* **10**, 169-174.
- Fayyazi, A., Eichmeyer, B., Soruri, A., Schweyer, S., Herms, J., Schwarz, P. and Radzun, H.J. (2000). Apoptosis of macrophages and T cells in tuberculosis associated caseous necrosis. *J Pathol* **191**, 417-425.
- Feng, C.G., Scanga, C.A., Collazo-Custodio, C.M., Cheever, A.W., Hieny, S., Caspar, P. and Sher, A. (2003). Mice lacking myeloid differentiation factor 88 display profound defects in host resistance and immune responses to *Mycobacterium avium* infection not exhibited by Toll-like receptor 2 (TLR2)- and TLR4-deficient animals. *J Immunol* **171**, 4758-4764.
- Fenhalls, G., Wong, A., Bezuidenhout, J., van Helden, P., Bardin, P. and Lukey, P.T. (2000). In situ production of gamma interferon, interleukin-4, and tumor necrosis factor alpha mRNA in human lung tuberculous granulomas. *Infect Immun* **68**, 2827-2836.
- Fenton, M.J. and Golenbock, D.T. (1998). LPS-binding proteins and receptors. *J Leukoc Biol* **64**, 25-32.
- Fink, A.L. (1999). Chaperone-mediated protein folding. *Physiol Rev* **79**, 425-449.
- Fiorentino, D.F., Zlotnik, A., Mosmann, T.R., Howard, M. and O'Garra, A. (1991a). IL-10 inhibits cytokine production by activated macrophages. *J Immunol* **147**, 3815-3822.
- Fiorentino, D.F., Zlotnik, A., Vieira, P., Mosmann, T.R., Howard, M., Moore, K.W. and O'Garra, A. (1991b). IL-10 acts on the antigen-presenting cell to inhibit cytokine production by Th1 cells. *J Immunol* **146**, 3444-3451.
- Fitzgerald, K.A., Rowe, D.C., Barnes, B.J., Caffrey, D.R., Visintin, A., Latz, E., *et al.* (2003). LPS-TLR4 signaling to IRF-3/7 and NF- $\kappa$ B involves the toll adapters TRAM and TRIF. *J Exp Med* **198**, 1043-1055.
- Flesch, I.E. and Kaufmann, S.H. (1990). Activation of tuberculostatic macrophage functions by gamma interferon, interleukin-4, and tumor necrosis factor. *Infect Immun* **58**, 2675-2677.
- Flohe, S.B., Bruggemann, J., Lendemans, S., Nikulina, M., Meierhoff, G., Flohe, S. and Kolb, H. (2003). Human heat shock protein 60 induces maturation of dendritic cells versus a Th1-promoting phenotype. *J Immunol* **170**, 2340-2348.
-

- 
- Flynn, J.L. (2004). Immunology of tuberculosis and implications in vaccine development. *Tuberculosis (Edinb)* **84**, 93-101.
- Flynn, J.L. and Chan, J. (2001). Immunology of tuberculosis. *Annu Rev Immunol* **19**, 93-129.
- Flynn, J.L. and Chan, J. (2003). Immune evasion by *Mycobacterium tuberculosis*: living with the enemy. *Curr Opin Immunol* **15**, 450-455.
- Flynn, J.L., Chan, J., Triebold, K.J., Dalton, D.K., Stewart, T.A. and Bloom, B.R. (1993). An essential role for interferon  $\gamma$  in resistance to *Mycobacterium tuberculosis* infection. *J Exp Med* **178**, 2249-2254.
- Flynn, J.L., Goldstein, M.M., Chan, J., Triebold, K.J., Pfeffer, K., Lowenstein, C.J., *et al.* (1995). Tumor necrosis factor- $\alpha$  is required in the protective immune response against *Mycobacterium tuberculosis* in mice. *Immunity* **2**, 561-572.
- Fortune, S.M., Solache, A., Jaeger, A., Hill, P.J., Belisle, J.T., Bloom, B.R., *et al.* (2004). *Mycobacterium tuberculosis* inhibits macrophage responses to IFN- $\gamma$  through myeloid differentiation factor 88-dependent and -independent mechanisms. *J Immunol* **172**, 6272-6280.
- Franchi, L., Warner, N., Viani, K. and Nunez, G. (2009). Function of Nod-like receptors in microbial recognition and host defense. *Immunol Rev* **227**, 106-128.
- Friedland, J.S., Shattock, R., Remick, D.G. and Griffin, G.E. (1993). Mycobacterial 65-kD heat shock protein induces release of proinflammatory cytokines from human monocytic cells. *Clin Exp Immunol* **91**, 58-62.
- Fukai, T., Okada, A.A., Sakai, J., Kezuka, T., Keino, H., Usui, M., *et al.* (1999). The role of costimulatory molecules B7-1 and B7-2 in mice with experimental autoimmune uveoretinitis. *Graefes Arch Clin Exp Ophthalmol* **237**, 928-933.
- Fulton, S.A., Cross, J.V., Toossi, Z.T. and Boom, W.H. (1998). Regulation of interleukin-12 by interleukin-10, transforming growth factor- $\beta$ , tumor necrosis factor- $\alpha$ , and interferon- $\gamma$  in human monocytes infected with *Mycobacterium tuberculosis* H37Ra. *J Infect Dis* **178**, 1105-1114.
- Gallegos, A.M., Pamer, E.G. and Glickman, M.S. (2008). Delayed protection by ESAT-6-specific effector CD4<sup>+</sup> T cells after airborne *M. tuberculosis* infection. *J Exp Med* **205**, 2359-2368.
- Gantner, B.N., Simmons, R.M., Canavera, S.J., Akira, S. and Underhill, D.M. (2003). Collaborative induction of inflammatory responses by dectin-1 and Toll-like receptor 2. *J Exp Med* **197**, 1107-1117.
-

- 
- Gao, G.F., Tormo, J., Gerth, U.C., Wyer, J.R., McMichael, A.J., Stuart, D.I., *et al.* (1997). Crystal structure of the complex between human CD8 $\alpha\alpha$  and HLA-A2. *Nature* **387**, 630-634.
- Gaston, J.S. (2002). Heat shock proteins and innate immunity. *Clin Exp Immunol* **127**, 1-3.
- Gehring, A.J., Dobos, K.M., Belisle, J.T., Harding, C.V. and Boom, W.H. (2004). *Mycobacterium tuberculosis* LprG (Rv1411c): a novel TLR-2 ligand that inhibits human macrophage class II MHC antigen processing. *J Immunol* **173**, 2660-2668.
- Gehring, A.J., Rojas, R.E., Canaday, D.H., Lakey, D.L., Harding, C.V. and Boom, W.H. (2003). The *Mycobacterium tuberculosis* 19-kilodalton lipoprotein inhibits gamma interferon-regulated HLA-DR and Fc $\gamma$ R1 on human macrophages through Toll-like receptor 2. *Infect Immun* **71**, 4487-4497.
- Geijtenbeek, T.B. and Gringhuis, S.I. (2009). Signalling through C-type lectin receptors: shaping immune responses. *Nat Rev Immunol* **9**, 465-479.
- Gerber, J.S. and Mosser, D.M. (2001). Reversing lipopolysaccharide toxicity by ligating the macrophage Fc $\gamma$  receptors. *J Immunol* **166**, 6861-6868.
- Gercken, J., Pryjma, J., Ernst, M. and Flad, H.D. (1994). Defective antigen presentation by *Mycobacterium tuberculosis*-infected monocytes. *Infect Immun* **62**, 3472-3478.
- Germain, R.N. and Margulies, D.H. (1993). The biochemistry and cell biology of antigen processing and presentation. *Annu Rev Immunol* **11**, 403-450.
- Getz, G.S. (2005). Thematic review series: the immune system and atherogenesis. Bridging the innate and adaptive immune systems. *J Lipid Res* **46**, 619-622.
- Ghorpade, D.S., Holla, S., Sinha, A.Y., Alagesan, S.K. and Balaji, K.N. (2013). Nitric oxide and KLF4 protein epigenetically modify class II transactivator to repress major histocompatibility complex II expression during *Mycobacterium bovis* bacillus Calmette-Guerin infection. *J Biol Chem* **288**, 20592-20606.
- Giodini, A., Rahner, C. and Cresswell, P. (2009). Receptor-mediated phagocytosis elicits cross-presentation in nonprofessional antigen-presenting cells. *Proc Natl Acad Sci U S A* **106**, 3324-3329.
- Gobert, A.P., Bambou, J.C., Werts, C., Balloy, V., Chignard, M., Moran, A.P. and Ferrero, R.L. (2004). *Helicobacter pylori* heat shock protein 60 mediates interleukin-6 production by macrophages via a toll-like receptor (TLR)-2-, TLR-
-

- 
- 4-, and myeloid differentiation factor 88-independent mechanism. *J Biol Chem* **279**, 245-250.
- Gohda, J., Matsumura, T. and Inoue, J. (2004). Cutting edge: TNFR-associated factor (TRAF) 6 is essential for MyD88-dependent pathway but not toll/IL-1 receptor domain-containing adaptor-inducing IFN- $\beta$  (TRIF)-dependent pathway in TLR signaling. *J Immunol* **173**, 2913-2917.
- Goldfeld, A. and Ellner, J.J. (2007). Pathogenesis and management of HIV/TB co-infection in Asia. *Tuberculosis (Edinb)* **87 Suppl 1**, S26-30.
- Gomes, M.S., Florido, M., Cordeiro, J.V., Teixeira, C.M., Takeuchi, O., Akira, S. and Appelberg, R. (2004). Limited role of the Toll-like receptor-2 in resistance to *Mycobacterium avium*. *Immunology* **111**, 179-185.
- Gong, J.H., Zhang, M., Modlin, R.L., Linsley, P.S., Iyer, D., Lin, Y. and Barnes, P.F. (1996). Interleukin-10 downregulates *Mycobacterium tuberculosis*-induced Th1 responses and CTLA-4 expression. *Infect Immun* **64**, 913-918.
- Gonzalez, S., Gonzalez-Rodriguez, A.P., Suarez-Alvarez, B., Lopez-Soto, A., Huergo-Zapico, L. and Lopez-Larrea, C. (2011). Conceptual aspects of self and nonself discrimination. *Self/nonself* **2**, 19-25.
- Goodridge, J.P., Lee, N., Burian, A., Pyo, C.W., Tykodi, S.S., Warren, E.H., *et al.* (2013). HLA-F and MHC-I open conformers cooperate in a MHC-I antigen cross-presentation pathway. *J Immunol* **191**, 1567-1577.
- Gordon, A.H., Hart, P.D. and Young, M.R. (1980). Ammonia inhibits phagosome-lysosome fusion in macrophages. *Nature* **286**, 79-80.
- Gordon, S. (2003). Alternative activation of macrophages. *Nat Rev Immunol* **3**, 23-35.
- Gordon, S., Keshav, S. and Stein, M. (1994). BCG-induced granuloma formation in murine tissues. *Immunobiology* **191**, 369-377.
- Gordon, S. and Martinez, F.O. (2010). Alternative activation of macrophages: mechanism and functions. *Immunity* **32**, 593-604.
- Gordon, S. and Taylor, P.R. (2005). Monocyte and macrophage heterogeneity. *Nat Rev Immunol* **5**, 953-964.
- Goren, M.B., D'Arcy Hart, P., Young, M.R. and Armstrong, J.A. (1976). Prevention of phagosome-lysosome fusion in cultured macrophages by sulfatides of *Mycobacterium tuberculosis*. *Proc Natl Acad Sci U S A* **73**, 2510-2514.
-

- 
- Gray, D. (2002). A role for antigen in the maintenance of immunological memory. *Nat Rev Immunol* **2**, 60-65.
- Guex, N. (1996). Swiss-Pdb Viewer: a new fast and easy to use PDB viewer for the Macintosh. *Experientia* **52**, A26.
- Habich, C., Baumgart, K., Kolb, H. and Burkart, V. (2002). The receptor for heat shock protein 60 on macrophages is saturable, specific, and distinct from receptors for other heat shock proteins. *J Immunol* **168**, 569-576.
- Hammerling, G.J., Vogt, A.B. and Kropshofer, H. (1999). Antigen processing and presentation--towards the millennium. *Immunol Rev* **172**, 5-9.
- Han, S.H., Kim, J.H., Martin, M., Michalek, S.M. and Nahm, M.H. (2003). Pneumococcal lipoteichoic acid (LTA) is not as potent as staphylococcal LTA in stimulating Toll-like receptor 2. *Infect Immun* **71**, 5541-5548.
- Harboe, M. and Quayle, A.J. (1991). Heat shock proteins: friend and foe? *Clin Exp Immunol* **86**, 2-5.
- Harding, C.V. and Boom, W.H. (2010). Regulation of antigen presentation by *Mycobacterium tuberculosis*: a role for Toll-like receptors. *Nat Rev Microbiol* **8**, 296-307.
- Harmala, L.A., Ingulli, E.G., Curtsinger, J.M., Lucido, M.M., Schmidt, C.S., Weigel, B.J., *et al.* (2002). The adjuvant effects of *Mycobacterium tuberculosis* heat shock protein 70 result from the rapid and prolonged activation of antigen-specific CD8<sup>+</sup> T cells in vivo. *J Immunol* **169**, 5622-5629.
- Hartl, F.U. and Hayer-Hartl, M. (2002). Molecular chaperones in the cytosol: from nascent chain to folded protein. *Science* **295**, 1852-1858.
- Hashimoto, C., Hudson, K.L. and Anderson, K.V. (1988). The Toll gene of *Drosophila*, required for dorsal-ventral embryonic polarity, appears to encode a transmembrane protein. *Cell* **52**, 269-279.
- Hasko, G., Pacher, P., Deitch, E.A. and Vizi, E.S. (2007). Shaping of monocyte and macrophage function by adenosine receptors. *Pharmacol Ther* **113**, 264-275.
- Hayashi, F., Smith, K.D., Ozinsky, A., Hawn, T.R., Yi, E.C., Goodlett, D.R., *et al.* (2001). The innate immune response to bacterial flagellin is mediated by Toll-like receptor 5. *Nature* **410**, 1099-1103.
- Hayashi, T., Kishiwada, M., Fujii, K., Yuasa, H., Nishioka, J., Ido, M., *et al.* (2006). Lipopolysaccharide-induced decreased protein S expression in liver cells is
-

- mediated by MEK/ERK signaling and NF- $\kappa$ B activation: involvement of membrane-bound CD14 and toll-like receptor-4. *J Thromb Haemost* **4**, 1763-1773.
- Heldwein, K.A. and Fenton, M.J. (2002). The role of Toll-like receptors in immunity against mycobacterial infection. *Microbes Infect* **4**, 937-944.
- Hemmi, H., Takeuchi, O., Kawai, T., Kaisho, T., Sato, S., Sanjo, H., *et al.* (2000). A Toll-like receptor recognizes bacterial DNA. *Nature* **408**, 740-745.
- Henderson, B. and Henderson, S. (2009). Unfolding the relationship between secreted molecular chaperones and macrophage activation states. *Cell Stress Chaperones* **14**, 329-341.
- Henderson, B. and Pockley, A.G. (2010). Molecular chaperones and protein-folding catalysts as intercellular signaling regulators in immunity and inflammation. *J Leukoc Biol* **88**, 445-462.
- Hernandez-Pando, R., Orozco, H., Sampieri, A., Pavon, L., Velasquillo, C., Larriva-Sahd, J., *et al.* (1996). Correlation between the kinetics of Th1, Th2 cells and pathology in a murine model of experimental pulmonary tuberculosis. *Immunology* **89**, 26-33.
- Hiemstra, P.S., Eisenhauer, P.B., Harwig, S.S., van den Barselaar, M.T., van Furth, R. and Lehrer, R.I. (1993). Antimicrobial proteins of murine macrophages. *Infect Immun* **61**, 3038-3046.
- Hiemstra, P.S., van den Barselaar, M.T., Roest, M., Nibbering, P.H. and van Furth, R. (1999). Ubiquicidin, a novel murine microbicidal protein present in the cytosolic fraction of macrophages. *J Leukoc Biol* **66**, 423-428.
- Higgins, D.M., Sanchez-Campillo, J., Rosas-Taraco, A.G., Lee, E.J., Orme, I.M. and Gonzalez-Juarrero, M. (2009). Lack of IL-10 alters inflammatory and immune responses during pulmonary *Mycobacterium tuberculosis* infection. *Tuberculosis (Edinb)* **89**, 149-157.
- Hightower, L.E. and Guidon, P.T., Jr. (1989). Selective release from cultured mammalian cells of heat-shock (stress) proteins that resemble glia-axon transfer proteins. *J Cell Physiol* **138**, 257-266.
- Hightower, L.E. and Hendershot, L.M. (1997). Molecular chaperones and the heat shock response at Cold Spring Harbor. *Cell Stress Chaperones* **2**, 1-11.
- Hirsch, C.S., Hussain, R., Toossi, Z., Dawood, G., Shahid, F. and Ellner, J.J. (1996). Cross-modulation by transforming growth factor  $\beta$  in human tuberculosis:



- 
- suppression of antigen-driven blastogenesis and interferon  $\gamma$  production. *Proc Natl Acad Sci U S A* **93**, 3193-3198.
- Hirsch, C.S., Toossi, Z., Othieno, C., Johnson, J.L., Schwander, S.K., Robertson, S., *et al.* (1999). Depressed T-cell interferon- $\gamma$  responses in pulmonary tuberculosis: analysis of underlying mechanisms and modulation with therapy. *J Infect Dis* **180**, 2069-2073.
- Hirschfeld, M., Weis, J.J., Toshchakov, V., Salkowski, C.A., Cody, M.J., Ward, D.C., *et al.* (2001). Signaling by toll-like receptor 2 and 4 agonists results in differential gene expression in murine macrophages. *Infect Immun* **69**, 1477-1482.
- Hmama, Z., Gabathuler, R., Jefferies, W.A., de Jong, G. and Reiner, N.E. (1998). Attenuation of HLA-DR expression by mononuclear phagocytes infected with *Mycobacterium tuberculosis* is related to intracellular sequestration of immature class II heterodimers. *J Immunol* **161**, 4882-4893.
- Hoffmann, J.A., Kafatos, F.C., Janeway, C.A. and Ezekowitz, R.A. (1999). Phylogenetic perspectives in innate immunity. *Science* **284**, 1313-1318.
- Hoffmann, M. and Dutton, R.W. (1971). Immune response restoration with macrophage culture supernatants. *Science* **172**, 1047-1048.
- Holland, S.M., Dorman, S.E., Kwon, A., Pitha-Rowe, I.F., Frucht, D.M., Gerstberger, S.M., *et al.* (1998). Abnormal regulation of interferon- $\gamma$ , interleukin-12, and tumor necrosis factor- $\alpha$  in human interferon- $\gamma$  receptor 1 deficiency. *J Infect Dis* **178**, 1095-1104.
- Hoshino, K., Takeuchi, O., Kawai, T., Sanjo, H., Ogawa, T., Takeda, Y., *et al.* (1999). Cutting edge: Toll-like receptor 4 (TLR4)-deficient mice are hyporesponsive to lipopolysaccharide: evidence for TLR4 as the *Lps* gene product. *J Immunol* **162**, 3749-3752.
- Hsieh, C.S., Macatonia, S.E., Tripp, C.S., Wolf, S.F., O'Garra, A. and Murphy, K.M. (1993). Development of TH1 CD4<sup>+</sup> T cells through IL-12 produced by Listeria-induced macrophages. *Science* **260**, 547-549.
- Hu, Y., Henderson, B., Lund, P.A., Tormay, P., Ahmed, M.T., Gurcha, S.S., *et al.* (2008). A *Mycobacterium tuberculosis* mutant lacking the *groEL* homologue *cpn60.1* is viable but fails to induce an inflammatory response in animal models of infection. *Infect Immun* **76**, 1535-1546.
-

- Huang, F.P., Niedbala, W., Wei, X.Q., Xu, D., Feng, G.J., Robinson, J.H., *et al.* (1998). Nitric oxide regulates Th1 cell development through the inhibition of IL-12 synthesis by macrophages. *Eur J Immunol* **28**, 4062-4070.
- Hughes, H.P. (1988). Oxidative killing of intracellular parasites mediated by macrophages. *Parasitol Today* **4**, 340-347.
- Huppa, J.B. and Davis, M.M. (2003). T-cell-antigen recognition and the immunological synapse. *Nat Rev Immunol* **3**, 973-983.
- Ibrahim, H.R., Matsuzaki, T. and Aoki, T. (2001). Genetic evidence that antibacterial activity of lysozyme is independent of its catalytic function. *FEBS Lett* **506**, 27-32.
- Inohara, Chamaillard, McDonald, C. and Nunez, G. (2005). NOD-LRR proteins: role in host-microbial interactions and inflammatory disease. *Annu Rev Biochem* **74**, 355-383.
- Iwasaki, A. and Medzhitov, R. (2010). Regulation of adaptive immunity by the innate immune system. *Science* **327**, 291-295.
- Jaattela, M. (1999). Heat shock proteins as cellular lifeguards. *Ann Med* **31**, 261-271.
- Jaattela, M. and Wissing, D. (1992). Emerging role of heat shock proteins in biology and medicine. *Ann Med* **24**, 249-258.
- Jackett, P.S., Aber, V.R. and Lowrie, D.B. (1978). Virulence and resistance to superoxide, low pH and hydrogen peroxide among strains of *Mycobacterium tuberculosis*. *J Gen Microbiol* **104**, 37-45.
- Janeway, C.A. (2005) *Immunobiology : the immune system in health and disease* New York, *Garland Science*.
- Janeway, C.A. (2001a) *Immunobiology 5 : the immune system in health and disease* New York, *Garland ; Edinburgh : Churchill Livingstone*.
- Janeway, C.A., Jr. (1989). Approaching the asymptote? Evolution and revolution in immunology. *Cold Spring Harb Symp Quant Biol* **54 Pt 1**, 1-13.
- Janeway, C.A., Jr. (1992). The immune system evolved to discriminate infectious nonself from noninfectious self. *Immunol Today* **13**, 11-16.
- Janeway, C.A., Jr. (2001b). How the immune system protects the host from infection. *Microbes Infect* **3**, 1167-1171.
-

- 
- Jenkins, S.J., Ruckerl, D., Cook, P.C., Jones, L.H., Finkelman, F.D., van Rooijen, N., *et al.* (2011). Local macrophage proliferation, rather than recruitment from the blood, is a signature of TH2 inflammation. *Science* **332**, 1284-1288.
- Jenner, R.G., Townsend, M.J., Jackson, I., Sun, K., Bouwman, R.D., Young, R.A., *et al.* (2009). The transcription factors T-bet and GATA-3 control alternative pathways of T-cell differentiation through a shared set of target genes. *Proc Natl Acad Sci U S A* **106**, 17876-17881.
- Jensen, P.E. (2007). Recent advances in antigen processing and presentation. *Nat Immunol* **8**, 1041-1048.
- Jiang, B., Xu, S., Hou, X., Pimentel, D.R., Brecher, P. and Cohen, R.A. (2004). Temporal control of NF- $\kappa$ B activation by ERK differentially regulates interleukin-1 $\beta$ -induced gene expression. *J Biol Chem* **279**, 1323-1329.
- Jiang, Z., Ninomiya-Tsuji, J., Qian, Y., Matsumoto, K. and Li, X. (2002). Interleukin-1 (IL-1) receptor-associated kinase-dependent IL-1-induced signaling complexes phosphorylate TAK1 and TAB2 at the plasma membrane and activate TAK1 in the cytosol. *Mol Cell Biol* **22**, 7158-7167.
- Jo, E.K., Park, J.K. and Dockrell, H.M. (2003). Dynamics of cytokine generation in patients with active pulmonary tuberculosis. *Curr Opin Infect Dis* **16**, 205-210.
- Jo, E.K., Yang, C.S., Choi, C.H. and Harding, C.V. (2007). Intracellular signalling cascades regulating innate immune responses to Mycobacteria: branching out from Toll-like receptors. *Cell Microbiol* **9**, 1087-1098.
- Jo, E.K., Yuk, J.M., Shin, D.M. and Sasakawa, C. (2013). Roles of autophagy in elimination of intracellular bacterial pathogens. *Front Immunol* **4**, 97.
- Joffre, O.P., Segura, E., Savina, A. and Amigorena, S. (2012). Cross-presentation by dendritic cells. *Nat Rev Immunol* **12**, 557-569.
- Jones, B.W., Heldwein, K.A., Means, T.K., Saukkonen, J.J. and Fenton, M.J. (2001a). Differential roles of Toll-like receptors in the elicitation of proinflammatory responses by macrophages. *Ann Rheum Dis* **60 Suppl 3**, iii6-12.
- Jones, B.W., Means, T.K., Heldwein, K.A., Keen, M.A., Hill, P.J., Belisle, J.T. and Fenton, M.J. (2001b). Different Toll-like receptor agonists induce distinct macrophage responses. *J Leukoc Biol* **69**, 1036-1044.
- Josefowicz, S.Z., Lu, L.F. and Rudensky, A.Y. (2012). Regulatory T cells: mechanisms of differentiation and function. *Annu Rev Immunol* **30**, 531-564.
-

- 
- Jouanguy, E., Altare, F., Lamhamedi, S., Revy, P., Emile, J.F., Newport, M., *et al.* (1996). Interferon- $\gamma$ -receptor deficiency in an infant with fatal bacille Calmette-Guerin infection. *N Engl J Med* **335**, 1956-1961.
- Jouanguy, E., Doffinger, R., Dupuis, S., Pallier, A., Altare, F. and Casanova, J.L. (1999a). IL-12 and IFN- $\gamma$  in host defense against mycobacteria and salmonella in mice and men. *Curr Opin Immunol* **11**, 346-351.
- Jouanguy, E., Lamhamedi-Cherradi, S., Lammas, D., Dorman, S.E., Fondaneche, M.C., Dupuis, S., *et al.* (1999b). A human IFNGR1 small deletion hotspot associated with dominant susceptibility to mycobacterial infection. *Nat Genet* **21**, 370-378.
- Jozefowski, S., Sobota, A. and Kwiatkowska, K. (2008). How *Mycobacterium tuberculosis* subverts host immune responses. *Bioessays* **30**, 943-954.
- Jung, S., Unutmaz, D., Wong, P., Sano, G., De los Santos, K., Sparwasser, T., *et al.* (2002). In vivo depletion of CD11c<sup>+</sup> dendritic cells abrogates priming of CD8<sup>+</sup> T cells by exogenous cell-associated antigens. *Immunity* **17**, 211-220.
- Kagan, J.C. and Medzhitov, R. (2006). Phosphoinositide-mediated adaptor recruitment controls toll-like receptor signaling. *Cell* **125**, 943-955.
- Kamath, A.B., Alt, J., Debbabi, H. and Behar, S.M. (2003). Toll-like receptor 4-defective C3H/HeJ mice are not more susceptible than other C3H substrains to infection with *Mycobacterium tuberculosis*. *Infect Immun* **71**, 4112-4118.
- Kaspar, A.A., Okada, S., Kumar, J., Poulain, F.R., Drouvalakis, K.A., Kelekar, A., *et al.* (2001). A distinct pathway of cell-mediated apoptosis initiated by granulysin. *J Immunol* **167**, 350-356.
- Kataoka, K., Muta, T., Yamazaki, S. and Takeshige, K. (2002). Activation of macrophages by linear (1 $\rightarrow$ 3)- $\beta$ -D-glucans. Implications for the recognition of fungi by innate immunity. *J Biol Chem* **277**, 36825-36831.
- Kato, H., Takahashi, K. and Fujita, T. (2011). RIG-I-like receptors: cytoplasmic sensors for non-self RNA. *Immunol Rev* **243**, 91-98.
- Kaufmann, S.H. (1990). Heat shock proteins and the immune response. *Immunol Today* **11**, 129-136.
- Kaufmann, S.H. (1993). Immunity to intracellular bacteria. *Annu Rev Immunol* **11**, 129-163.
- Kaufmann, S.H. (2001). How can immunology contribute to the control of tuberculosis? *Nat Rev Immunol* **1**, 20-30.
-

- 
- Kawagoe, T., Sato, S., Matsushita, K., Kato, H., Matsui, K., Kumagai, Y., *et al.* (2008). Sequential control of Toll-like receptor-dependent responses by IRAK1 and IRAK2. *Nat Immunol* **9**, 684-691.
- Kawamoto, H., Wada, H. and Katsura, Y. (2010). A revised scheme for developmental pathways of hematopoietic cells: the myeloid-based model. *Int Immunol* **22**, 65-70.
- Keane, J., Balcewicz-Sablinska, M.K., Remold, H.G., Chupp, G.L., Meek, B.B., Fenton, M.J. and Kornfeld, H. (1997). Infection by *Mycobacterium tuberculosis* promotes human alveolar macrophage apoptosis. *Infect Immun* **65**, 298-304.
- Kern, P.S., Teng, M.K., Smolyar, A., Liu, J.H., Liu, J., Hussey, R.E., *et al.* (1998). Structural basis of CD8 coreceptor function revealed by crystallographic analysis of a murine CD8 $\alpha$  ectodomain fragment in complex with H-2Kb. *Immunity* **9**, 519-530.
- Khan, N., Alam, K., Mande, S.C., Valluri, V.L., Hasnain, S.E. and Mukhopadhyay, S. (2008). *Mycobacterium tuberculosis* heat shock protein 60 modulates immune response to PPD by manipulating the surface expression of TLR2 on macrophages. *Cell Microbiol* **10**, 1711-1722.
- Khan, N., Ghousunnissa, S., Jegadeeswaran, S.M., Thiagarajan, D., Hasnain, S.E. and Mukhopadhyay, S. (2007). Anti-B7-1/B7-2 antibody elicits innate-effector responses in macrophages through NF- $\kappa$ B-dependent pathway. *Int Immunol* **19**, 477-486.
- Khan, N., Rahim, S.S., Boddupalli, C.S., Ghousunnissa, S., Padma, S., Pathak, N., *et al.* (2006). Hydrogen peroxide inhibits IL-12 p40 induction in macrophages by inhibiting c-rel translocation to the nucleus through activation of calmodulin protein. *Blood* **107**, 1513-1520.
- Kiessling, R., Gronberg, A., Ivanyi, J., Soderstrom, K., Ferm, M., Kleinau, S., *et al.* (1991). Role of hsp60 during autoimmune and bacterial inflammation. *Immunol Rev* **121**, 91-111.
- Kim, H.Y., DeKruyff, R.H. and Umetsu, D.T. (2010). The many paths to asthma: phenotype shaped by innate and adaptive immunity. *Nat Immunol* **11**, 577-584.
- Kincaid, E.Z. and Ernst, J.D. (2003). *Mycobacterium tuberculosis* exerts gene-selective inhibition of transcriptional responses to IFN- $\gamma$  without inhibiting STAT1 function. *J Immunol* **171**, 2042-2049.
-

- 
- Kindler, V., Sappino, A.P., Grau, G.E., Piguet, P.F. and Vassalli, P. (1989). The inducing role of tumor necrosis factor in the development of bactericidal granulomas during BCG infection. *Cell* **56**, 731-740.
- Kirby, A.C., Meghji, S., Nair, S.P., White, P., Reddi, K., Nishihara, T., *et al.* (1995). The potent bone-resorbing mediator of *Actinobacillus actinomycetemcomitans* is homologous to the molecular chaperone GroEL. *J Clin Invest* **96**, 1185-1194.
- Klion, A.D. and Nutman, T.B. (2004). The role of eosinophils in host defense against helminth parasites. *J Allergy Clin Immunol* **113**, 30-37.
- Kol, A., Bourcier, T., Lichtman, A.H. and Libby, P. (1999). Chlamydial and human heat shock protein 60s activate human vascular endothelium, smooth muscle cells, and macrophages. *J Clin Invest* **103**, 571-577.
- Kong, T.H., Coates, A.R., Butcher, P.D., Hickman, C.J. and Shinnick, T.M. (1993). *Mycobacterium tuberculosis* expresses two chaperonin-60 homologs. *Proc Natl Acad Sci U S A* **90**, 2608-2612.
- Koul, A., Herget, T., Klebl, B. and Ullrich, A. (2004). Interplay between mycobacteria and host signalling pathways. *Nat Rev Microbiol* **2**, 189-202.
- Kovacsovics-Bankowski, M. and Rock, K.L. (1995). A phagosome-to-cytosol pathway for exogenous antigens presented on MHC class I molecules. *Science* **267**, 243-246.
- Krausgruber, T., Blazek, K., Smallie, T., Alzabin, S., Lockstone, H., Sahgal, N., *et al.* (2011). IRF5 promotes inflammatory macrophage polarization and TH1-TH17 responses. *Nat Immunol* **12**, 231-238.
- Kreider, T., Anthony, R.M., Urban, J.F., Jr. and Gause, W.C. (2007). Alternatively activated macrophages in helminth infections. *Curr Opin Immunol* **19**, 448-453.
- Krutzik, P.O. and Nolan, G.P. (2003). Intracellular phospho-protein staining techniques for flow cytometry: monitoring single cell signaling events. *Cytometry A* **55**, 61-70.
- Kuchroo, V.K., Das, M.P., Brown, J.A., Ranger, A.M., Zamvil, S.S., Sobel, R.A., *et al.* (1995). B7-1 and B7-2 costimulatory molecules activate differentially the Th1/Th2 developmental pathways: application to autoimmune disease therapy. *Cell* **80**, 707-718.
- Kulkarni, A.B., Mullbacher, A. and Blanden, R.V. (1991). Functional analysis of macrophages, B cells and splenic dendritic cells as antigen-presenting cells in
-

- 
- West Nile virus-specific murine T lymphocyte proliferation. *Immunol Cell Biol* **69** ( Pt 2), 71-80.
- Kurt-Jones, E.A., Popova, L., Kwinn, L., Haynes, L.M., Jones, L.P., Tripp, R.A., *et al.* (2000). Pattern recognition receptors TLR4 and CD14 mediate response to respiratory syncytial virus. *Nat Immunol* **1**, 398-401.
- Lambris, J.D., Ricklin, D. and Geisbrecht, B.V. (2008). Complement evasion by human pathogens. *Nat Rev Microbiol* **6**, 132-142.
- Lankat-Buttgereit, B. and Tampe, R. (2002). The transporter associated with antigen processing: function and implications in human diseases. *Physiol Rev* **82**, 187-204.
- Laugel, B., Cole, D.K., Clement, M., Wooldridge, L., Price, D.A. and Sewell, A.K. (2011). The multiple roles of the CD8 coreceptor in T cell biology: opportunities for the selective modulation of self-reactive cytotoxic T cells. *J Leukoc Biol* **90**, 1089-1099.
- LeBien, T.W. and Tedder, T.F. (2008). B lymphocytes: how they develop and function. *Blood* **112**, 1570-1580.
- Lee, J., Rhee, M.H., Kim, E. and Cho, J.Y. (2012). BAY 11-7082 is a broad-spectrum inhibitor with anti-inflammatory activity against multiple targets. *Mediators Inflamm* **2012**, 416036.
- Lemaitre, B., Nicolas, E., Michaut, L., Reichhart, J.M. and Hoffmann, J.A. (1996). The dorsoventral regulatory gene cassette spatzle/Toll/cactus controls the potent antifungal response in *Drosophila* adults. *Cell* **86**, 973-983.
- Lewthwaite, J., Skinner, A. and Henderson, B. (1998). Are molecular chaperones microbial virulence factors? *Trends Microbiol* **6**, 426-428.
- Lewthwaite, J.C., Clarkin, C.E., Coates, A.R., Poole, S., Lawrence, R.A., Wheeler-Jones, C.P., *et al.* (2007). Highly homologous *Mycobacterium tuberculosis* chaperonin 60 proteins with differential CD14 dependencies stimulate cytokine production by human monocytes through cooperative activation of p38 and ERK1/2 mitogen-activated protein kinases. *Int Immunopharmacol* **7**, 230-240.
- Lewthwaite, J.C., Coates, A.R., Tormay, P., Singh, M., Mascagni, P., Poole, S., *et al.* (2001). *Mycobacterium tuberculosis* chaperonin 60.1 is a more potent cytokine stimulator than chaperonin 60.2 (Hsp 65) and contains a CD14-binding domain. *Infect Immun* **69**, 7349-7355.
-

- 
- Li, M.O., Wan, Y.Y. and Flavell, R.A. (2007). T cell-produced transforming growth factor- $\beta$ 1 controls T cell tolerance and regulates Th1- and Th17-cell differentiation. *Immunity* **26**, 579-591.
- Liang, L. and Sha, W.C. (2002). The right place at the right time: novel B7 family members regulate effector T cell responses. *Curr Opin Immunol* **14**, 384-390.
- Liao, X., Sharma, N., Kapadia, F., Zhou, G., Lu, Y., Hong, H., *et al.* (2011). Kruppel-like factor 4 regulates macrophage polarization. *J Clin Invest* **121**, 2736-2749.
- Lindahl, E., Hess, B. and van der Spoel, D. (2001). GROMACS 3.0: a package for molecular simulation and trajectory analysis. *J Mol Model* **7**, 306-317.
- Lindquist, S. and Craig, E.A. (1988). The heat-shock proteins. *Annu Rev Genet* **22**, 631-677.
- Litman, G.W., Cannon, J.P. and Dishaw, L.J. (2005). Reconstructing immune phylogeny: new perspectives. *Nat Rev Immunol* **5**, 866-879.
- Litman, G.W., Rast, J.P. and Fugmann, S.D. (2010). The origins of vertebrate adaptive immunity. *Nat Rev Immunol* **10**, 543-553.
- Liu, G. and Yang, H. (2013). Modulation of macrophage activation and programming in immunity. *J Cell Physiol* **228**, 502-512.
- Liu, Y., Stewart, K.N., Bishop, E., Marek, C.J., Kluth, D.C., Rees, A.J. and Wilson, H.M. (2008). Unique expression of suppressor of cytokine signaling 3 is essential for classical macrophage activation in rodents in vitro and in vivo. *J Immunol* **180**, 6270-6278.
- Loke, P., Gallagher, I., Nair, M.G., Zang, X., Brombacher, F., Mohrs, M., *et al.* (2007). Alternative activation is an innate response to injury that requires CD4<sup>+</sup> T cells to be sustained during chronic infection. *J Immunol* **179**, 3926-3936.
- Lotteau, V., Teyton, L., Peleraux, A., Nilsson, T., Karlsson, L., Schmid, S.L., *et al.* (1990). Intracellular transport of class II MHC molecules directed by invariant chain. *Nature* **348**, 600-605.
- Lotz, M., Jirik, F., Kabouridis, P., Tsoukas, C., Hirano, T., Kishimoto, T. and Carson, D.A. (1988). B cell stimulating factor 2/interleukin 6 is a costimulant for human thymocytes and T lymphocytes. *J Exp Med* **167**, 1253-1258.
- Loures, F.V., Pina, A., Felonato, M., Araujo, E.F., Leite, K.R. and Calich, V.L. (2010). Toll-like receptor 4 signaling leads to severe fungal infection associated with
-



- 
- enhanced proinflammatory immunity and impaired expansion of regulatory T cells. *Infect Immun* **78**, 1078-1088.
- Lu, L.F., Boldin, M.P., Chaudhry, A., Lin, L.L., Taganov, K.D., Hanada, T., *et al.* (2010). Function of miR-146a in controlling Treg cell-mediated regulation of Th1 responses. *Cell* **142**, 914-929.
- Luthy, R., Bowie, J.U. and Eisenberg, D. (1992). Assessment of protein models with three-dimensional profiles. *Nature* **356**, 83-85.
- Mackaness, G.B. (1962). Cellular resistance to infection. *J Exp Med* **116**, 381-406.
- Mackaness, G.B. (1977). Cellular immunity and the parasite. *Adv Exp Med Biol* **93**, 65-73.
- Maglione, P.J. and Chan, J. (2009). How B cells shape the immune response against *Mycobacterium tuberculosis*. *Eur J Immunol* **39**, 676-686.
- Magram, J., Sfarra, J., Connaughton, S., Faherty, D., Warriar, R., Carvajal, D., *et al.* (1996). IL-12-deficient mice are defective but not devoid of type 1 cytokine responses. *Ann N Y Acad Sci* **795**, 60-70.
- Maguire, M., Poole, S., Coates, A.R., Tormay, P., Wheeler-Jones, C. and Henderson, B. (2005). Comparative cell signalling activity of ultrapure recombinant chaperonin 60 proteins from prokaryotes and eukaryotes. *Immunology* **115**, 231-238.
- Malito, E., Faleri, A., Lo Surdo, P., Veggi, D., Maruggi, G., Grassi, E., *et al.* (2013). Defining a protective epitope on factor H binding protein, a key meningococcal virulence factor and vaccine antigen. *Proc Natl Acad Sci U S A* **110**, 3304-3309.
- Mantovani, A., Sozzani, S., Locati, M., Allavena, P. and Sica, A. (2002). Macrophage polarization: tumor-associated macrophages as a paradigm for polarized M2 mononuclear phagocytes. *Trends Immunol* **23**, 549-555.
- Marcatili, A., Cipollaro de l'Ero, G., Galdiero, M., Folgore, A. and Petrillo, G. (1997). TNF- $\alpha$ , IL-1 $\alpha$ , IL-6 and ICAM-1 expression in human keratinocytes stimulated *in vitro* with *Escherichia coli* heat-shock proteins. *Microbiology* **143** ( Pt 1), 45-53.
- Marti-Renom, M.A., Stuart, A.C., Fiser, A., Sanchez, R., Melo, F. and Sali, A. (2000). Comparative protein structure modeling of genes and genomes. *Annu Rev Biophys Biomol Struct* **29**, 291-325.
-

- 
- Martinez, F.O., Helming, L. and Gordon, S. (2009). Alternative activation of macrophages: an immunologic functional perspective. *Annu Rev Immunol* **27**, 451-483.
- Means, T.K., Lien, E., Yoshimura, A., Wang, S., Golenbock, D.T. and Fenton, M.J. (1999a). The CD14 ligands lipoarabinomannan and lipopolysaccharide differ in their requirement for Toll-like receptors. *J Immunol* **163**, 6748-6755.
- Means, T.K., Wang, S., Lien, E., Yoshimura, A., Golenbock, D.T. and Fenton, M.J. (1999b). Human toll-like receptors mediate cellular activation by *Mycobacterium tuberculosis*. *J Immunol* **163**, 3920-3927.
- Medzhitov, R. (2010). Inflammation 2010: new adventures of an old flame. *Cell* **140**, 771-776.
- Medzhitov, R. and Janeway, C.A., Jr. (1997a). Innate immunity: the virtues of a nonclonal system of recognition. *Cell* **91**, 295-298.
- Medzhitov, R., Preston-Hurlburt, P. and Janeway, C.A., Jr. (1997b). A human homologue of the *Drosophila* Toll protein signals activation of adaptive immunity. *Nature* **388**, 394-397.
- Melgert, B.N., ten Hacken, N.H., Rutgers, B., Timens, W., Postma, D.S. and Hylkema, M.N. (2011). More alternative activation of macrophages in lungs of asthmatic patients. *J Allergy Clin Immunol* **127**, 831-833.
- Metchnikoff, E. (1905). *Immunity in the Infectious Diseases*. New York, Macmillan.
- Mishell, R.I. and Dutton, R.W. (1966). Immunization of normal mouse spleen cell suspensions in vitro. *Science* **153**, 1004-1006.
- Mohr, E., Cunningham, A.F., Toellner, K.M., Bobat, S., Coughlan, R.E., Bird, R.A., *et al.* (2010). IFN- $\gamma$  produced by CD8 T cells induces T-bet-dependent and -independent class switching in B cells in responses to alum-precipitated protein vaccine. *Proc Natl Acad Sci U S A* **107**, 17292-17297.
- Monahan, I.M., Betts, J., Banerjee, D.K. and Butcher, P.D. (2001). Differential expression of mycobacterial proteins following phagocytosis by macrophages. *Microbiology* **147**, 459-471.
- Moody, D.B. and Porcelli, S.A. (2003). Intracellular pathways of CD1 antigen presentation. *Nat Rev Immunol* **3**, 11-22.
- Moore, K.W., de Waal Malefyt, R., Coffman, R.L. and O'Garra, A. (2001). Interleukin-10 and the interleukin-10 receptor. *Annu Rev Immunol* **19**, 683-765.
-

- 
- Moore, K.W., O'Garra, A., de Waal Malefyt, R., Vieira, P. and Mosmann, T.R. (1993). Interleukin-10. *Annu Rev Immunol* **11**, 165-190.
- Mori, N., Yamada, Y., Ikeda, S., Yamasaki, Y., Tsukasaki, K., Tanaka, Y., *et al.* (2002). Bay 11-7082 inhibits transcription factor NF- $\kappa$ B and induces apoptosis of HTLV-I-infected T-cell lines and primary adult T-cell leukemia cells. *Blood* **100**, 1828-1834.
- Morris, P., Shaman, J., Attaya, M., Amaya, M., Goodman, S., Bergman, C., *et al.* (1994). An essential role for HLA-DM in antigen presentation by class II major histocompatibility molecules. *Nature* **368**, 551-554.
- Mosmann, T.R., Cherwinski, H., Bond, M.W., Giedlin, M.A. and Coffman, R.L. (1986). Two types of murine helper T cell clone. I. Definition according to profiles of lymphokine activities and secreted proteins. *J Immunol* **136**, 2348-2357.
- Mosmann, T.R. and Coffman, R.L. (1989). TH1 and TH2 cells: different patterns of lymphokine secretion lead to different functional properties. *Annu Rev Immunol* **7**, 145-173.
- Mosser, D.M. and Edwards, J.P. (2008). Exploring the full spectrum of macrophage activation. *Nat Rev Immunol* **8**, 958-969.
- Moudgil, K.D., Thompson, S.J., Geraci, F., De Paepe, B. and Shoenfeld, Y. (2013). Heat-shock proteins in autoimmunity. *Autoimmune diseases* **2013**, 621417.
- Mueller, S.N., Gebhardt, T., Carbone, F.R. and Heath, W.R. (2013). Memory T cell subsets, migration patterns, and tissue residence. *Annu Rev Immunol* **31**, 137-161.
- Mukhopadhyay, S., George, A., Bal, V., Ravindran, B. and Rath, S. (1999a). Bruton's tyrosine kinase deficiency in macrophages inhibits nitric oxide generation leading to enhancement of IL-12 induction. *J Immunol* **163**, 1786-1792.
- Mukhopadhyay, S., Mohanty, M., Mangla, A., George, A., Bal, V., Rath, S. and Ravindran, B. (2002). Macrophage effector functions controlled by Bruton's tyrosine kinase are more crucial than the cytokine balance of T cell responses for microfilarial clearance. *J Immunol* **168**, 2914-2921.
- Mukhopadhyay, S., Nair, S. and Hasnain, S.E. (2007). Nitric oxide: friendly rivalry in tuberculosis. *Curr Signal Transduct Ther* **2**, 121-128.
- Mukhopadhyay, S., Sahoo, P.K., George, A., Bal, V., Rath, S. and Ravindran, B. (1999b). Delayed clearance of filarial infection and enhanced Th1 immunity due
-

- to modulation of macrophage APC functions in xid mice. *J Immunol* **163**, 875-883.
- Mukhopadhyay, S., Srivastava, V.M., Murthy, P.K. and Hasnain, S.E. (2004). Poorer NF- $\kappa$ B signaling by microfilariae in macrophages from BALB/c mice affects their ability to produce cytotoxic levels of nitric oxide to kill microfilariae. *FEBS Lett* **567**, 275-280.
- Murata, Y., Shimamura, T. and Hamuro, J. (2002a). The polarization of T(h)1/T(h)2 balance is dependent on the intracellular thiol redox status of macrophages due to the distinctive cytokine production. *Int Immunol* **14**, 201-212.
- Murata, Y., Shimamura, T., Tagami, T., Takatsuki, F. and Hamuro, J. (2002b). The skewing to Th1 induced by lentinan is directed through the distinctive cytokine production by macrophages with elevated intracellular glutathione content. *Int Immunopharmacol* **2**, 673-689.
- Murphy, K.M. and Reiner, S.L. (2002). The lineage decisions of helper T cells. *Nat Rev Immunol* **2**, 933-944.
- Nagabhushanam, V., Solache, A., Ting, L.M., Escaron, C.J., Zhang, J.Y. and Ernst, J.D. (2003). Innate inhibition of adaptive immunity: *Mycobacterium tuberculosis*-induced IL-6 inhibits macrophage responses to IFN- $\gamma$ . *J Immunol* **171**, 4750-4757.
- Nagai, Y., Akashi, S., Nagafuku, M., Ogata, M., Iwakura, Y., Akira, S., *et al.* (2002). Essential role of MD-2 in LPS responsiveness and TLR4 distribution. *Nat Immunol* **3**, 667-672.
- Nair, S., Pandey, A.D. and Mukhopadhyay, S. (2011). The PPE18 protein of *Mycobacterium tuberculosis* inhibits NF- $\kappa$ B/rel-mediated proinflammatory cytokine production by upregulating and phosphorylating suppressor of cytokine signaling 3 protein. *J Immunol* **186**, 5413-5424.
- Nair, S., Ramaswamy, P.A., Ghosh, S., Joshi, D.C., Pathak, N., Siddiqui, I., *et al.* (2009). The PPE18 of *Mycobacterium tuberculosis* interacts with TLR2 and activates IL-10 induction in macrophage. *J Immunol* **183**, 6269-6281.
- Nakahara, T., Moroi, Y., Uchi, H. and Furue, M. (2006). Differential role of MAPK signaling in human dendritic cell maturation and Th1/Th2 engagement. *J Dermatol Sci* **42**, 1-11.
- Nakayamada, S., Takahashi, H., Kanno, Y. and O'Shea, J.J. (2012). Helper T cell diversity and plasticity. *Curr Opin Immunol* **24**, 297-302.

- 
- Nandan, D. and Reiner, N.E. (1995). Attenuation of gamma interferon-induced tyrosine phosphorylation in mononuclear phagocytes infected with *Leishmania donovani*: selective inhibition of signaling through *Janus* kinases and Stat1. *Infect Immun* **63**, 4495-4500.
- Nathan, C. (2008). Metchnikoff's Legacy in 2008. *Nat Immunol* **9**, 695-698.
- Nau, G.J., Richmond, J.F., Schlesinger, A., Jennings, E.G., Lander, E.S. and Young, R.A. (2002). Human macrophage activation programs induced by bacterial pathogens. *Proc Natl Acad Sci U S A* **99**, 1503-1508.
- Netea, M.G., Van der Graaf, C., Van der Meer, J.W. and Kullberg, B.J. (2004). Recognition of fungal pathogens by Toll-like receptors. *Eur J Clin Microbiol Infect Dis* **23**, 672-676.
- Netea, M.G., Van der Meer, J.W., Suttmuller, R.P., Adema, G.J. and Kullberg, B.J. (2005). From the Th1/Th2 paradigm towards a Toll-like receptor/T-helper bias. *Antimicrob Agents Chemother* **49**, 3991-3996.
- Newport, M.J., Huxley, C.M., Huston, S., Hawrylowicz, C.M., Oostra, B.A., Williamson, R. and Levin, M. (1996). A mutation in the interferon- $\gamma$ -receptor gene and susceptibility to mycobacterial infection. *N Engl J Med* **335**, 1941-1949.
- Niedbala, W., Wei, X.Q., Campbell, C., Thomson, D., Komai-Koma, M. and Liew, F.Y. (2002). Nitric oxide preferentially induces type 1 T cell differentiation by selectively up-regulating IL-12 receptor  $\beta$ 2 expression via cGMP. *Proc Natl Acad Sci U S A* **99**, 16186-16191.
- Noel, W., Raes, G., Hassanzadeh Ghassabeh, G., De Baetselier, P. and Beschin, A. (2004). Alternatively activated macrophages during parasite infections. *Trends Parasitol* **20**, 126-133.
- Norcross, M.A. (1984). A synaptic basis for T-lymphocyte activation. *Ann Immunol* **135D**, 113-134.
- Noss, E.H., Harding, C.V. and Boom, W.H. (2000). *Mycobacterium tuberculosis* inhibits MHC class II antigen processing in murine bone marrow macrophages. *Cell Immunol* **201**, 63-74.
- Noss, E.H., Pai, R.K., Sellati, T.J., Radolf, J.D., Belisle, J., Golenbock, D.T., *et al.* (2001). Toll-like receptor 2-dependent inhibition of macrophage class II MHC expression and antigen processing by 19-kDa lipoprotein of *Mycobacterium tuberculosis*. *J Immunol* **167**, 910-918.
-

- 
- O'Garra, A. and Robinson, D. (2004). Development and function of T helper 1 cells. *Adv Immunol* **83**, 133-162.
- O'Neill, L.A. (2006). How Toll-like receptors signal: what we know and what we don't know. *Curr Opin Immunol* **18**, 3-9.
- O'Neill, L.A. and Bowie, A.G. (2007). The family of five: TIR-domain-containing adaptors in Toll-like receptor signalling. *Nat Rev Immunol* **7**, 353-364.
- O'Neill, L.A., Fitzgerald, K.A. and Bowie, A.G. (2003). The Toll-IL-1 receptor adaptor family grows to five members. *Trends Immunol* **24**, 286-290.
- Ogura, Y., Inohara, N., Benito, A., Chen, F.F., Yamaoka, S. and Nunez, G. (2001). Nod2, a Nod1/Apaf-1 family member that is restricted to monocytes and activates NF- $\kappa$ B. *J Biol Chem* **276**, 4812-4818.
- Ohashi, K., Burkart, V., Flohe, S. and Kolb, H. (2000). Cutting edge: heat shock protein 60 is a putative endogenous ligand of the toll-like receptor-4 complex. *J Immunol* **164**, 558-561.
- Oikonomopoulou, K., Ricklin, D., Ward, P.A. and Lambris, J.D. (2012). Interactions between coagulation and complement--their role in inflammation. *Semin Immunopathol* **34**, 151-165.
- Okada, R., Kondo, T., Matsuki, F., Takata, H. and Takiguchi, M. (2008). Phenotypic classification of human CD4<sup>+</sup> T cell subsets and their differentiation. *Int Immunol* **20**, 1189-1199.
- Onoguchi, K., Yoneyama, M. and Fujita, T. (2011). Retinoic acid-inducible gene-I-like receptors. *J Interferon Cytokine Res* **31**, 27-31.
- Onwubalili, J.K., Scott, G.M. and Robinson, J.A. (1985). Deficient immune interferon production in tuberculosis. *Clin Exp Immunol* **59**, 405-413.
- Oppenheim, J.J., Biragyn, A., Kwak, L.W. and Yang, D. (2003). Roles of antimicrobial peptides such as defensins in innate and adaptive immunity. *Ann Rheum Dis* **62 Suppl 2**, ii17-21.
- Orme, I.M., Roberts, A.D., Griffin, J.P. and Abrams, J.S. (1993). Cytokine secretion by CD4 T lymphocytes acquired in response to *Mycobacterium tuberculosis* infection. *J Immunol* **151**, 518-525.
- Ozinsky, A., Underhill, D.M., Fontenot, J.D., Hajjar, A.M., Smith, K.D., Wilson, C.B., *et al.* (2000). The repertoire for pattern recognition of pathogens by the innate
-

- 
- immune system is defined by cooperation between toll-like receptors. *Proc Natl Acad Sci U S A* **97**, 13766-13771.
- Pai, R.K., Convery, M., Hamilton, T.A., Boom, W.H. and Harding, C.V. (2003). Inhibition of IFN- $\gamma$ -induced class II transactivator expression by a 19-kDa lipoprotein from *Mycobacterium tuberculosis*: a potential mechanism for immune evasion. *J Immunol* **171**, 175-184.
- Pai, R.K., Pennini, M.E., Tobian, A.A., Canaday, D.H., Boom, W.H. and Harding, C.V. (2004). Prolonged toll-like receptor signaling by *Mycobacterium tuberculosis* and its 19-kilodalton lipoprotein inhibits gamma interferon-induced regulation of selected genes in macrophages. *Infect Immun* **72**, 6603-6614.
- Pamer, E. and Cresswell, P. (1998). Mechanisms of MHC class I--restricted antigen processing. *Annu Rev Immunol* **16**, 323-358.
- Paterson, G.K. and Mitchell, T.J. (2006). Innate immunity and the pneumococcus. *Microbiology* **152**, 285-293.
- Pathak, S.K., Basu, S., Basu, K.K., Banerjee, A., Pathak, S., Bhattacharyya, A., *et al.* (2007). Direct extracellular interaction between the early secreted antigen ESAT-6 of *Mycobacterium tuberculosis* and TLR2 inhibits TLR signaling in macrophages. *Nat Immunol* **8**, 610-618.
- Pathak, S.K., Basu, S., Bhattacharyya, A., Pathak, S., Kundu, M. and Basu, J. (2005). *Mycobacterium tuberculosis* lipoarabinomannan-mediated IRAK-M induction negatively regulates Toll-like receptor-dependent interleukin-12 p40 production in macrophages. *J Biol Chem* **280**, 42794-42800.
- Peaper, D.R., Wearsch, P.A. and Cresswell, P. (2005). Tapasin and ERp57 form a stable disulfide-linked dimer within the MHC class I peptide-loading complex. *EMBO J* **24**, 3613-3623.
- Pecora, N.D., Gehring, A.J., Canaday, D.H., Boom, W.H. and Harding, C.V. (2006). *Mycobacterium tuberculosis* LprA is a lipoprotein agonist of TLR2 that regulates innate immunity and APC function. *J Immunol* **177**, 422-429.
- Peetermans, W.E., Raats, C.J., van Furth, R. and Langermans, J.A. (1995). Mycobacterial 65-kilodalton heat shock protein induces tumor necrosis factor alpha and interleukin-6, reactive nitrogen intermediates, and toxoplasmastatic activity in murine peritoneal macrophages. *Infect Immun* **63**, 3454-3458.
-

- 
- Pello, O.M., De Pizzol, M., Mirolo, M., Soucek, L., Zammataro, L., Amabile, A., *et al.* (2012). Role of c-MYC in alternative activation of human macrophages and tumor-associated macrophage biology. *Blood* **119**, 411-421.
- Pennini, M.E., Pai, R.K., Schultz, D.C., Boom, W.H. and Harding, C.V. (2006). *Mycobacterium tuberculosis* 19-kDa lipoprotein inhibits IFN- $\gamma$ -induced chromatin remodeling of *MHC2TA* by TLR2 and MAPK signaling. *J Immunol* **176**, 4323-4330.
- Persson, U., Hammarstrom, L., Moller, E., Moller, G. and Smith, C.I. (1978). The role of adherent cells in B and T lymphocyte activation. *Immunol Rev* **40**, 78-101.
- Peterson, J.D., Herzenberg, L.A., Vasquez, K. and Waltenbaugh, C. (1998). Glutathione levels in antigen-presenting cells modulate Th1 versus Th2 response patterns. *Proc Natl Acad Sci U S A* **95**, 3071-3076.
- Pfeifer, J.D., Wick, M.J., Roberts, R.L., Findlay, K., Normark, S.J. and Harding, C.V. (1993). Phagocytic processing of bacterial antigens for class I MHC presentation to T cells. *Nature* **361**, 359-362.
- Pfeiffer, C., Stein, J., Southwood, S., Ketelaar, H., Sette, A. and Bottomly, K. (1995). Altered peptide ligands can control CD4 T lymphocyte differentiation in vivo. *J Exp Med* **181**, 1569-1574.
- Pieters, J. (1997). MHC class II restricted antigen presentation. *Curr Opin Immunol* **9**, 89-96.
- Pluddemann, A., Mukhopadhyay, S. and Gordon, S. (2006). The interaction of macrophage receptors with bacterial ligands. *Expert Rev Mol Med* **8**, 1-25.
- Pluddemann, A., Mukhopadhyay, S. and Gordon, S. (2011). Innate immunity to intracellular pathogens: macrophage receptors and responses to microbial entry. *Immunol Rev* **240**, 11-24.
- Pockley, A.G. (2001). Heat shock proteins in health and disease: therapeutic targets or therapeutic agents? *Expert Rev Mol Med* **3**, 1-21.
- Pockley, A.G. (2002). Heat shock proteins, inflammation, and cardiovascular disease. *Circulation* **105**, 1012-1017.
- Poltorak, A., He, X., Smirnova, I., Liu, M.Y., Van Huffel, C., Du, X., *et al.* (1998a). Defective LPS signaling in C3H/HeJ and C57BL/10ScCr mice: mutations in *Tlr4* gene. *Science* **282**, 2085-2088.
-



- 
- Poltorak, A., Smirnova, I., He, X., Liu, M.Y., Van Huffel, C., McNally, O., *et al.* (1998b). Genetic and physical mapping of the *Lps* locus: identification of the toll-4 receptor as a candidate gene in the critical region. *Blood Cells Mol Dis* **24**, 340-355.
- Poluektov, Y.O., Kim, A. and Sadegh-Nasseri, S. (2013). HLA-DO and Its Role in MHC Class II Antigen Presentation. *Front Immunol* **4**, 260.
- Porta, C., Rimoldi, M., Raes, G., Brys, L., Ghezzi, P., Di Liberto, D., *et al.* (2009). Tolerance and M2 (alternative) macrophage polarization are related processes orchestrated by p50 nuclear factor  $\kappa$ B. *Proc Natl Acad Sci U S A* **106**, 14978-14983.
- Qamra, R., Mande, S.C., Coates, A.R. and Henderson, B. (2005). The unusual chaperonins of *Mycobacterium tuberculosis*. *Tuberculosis (Edinb)* **85**, 385-394.
- Qamra, R., Srinivas, V. and Mande, S.C. (2004). *Mycobacterium tuberculosis* GroEL homologues unusually exist as lower oligomers and retain the ability to suppress aggregation of substrate proteins. *J Mol Biol* **342**, 605-617.
- Qian, C., Jiang, X., An, H., Yu, Y., Guo, Z., Liu, S., *et al.* (2006). TLR agonists promote ERK-mediated preferential IL-10 production of regulatory dendritic cells (diffDCs), leading to NK-cell activation. *Blood* **108**, 2307-2315.
- Quesniaux, V., Fremond, C., Jacobs, M., Parida, S., Nicolle, D., Yeremeev, V., *et al.* (2004a). Toll-like receptor pathways in the immune responses to mycobacteria. *Microbes Infect* **6**, 946-959.
- Quesniaux, V.F., Jacobs, M., Allie, N., Grivennikov, S., Nedospasov, S.A., Garcia, I., *et al.* (2010). TNF in host resistance to tuberculosis infection. *Curr Dir Autoimmun* **11**, 157-179.
- Quesniaux, V.J., Nicolle, D.M., Torres, D., Kremer, L., Guerardel, Y., Nigou, J., *et al.* (2004b). Toll-like receptor 2 (TLR2)-dependent-positive and TLR2-independent-negative regulation of proinflammatory cytokines by mycobacterial lipomannans. *J Immunol* **172**, 4425-4434.
- Rahim, S.S., Khan, N., Boddupalli, C.S., Hasnain, S.E. and Mukhopadhyay, S. (2005). Interleukin-10 (IL-10) mediated suppression of IL-12 production in RAW 264.7 cells also involves c-rel transcription factor. *Immunology* **114**, 313-321.
- Ramakrishnan, L. (2012). Revisiting the role of the granuloma in tuberculosis. *Nat Rev Immunol* **12**, 352-366.
-

- 
- Re, F. and Strominger, J.L. (2004). IL-10 released by concomitant TLR2 stimulation blocks the induction of a subset of Th1 cytokines that are specifically induced by TLR4 or TLR3 in human dendritic cells. *J Immunol* **173**, 7548-7555.
- Reddi, K., Meghji, S., Nair, S.P., Arnett, T.R., Miller, A.D., Preuss, M., *et al.* (1998). The *Escherichia coli* chaperonin 60 (groEL) is a potent stimulator of osteoclast formation. *J Bone Miner Res* **13**, 1260-1266.
- Redpath, S., Ghazal, P. and Gascoigne, N.R. (2001). Hijacking and exploitation of IL-10 by intracellular pathogens. *Trends Microbiol* **9**, 86-92.
- Reese, T.A., Liang, H.E., Tager, A.M., Luster, A.D., Van Rooijen, N., Voehringer, D. and Locksley, R.M. (2007). Chitin induces accumulation in tissue of innate immune cells associated with allergy. *Nature* **447**, 92-96.
- Reiling, N., Blumenthal, A., Flad, H.D., Ernst, M. and Ehlers, S. (2001). Mycobacteria-induced TNF- $\alpha$  and IL-10 formation by human macrophages is differentially regulated at the level of mitogen-activated protein kinase activity. *J Immunol* **167**, 3339-3345.
- Reiling, N., Holscher, C., Fehrenbach, A., Kroger, S., Kirschning, C.J., Goyert, S. and Ehlers, S. (2002). Cutting edge: Toll-like receptor (TLR)2- and TLR4-mediated pathogen recognition in resistance to airborne infection with *Mycobacterium tuberculosis*. *J Immunol* **169**, 3480-3484.
- Repique, C.J., Li, A., Brickey, W.J., Ting, J.P., Collins, F.M. and Morris, S.L. (2003). Susceptibility of mice deficient in the MHC class II transactivator to infection with *Mycobacterium tuberculosis*. *Scand J Immunol* **58**, 15-22.
- Retzlaff, C., Yamamoto, Y., Hoffman, P.S., Friedman, H. and Klein, T.W. (1994). Bacterial heat shock proteins directly induce cytokine mRNA and interleukin-1 secretion in macrophage cultures. *Infect Immun* **62**, 5689-5693.
- Riffo-Vasquez, Y., Spina, D., Page, C., Tormay, P., Singh, M., Henderson, B. and Coates, A. (2004). Effect of *Mycobacterium tuberculosis* chaperonins on bronchial eosinophilia and hyper-responsiveness in a murine model of allergic inflammation. *Clin Exp Allergy* **34**, 712-719.
- Roach, D.R., Bean, A.G., Demangel, C., France, M.P., Briscoe, H. and Britton, W.J. (2002). TNF regulates chemokine induction essential for cell recruitment, granuloma formation, and clearance of mycobacterial infection. *J Immunol* **168**, 4620-4627.
-

- 
- Robbins, C.S., Hilgendorf, I., Weber, G.F., Theurl, I., Iwamoto, Y., Figueiredo, J.L., *et al.* (2013). Local proliferation dominates lesional macrophage accumulation in atherosclerosis. *Nat Med* **19**, 1166-1172.
- Robert, J. (2003). Evolution of heat shock protein and immunity. *Dev Comp Immunol* **27**, 449-464.
- Roche, P.A. and Cresswell, P. (1990). Invariant chain association with HLA-DR molecules inhibits immunogenic peptide binding. *Nature* **345**, 615-618.
- Roche, P.A. and Cresswell, P. (1991). Proteolysis of the class II-associated invariant chain generates a peptide binding site in intracellular HLA-DR molecules. *Proc Natl Acad Sci U S A* **88**, 3150-3154.
- Rock, F.L., Hardiman, G., Timans, J.C., Kastelein, R.A. and Bazan, J.F. (1998). A family of human receptors structurally related to *Drosophila* Toll. *Proc Natl Acad Sci U S A* **95**, 588-593.
- Romagnani, S. (2006). Regulation of the T cell response. *Clin Exp Allergy* **36**, 1357-1366.
- Romani, L. (2004). Immunity to fungal infections. *Nat Rev Immunol* **4**, 1-23.
- Rooijackers, S.H. and van Strijp, J.A. (2007). Bacterial complement evasion. *Mol Immunol* **44**, 23-32.
- Rook, G.A. (2007). Th2 cytokines in susceptibility to tuberculosis. *Curr Mol Med* **7**, 327-337.
- Rook, G.A., Dheda, K. and Zumla, A. (2005). Immune responses to tuberculosis in developing countries: implications for new vaccines. *Nat Rev Immunol* **5**, 661-667.
- Rubin, E.J. (2009). The granuloma in tuberculosis--friend or foe? *N Engl J Med* **360**, 2471-2473.
- Russell, D.G. (2001). *Mycobacterium tuberculosis*: here today, and here tomorrow. *Nat Rev Mol Cell Biol* **2**, 569-577.
- Ryffel, B., Fremont, C., Jacobs, M., Parida, S., Botha, T., Schnyder, B. and Quesniaux, V. (2005). Innate immunity to mycobacterial infection in mice: critical role for toll-like receptors. *Tuberculosis (Edinb)* **85**, 395-405.
- Sahiratmadja, E., Alisjahbana, B., de Boer, T., Adnan, I., Maya, A., Danusantoso, H., *et al.* (2007). Dynamic changes in pro- and anti-inflammatory cytokine profiles and
-

- 
- gamma interferon receptor signaling integrity correlate with tuberculosis disease activity and response to curative treatment. *Infect Immun* **75**, 820-829.
- Sallusto, F., Geginat, J. and Lanzavecchia, A. (2004). Central memory and effector memory T cell subsets: function, generation, and maintenance. *Annu Rev Immunol* **22**, 745-763.
- Saraiva, M., Christensen, J.R., Tsytsykova, A.V., Goldfeld, A.E., Ley, S.C., Kioussis, D. and O'Garra, A. (2005). Identification of a macrophage-specific chromatin signature in the IL-10 locus. *J Immunol* **175**, 1041-1046.
- Sasu, S., LaVerda, D., Qureshi, N., Golenbock, D. T. and Beasley, D. (2001). *Chlamydia pneumoniae* and chlamydial heat shock protein 60 stimulate proliferation of human vascular smooth muscle cells via toll-like receptor 4 and p44/p42 mitogen-activated protein kinase activation. *Circ Res* **89**, 244-250.
- Sato, S., Sugiyama, M., Yamamoto, M., Watanabe, Y., Kawai, T., Takeda, K. and Akira, S. (2003). Toll/IL-1 receptor domain-containing adaptor inducing IFN- $\beta$  (TRIF) associates with TNF receptor-associated factor 6 and TANK-binding kinase 1, and activates two distinct transcription factors, NF- $\kappa$ B and IFN-regulatory factor-3, in the toll-like receptor signaling. *J Immunol* **171**, 4304-4310.
- Saunders, B.M. and Britton, W.J. (2007). Life and death in the granuloma: immunopathology of tuberculosis. *Immunol Cell Biol* **85**, 103-111.
- Sawant, D.V., Sehra, S., Nguyen, E.T., Jadhav, R., Englert, K., Shinnakasu, R., *et al.* (2012). Bcl6 controls the Th2 inflammatory activity of regulatory T cells by repressing Gata3 function. *J Immunol* **189**, 4759-4769.
- Scanga, C.A., Mohan, V.P., Yu, K., Joseph, H., Tanaka, K., Chan, J. and Flynn, J.L. (2000). Depletion of Cd4<sup>+</sup> T cells causes reactivation of murine persistent tuberculosis despite continued expression of interferon  $\gamma$  and nitric oxide synthase 2. *J Exp Med* **192**, 347-358.
- Schenten, D. and Medzhitov, R. (2011). The control of adaptive immune responses by the innate immune system. *Adv Immunol* **109**, 87-124.
- Schluger, N.W. and Rom, W.N. (1998). The host immune response to tuberculosis. *Am J Respir Crit Care Med* **157**, 679-691.
- Schmalstieg, F.C., Jr. and Goldman, A.S. (2010). Birth of the science of immunology. *J Med Biogr* **18**, 88-98.
- Schmid, S.L. (1997). Clathrin-coated vesicle formation and protein sorting: an integrated process. *Annual review of biochemistry* **66**, 511-548.
-

- 
- Segal, A.W. (2005). How neutrophils kill microbes. *Annu Rev Immunol* **23**, 197-223.
- Selsted, M.E. and Ouellette, A.J. (1995). Defensins in granules of phagocytic and non-phagocytic cells. *Trends Cell Biol* **5**, 114-119.
- Sen, G.C. and Sarkar, S.N. (2005). Transcriptional signaling by double-stranded RNA: role of TLR3. *Cytokine Growth Factor Rev* **16**, 1-14.
- Senaldi, G., Yin, S., Shaklee, C.L., Piguet, P.F., Mak, T.W. and Ulich, T.R. (1996). *Corynebacterium parvum*- and *Mycobacterium bovis* bacillus Calmette-Guerin-induced granuloma formation is inhibited in TNF receptor I (TNF-RI) knockout mice and by treatment with soluble TNF-RI. *J Immunol* **157**, 5022-5026.
- Shaughnessy, L.M. and Swanson, J.A. (2007). The role of the activated macrophage in clearing *Listeria monocytogenes* infection. *Front Biosci* **12**, 2683-2692.
- Sher, A., Gazzinelli, R.T., Oswald, I.P., Clerici, M., Kullberg, M., Pearce, E.J., *et al.* (1992). Role of T-cell derived cytokines in the downregulation of immune responses in parasitic and retroviral infection. *Immunol Rev* **127**, 183-204.
- Shiloh, M.U., MacMicking, J.D., Nicholson, S., Brause, J.E., Potter, S., Marino, M., *et al.* (1999). Phenotype of mice and macrophages deficient in both phagocyte oxidase and inducible nitric oxide synthase. *Immunity* **10**, 29-38.
- Shim, T.S., Turner, O.C. and Orme, I.M. (2003). Toll-like receptor 4 plays no role in susceptibility of mice to *Mycobacterium tuberculosis* infection. *Tuberculosis (Edinb)* **83**, 367-371.
- Shimazu, R., Akashi, S., Ogata, H., Nagai, Y., Fukudome, K., Miyake, K. and Kimoto, M. (1999). MD-2, a molecule that confers lipopolysaccharide responsiveness on Toll-like receptor 4. *J Exp Med* **189**, 1777-1782.
- Shin, H. and Iwasaki, A. (2013). Tissue-resident memory T cells. *Immunol Rev* **255**, 165-181.
- Shinnick, T.M. (1991). Heat shock proteins as antigens of bacterial and parasitic pathogens. *Curr Top Microbiol Immunol* **167**, 145-160.
- Shirey, K.A., Pletneva, L.M., Puche, A.C., Keegan, A.D., Prince, G.A., Blanco, J.C. and Vogel, S.N. (2010). Control of RSV-induced lung injury by alternatively activated macrophages is IL-4R $\alpha$ -, TLR4-, and IFN- $\beta$ -dependent. *Mucosal Immunol* **3**, 291-300.
-

- 
- Shoham, S., Huang, C., Chen, J.M., Golenbock, D.T. and Levitz, S.M. (2001). Toll-like receptor 4 mediates intracellular signaling without TNF- $\alpha$  release in response to *Cryptococcus neoformans* polysaccharide capsule. *J Immunol* **166**, 4620-4626.
- Sica, A. and Mantovani, A. (2012). Macrophage plasticity and polarization: in vivo veritas. *J Clin Invest* **122**, 787-795.
- Sieling, P.A., Wang, X.H., Gately, M.K., Oliveros, J.L., McHugh, T., Barnes, P.F., *et al.* (1994). IL-12 regulates T helper type 1 cytokine responses in human infectious disease. *J Immunol* **153**, 3639-3647.
- Singh, S.B., Davis, A.S., Taylor, G.A. and Deretic, V. (2006). Human IRGM induces autophagy to eliminate intracellular mycobacteria. *Science* **313**, 1438-1441.
- Small, P.M., Tauber, M.G., Hackbarth, C.J. and Sande, M.A. (1986). Influence of body temperature on bacterial growth rates in experimental pneumococcal meningitis in rabbits. *Infect Immun* **52**, 484-487.
- Somersan, S., Larsson, M., Fonteneau, J.F., Basu, S., Srivastava, P. and Bhardwaj, N. (2001). Primary tumor tissue lysates are enriched in heat shock proteins and induce the maturation of human dendritic cells. *J Immunol* **167**, 4844-4852.
- Song, C.H., Lee, J.S., Lee, S.H., Lim, K., Kim, H.J., Park, J.K., *et al.* (2003). Role of mitogen-activated protein kinase pathways in the production of tumor necrosis factor- $\alpha$ , interleukin-10, and monocyte chemoattractant protein-1 by *Mycobacterium tuberculosis* H37Rv-infected human monocytes. *J Clin Immunol* **23**, 194-201.
- Souza, C.D., Evanson, O.A. and Weiss, D.J. (2006). Mitogen activated protein kinase p38 pathway is an important component of the anti-inflammatory response in *Mycobacterium avium* subsp. paratuberculosis-infected bovine monocytes. *Microb Pathog* **41**, 59-66.
- Sperling, A.I., Auger, J.A., Ehst, B.D., Rulifson, I.C., Thompson, C.B. and Bluestone, J.A. (1996). CD28/B7 interactions deliver a unique signal to naive T cells that regulates cell survival but not early proliferation. *J Immunol* **157**, 3909-3917.
- Spits, H. (2002). Development of  $\alpha\beta$  T cells in the human thymus. *Nat Rev Immunol* **2**, 760-772.
- Srivastava, P. (2002a). Interaction of heat shock proteins with peptides and antigen presenting cells: chaperoning of the innate and adaptive immune responses. *Annu Rev Immunol* **20**, 395-425.
- Srivastava, P. (2002b). Roles of heat-shock proteins in innate and adaptive immunity. *Nat Rev Immunol* **2**, 185-194.
-

- 
- Steimle, V., Siegrist, C.A., Mottet, A., Lisowska-Groszpiere, B. and Mach, B. (1994). Regulation of MHC class II expression by interferon- $\gamma$  mediated by the transactivator gene CIITA. *Science* **265**, 106-109.
- Stenger, S. and Modlin, R.L. (2002). Control of *Mycobacterium tuberculosis* through mammalian Toll-like receptors. *Curr Opin Immunol* **14**, 452-457.
- Sternberg, E.M. (2006). Neural regulation of innate immunity: a coordinated nonspecific host response to pathogens. *Nat Rev Immunol* **6**, 318-328.
- Stewart, G.R., Wernisch, L., Stabler, R., Mangan, J.A., Hinds, J., Laing, K.G., *et al.* (2002). Dissection of the heat-shock response in *Mycobacterium tuberculosis* using mutants and microarrays. *Microbiology* **148**, 3129-3138.
- Strassmann, G., Patil-Koota, V., Finkelman, F., Fong, M. and Kambayashi, T. (1994). Evidence for the involvement of interleukin 10 in the differential deactivation of murine peritoneal macrophages by prostaglandin E2. *J Exp Med* **180**, 2365-2370.
- Subronto, Y.W., van Meijgaarden, K.E., Geluk, A., Arend, S.M., Sunardi, T., Franken, K.L., *et al.* (2003). Interferon- $\gamma$  production in response to *M. tuberculosis* antigens in TB patients in Indonesia. *Adv Exp Med Biol* **531**, 249-260.
- Sugita, M., Grant, E.P., van Donselaar, E., Hsu, V.W., Rogers, R.A., Peters, P.J. and Brenner, M.B. (1999). Separate pathways for antigen presentation by CD1 molecules. *Immunity* **11**, 743-752.
- Szabo, S.J., Kim, S.T., Costa, G.L., Zhang, X., Fathman, C.G. and Glimcher, L.H. (2000). A novel transcription factor, T-bet, directs Th1 lineage commitment. *Cell* **100**, 655-669.
- Szabo, S.J., Sullivan, B.M., Stemmann, C., Satoskar, A.R., Sleckman, B.P. and Glimcher, L.H. (2002). Distinct effects of T-bet in TH1 lineage commitment and IFN- $\gamma$  production in CD4 and CD8 T cells. *Science* **295**, 338-342.
- Szanto, A., Balint, B.L., Nagy, Z.S., Barta, E., Dezso, B., Pap, A., *et al.* (2010). STAT6 transcription factor is a facilitator of the nuclear receptor PPAR $\gamma$ -regulated gene expression in macrophages and dendritic cells. *Immunity* **33**, 699-712.
- Tabona, P., Reddi, K., Khan, S., Nair, S.P., Crean, S.J., Meghji, S., *et al.* (1998). Homogeneous *Escherichia coli* chaperonin 60 induces IL-1 $\beta$  and IL-6 gene expression in human monocytes by a mechanism independent of protein conformation. *J Immunol* **161**, 1414-1421.
- Takahama, Y. (2006). Journey through the thymus: stromal guides for T-cell development and selection. *Nat Rev Immunol* **6**, 127-135.
-

- 
- Takashima, T., Ueta, C., Tsuyuguchi, I. and Kishimoto, S. (1990). Production of tumor necrosis factor alpha by monocytes from patients with pulmonary tuberculosis. *Infect Immun* **58**, 3286-3292.
- Takeda, K. and Akira, S. (2005). Toll-like receptors in innate immunity. *Int Immunol* **17**, 1-14.
- Takeda, K., Kaisho, T. and Akira, S. (2003). Toll-like receptors. *Annu Rev Immunol* **21**, 335-376.
- Takeuchi, O. and Akira, S. (2010). Pattern recognition receptors and inflammation. *Cell* **140**, 805-820.
- Takeuchi, O., Kawai, T., Sanjo, H., Copeland, N.G., Gilbert, D.J., Jenkins, N.A., *et al.* (1999). TLR6: A novel member of an expanding toll-like receptor family. *Gene* **231**, 59-65.
- Takeuchi, O., Sato, S., Horiuchi, T., Hoshino, K., Takeda, K., Dong, Z., *et al.* (2002). Cutting edge: role of Toll-like receptor 1 in mediating immune response to microbial lipoproteins. *J Immunol* **169**, 10-14.
- Taylor, P.R., Martinez-Pomares, L., Stacey, M., Lin, H.H., Brown, G.D. and Gordon, S. (2005). Macrophage receptors and immune recognition. *Annu Rev Immunol* **23**, 901-944.
- Thole, J.E., Hindersson, P., de Bruyn, J., Cremers, F., van der Zee, J., de Cock, H., *et al.* (1988). Antigenic relatedness of a strongly immunogenic 65 kDA mycobacterial protein antigen with a similarly sized ubiquitous bacterial common antigen. *Microb Pathog* **4**, 71-83.
- Thole, J.E., Stabel, L.F., Suykerbuyk, M.E., De Wit, M.Y., Klatser, P.R., Kolk, A.H. and Hartskeerl, R.A. (1990). A major immunogenic 36,000-molecular-weight antigen from *Mycobacterium leprae* contains an immunoreactive region of proline-rich repeats. *Infect Immun* **58**, 80-87.
- Thoma-Uszynski, S., Stenger, S., Takeuchi, O., Ochoa, M.T., Engele, M., Sieling, P.A., *et al.* (2001). Induction of direct antimicrobial activity through mammalian toll-like receptors. *Science* **291**, 1544-1547.
- Thompson, C.B. (1995). Distinct roles for the costimulatory ligands B7-1 and B7-2 in T helper cell differentiation? *Cell* **81**, 979-982.
- Tobian, A.A., Potter, N.S., Ramachandra, L., Pai, R.K., Convery, M., Boom, W.H. and Harding, C.V. (2003). Alternate class I MHC antigen processing is inhibited by Toll-like receptor signaling pathogen-associated molecular patterns:
-



- 
- Mycobacterium tuberculosis* 19-kDa lipoprotein, CpG DNA, and lipopolysaccharide. *J Immunol* **171**, 1413-1422.
- Toossi, Z. and Ellner, J.J. (1998). The role of TGF- $\beta$  in the pathogenesis of human tuberculosis. *Clin Immunol Immunopathol* **87**, 107-114.
- Tormay, P., Coates, A.R. and Henderson, B. (2005). The intercellular signaling activity of the *Mycobacterium tuberculosis* chaperonin 60.1 protein resides in the equatorial domain. *J Biol Chem* **280**, 14272-14277.
- Torres, M., Herrera, T., Villareal, H., Rich, E.A. and Sada, E. (1998). Cytokine profiles for peripheral blood lymphocytes from patients with active pulmonary tuberculosis and healthy household contacts in response to the 30-kilodalton antigen of *Mycobacterium tuberculosis*. *Infect Immun* **66**, 176-180.
- Trapani, J.A. and Smyth, M.J. (2002). Functional significance of the perforin/granzyme cell death pathway. *Nat Rev Immunol* **2**, 735-747.
- Triantafilou, K., Vakakis, E., Orthopoulos, G., Ahmed, M.A., Schumann, C., Lepper, P.M. and Triantafilou, M. (2005). TLR8 and TLR7 are involved in the host's immune response to human parechovirus 1. *Eur J Immunol* **35**, 2416-2423.
- Trinchieri, G. (1994). Interleukin-12: a cytokine produced by antigen-presenting cells with immunoregulatory functions in the generation of T-helper cells type 1 and cytotoxic lymphocytes. *Blood* **84**, 4008-4027.
- Trinchieri, G. (1995). Interleukin-12: a proinflammatory cytokine with immunoregulatory functions that bridge innate resistance and antigen-specific adaptive immunity. *Annu Rev Immunol* **13**, 251-276.
- Trinchieri, G. (2003). Interleukin-12 and the regulation of innate resistance and adaptive immunity. *Nat Rev Immunol* **3**, 133-146.
- Tse, H.M., Josephy, S.I., Chan, E.D., Fouts, D. and Cooper, A.M. (2002). Activation of the mitogen-activated protein kinase signaling pathway is instrumental in determining the ability of *Mycobacterium avium* to grow in murine macrophages. *J Immunol* **168**, 825-833.
- Tsuei, A.C. and Martinus, R.D. (2012). Metformin induced expression of Hsp60 in human THP-1 monocyte cells. *Cell stress & chaperones* **17**, 23-28.
- Turner, J., Gonzalez-Juarrero, M., Ellis, D.L., Basaraba, R.J., Kipnis, A., Orme, I.M. and Cooper, A.M. (2002). In vivo IL-10 production reactivates chronic pulmonary tuberculosis in C57BL/6 mice. *J Immunol* **169**, 6343-6351.
-

- 
- Turvey, S.E. and Broide, D.H. (2010). Innate immunity. *J Allergy Clin Immunol* **125**, S24-32.
- Ulrichs, T. and Kaufmann, S.H. (2006). New insights into the function of granulomas in human tuberculosis. *J Pathol* **208**, 261-269.
- Unanue, E.R. (1981). The regulatory role of macrophages in antigenic stimulation. Part Two: symbiotic relationship between lymphocytes and macrophages. *Adv Immunol* **31**, 1-136.
- Unanue, E.R. (1984). Antigen-presenting function of the macrophage. *Annu Rev Immunol* **2**, 395-428.
- Underhill, D.M., Bassetti, M., Rudensky, A. and Aderem, A. (1999a). Dynamic interactions of macrophages with T cells during antigen presentation. *J Exp Med* **190**, 1909-1914.
- Underhill, D.M., Ozinsky, A., Smith, K.D. and Aderem, A. (1999b). Toll-like receptor-2 mediates mycobacteria-induced proinflammatory signaling in macrophages. *Proc Natl Acad Sci U S A* **96**, 14459-14463.
- Vabulas, R.M., Ahmad-Nejad, P., da Costa, C., Miethke, T., Kirschning, C.J., Hacker, H. and Wagner, H. (2001). Endocytosed HSP60s use toll-like receptor 2 (TLR2) and TLR4 to activate the toll/interleukin-1 receptor signaling pathway in innate immune cells. *J Biol Chem* **276**, 31332-31339.
- Vabulas, R.M., Braedel, S., Hilf, N., Singh-Jasuja, H., Herter, S., Ahmad-Nejad, P., *et al.* (2002a). The endoplasmic reticulum-resident heat shock protein Gp96 activates dendritic cells via the Toll-like receptor 2/4 pathway. *J Biol Chem* **277**, 20847-20853.
- Vabulas, R.M., Wagner, H. and Schild, H. (2002b). Heat shock proteins as ligands of toll-like receptors. *Curr Top Microbiol Immunol* **270**, 169-184.
- Van Seventer, G.A., Shimizu, Y., Horgan, K.J. and Shaw, S. (1990). The LFA-1 ligand ICAM-1 provides an important costimulatory signal for T cell receptor-mediated activation of resting T cells. *J Immunol* **144**, 4579-4586.
- Verdegaal, M.E., Zegveld, S.T. and van Furth, R. (1996). Heat shock protein 65 induces CD62e, CD106, and CD54 on cultured human endothelial cells and increases their adhesiveness for monocytes and granulocytes. *J Immunol* **157**, 369-376.
- Villadangos, J.A. and Schnorrer, P. (2007). Intrinsic and cooperative antigen-presenting functions of dendritic-cell subsets *in vivo*. *Nat Rev Immunol* **7**, 543-555.
-

- 
- Vivier, E. and Malissen, B. (2005). Innate and adaptive immunity: specificities and signaling hierarchies revisited. *Nat Immunol* **6**, 17-21.
- Volkman, H.E., Clay, H., Beery, D., Chang, J.C., Sherman, D.R. and Ramakrishnan, L. (2004). Tuberculous granuloma formation is enhanced by a mycobacterium virulence determinant. *PLoS biology* **2**, e367.
- Volkman, H.E., Pozos, T.C., Zheng, J., Davis, J.M., Rawls, J.F. and Ramakrishnan, L. (2010). Tuberculous granuloma induction via interaction of a bacterial secreted protein with host epithelium. *Science* **327**, 466-469.
- Wagner, C.S., Grotzke, J.E. and Cresswell, P. (2012). Intracellular events regulating cross-presentation. *Front Immunol* **3**, 138.
- Wagner, D.H., Jr., Vaitaitis, G., Sanderson, R., Poulin, M., Dobbs, C. and Haskins, K. (2002). Expression of CD40 identifies a unique pathogenic T cell population in type 1 diabetes. *Proc Natl Acad Sci U S A* **99**, 3782-3787.
- Wakeham, J., Wang, J., Magram, J., Croitoru, K., Harkness, R., Dunn, P., *et al.* (1998). Lack of both types 1 and 2 cytokines, tissue inflammatory responses, and immune protection during pulmonary infection by *Mycobacterium bovis* bacille Calmette-Guerin in IL-12-deficient mice. *J Immunol* **160**, 6101-6111.
- Wan, Y.Y. (2010). Multi-tasking of helper T cells. *Immunology* **130**, 166-171.
- Wang, I.M., Contursi, C., Masumi, A., Ma, X., Trinchieri, G. and Ozato, K. (2000). An IFN- $\gamma$ -inducible transcription factor, IFN consensus sequence binding protein (ICSBP), stimulates IL-12 p40 expression in macrophages. *J Immunol* **165**, 271-279.
- Wang, J., Wakeham, J., Harkness, R. and Xing, Z. (1999). Macrophages are a significant source of type 1 cytokines during mycobacterial infection. *J Clin Invest* **103**, 1023-1029.
- Wang, Y., Kelly, C.G., Singh, M., McGowan, E.G., Carrara, A.S., Bergmeier, L.A. and Lehner, T. (2002). Stimulation of Th1-polarizing cytokines, C-C chemokines, maturation of dendritic cells, and adjuvant function by the peptide binding fragment of heat shock protein 70. *J Immunol* **169**, 2422-2429.
- Watts, C. (1997). Capture and processing of exogenous antigens for presentation on MHC molecules. *Annu Rev Immunol* **15**, 821-850.
- Watts, C. (2004). The exogenous pathway for antigen presentation on major histocompatibility complex class II and CD1 molecules. *Nat Immunol* **5**, 685-692.
-

- 
- Wei, X.Q., Charles, I.G., Smith, A., Ure, J., Feng, G.J., Huang, F.P., *et al.* (1995). Altered immune responses in mice lacking inducible nitric oxide synthase. *Nature* **375**, 408-411.
- Welch, W.J. (1992). Mammalian stress response: cell physiology, structure/function of stress proteins, and implications for medicine and disease. *Physiological reviews* **72**, 1063-1081.
- Wesemann, D.R., Portuguese, A.J., Meyers, R.M., Gallagher, M.P., Cluff-Jones, K., Magee, J.M., *et al.* (2013). Microbial colonization influences early B-lineage development in the gut lamina propria. *Nature* **501**, 112-115.
- WHO (2013) TUBERCULOSIS WHO Global Tuberculosis Report 2013. [http://www.who.int/tb/publications/factsheet\\_global.pdf](http://www.who.int/tb/publications/factsheet_global.pdf)
- Whyte, C.S., Bishop, E.T., Ruckerl, D., Gaspar-Pereira, S., Barker, R.N., Allen, J.E., *et al.* (2011). Suppressor of cytokine signaling (SOCS)1 is a key determinant of differential macrophage activation and function. *J Leukoc Biol* **90**, 845-854.
- Willinger, T., Freeman, T., Hasegawa, H., McMichael, A.J. and Callan, M.F. (2005). Molecular signatures distinguish human central memory from effector memory CD8 T cell subsets. *J Immunol* **175**, 5895-5903.
- Wilsher, M.L., Hagan, C., Prestidge, R., Wells, A.U. and Murison, G. (1999). Human in vitro immune responses to *Mycobacterium tuberculosis*. *Tuber Lung Dis* **79**, 371-377.
- Windhagen, A., Scholz, C., Hollsberg, P., Fukaura, H., Sette, A. and Hafler, D.A. (1995). Modulation of cytokine patterns of human autoreactive T cell clones by a single amino acid substitution of their peptide ligand. *Immunity* **2**, 373-380.
- Wink, D.A., Hines, H.B., Cheng, R.Y., Switzer, C.H., Flores-Santana, W., Vitek, M.P., *et al.* (2011). Nitric oxide and redox mechanisms in the immune response. *J Leukoc Biol* **89**, 873-891.
- Wojciechowski, W., DeSanctis, J., Skamene, E. and Radzioch, D. (1999). Attenuation of MHC class II expression in macrophages infected with *Mycobacterium bovis* bacillus Calmette-Guerin involves class II transactivator and depends on the *Nramp1* gene. *J Immunol* **163**, 2688-2696.
- Wolf, A.J., Desvignes, L., Linas, B., Banaiee, N., Tamura, T., Takatsu, K. and Ernst, J.D. (2008). Initiation of the adaptive immune response to *Mycobacterium tuberculosis* depends on antigen production in the local lymph node, not the lungs. *J Exp Med* **205**, 105-115.
-

- 
- Wooldridge, L., van den Berg, H.A., Glick, M., Gostick, E., Laugel, B., Hutchinson, S.L., *et al.* (2005). Interaction between the CD8 coreceptor and major histocompatibility complex class I stabilizes T cell receptor-antigen complexes at the cell surface. *J Biol Chem* **280**, 27491-27501.
- Xu, D., Liu, H., Komai-Koma, M., Campbell, C., McSharry, C., Alexander, J. and Liew, F.Y. (2003). CD4<sup>+</sup>CD25<sup>+</sup> regulatory T cells suppress differentiation and functions of Th1 and Th2 cells, *Leishmania major* infection, and colitis in mice. *J Immunol* **170**, 394-399.
- Xu, Q., Schett, G., Perschinka, H., Mayr, M., Egger, G., Oberhollenzer, F., *et al.* (2000). Serum soluble heat shock protein 60 is elevated in subjects with atherosclerosis in a general population. *Circulation* **102**, 14-20.
- Yadav, M., Roach, S.K. and Schorey, J.S. (2004). Increased mitogen-activated protein kinase activity and TNF- $\alpha$  production associated with *Mycobacterium smegmatis*- but not *Mycobacterium avium*-infected macrophages requires prolonged stimulation of the calmodulin/calmodulin kinase and cyclic AMP/protein kinase A pathways. *J Immunol* **172**, 5588-5597.
- Yadav, M. and Schorey, J.S. (2006). The  $\beta$ -glucan receptor dectin-1 functions together with TLR2 to mediate macrophage activation by mycobacteria. *Blood* **108**, 3168-3175.
- Yagi, R., Zhu, J. and Paul, W.E. (2011). An updated view on transcription factor GATA3-mediated regulation of Th1 and Th2 cell differentiation. *Int Immunol* **23**, 415-420.
- Yamamoto, M., Sato, S., Hemmi, H., Sanjo, H., Uematsu, S., Kaisho, T., *et al.* (2002). Essential role for TIRAP in activation of the signalling cascade shared by TLR2 and TLR4. *Nature* **420**, 324-329.
- Yamane, H. and Paul, W.E. (2013). Early signaling events that underlie fate decisions of naive CD4<sup>+</sup> T cells toward distinct T-helper cell subsets. *Immunol Rev* **252**, 12-23.
- Yang, C.S., Shin, D.M., Lee, H.M., Son, J.W., Lee, S.J., Akira, S., *et al.* (2008). ASK1-p38 MAPK-p47phox activation is essential for inflammatory responses during tuberculosis via TLR2-ROS signalling. *Cell Microbiol* **10**, 741-754.
- Yarovinsky, F., Zhang, D., Andersen, J.F., Bannenberg, G.L., Serhan, C.N., Hayden, M.S., *et al.* (2005). TLR11 activation of dendritic cells by a protozoan profilin-like protein. *Science* **308**, 1626-1629.
-

- Yokota, S., Minota, S. and Fujii, N. (2006). Anti-HSP auto-antibodies enhance HSP-induced pro-inflammatory cytokine production in human monocytic cells via Toll-like receptors. *Int Immunol* **18**, 573-580.
- Yoneyama, M. and Fujita, T. (2009). RNA recognition and signal transduction by RIG-I-like receptors. *Immunol Rev* **227**, 54-65.
- Yoshida, A., Koide, Y., Uchijima, M. and Yoshida, T.O. (1994). IFN- $\gamma$  induces IL-12 mRNA expression by a murine macrophage cell line, J774. *Biochem Biophys Res Commun* **198**, 857-861.
- Young, D., Hussell, T. and Dougan, G. (2002). Chronic bacterial infections: living with unwanted guests. *Nat Immunol* **3**, 1026-1032.
- Young, D.B. (1992). Heat-shock proteins: immunity and autoimmunity. *Curr Opin Immunol* **4**, 396-400.
- Young, D.B. and Garbe, T.R. (1991). Heat shock proteins and antigens of *Mycobacterium tuberculosis*. *Infect Immun* **59**, 3086-3093.
- Zelensky, A.N. and Gready, J.E. (2005). The C-type lectin-like domain superfamily. *FEBS J* **272**, 6179-6217.
- Zeng, W.P. (2013). 'All things considered': transcriptional regulation of T helper type 2 cell differentiation from precursor to effector activation. *Immunology* **140**, 31-38.
- Zhang, F.X., Kirschning, C.J., Mancinelli, R., Xu, X.P., Jin, Y., Faure, E., *et al.* (1999a). Bacterial lipopolysaccharide activates nuclear factor- $\kappa$ B through interleukin-1 signaling mediators in cultured human dermal endothelial cells and mononuclear phagocytes. *J Biol Chem* **274**, 7611-7614.
- Zhang, G. and Ghosh, S. (2001). Toll-like receptor-mediated NF- $\kappa$ B activation: a phylogenetically conserved paradigm in innate immunity. *J Clin Invest* **107**, 13-19.
- Zhang, J., Roberts, A.I., Liu, C., Ren, G., Xu, G., Zhang, L., *et al.* (2013). A novel subset of helper T cells promotes immune responses by secreting GM-CSF. *Cell Death Differ.*
- Zhang, M., Gong, J., Presky, D.H., Xue, W. and Barnes, P.F. (1999b). Expression of the IL-12 receptor  $\beta$ 1 and  $\beta$ 2 subunits in human tuberculosis. *J Immunol* **162**, 2441-2447.
-

- Zipfel, P.F., Hallstrom, T. and Riesbeck, K. (2013). Human complement control and complement evasion by pathogenic microbes--tipping the balance. *Mol Immunol* **56**, 152-160.
- Zipfel, P.F. and Skerka, C. (2009). Complement regulators and inhibitory proteins. *Nat Rev Immunol* **9**, 729-740.
- Zipfel, P.F., Wurzner, R. and Skerka, C. (2007). Complement evasion of pathogens: common strategies are shared by diverse organisms. *Mol Immunol* **44**, 3850-3857.
- Zuckerman, L.A., Pullen, L. and Miller, J. (1998). Functional consequences of costimulation by ICAM-1 on IL-2 gene expression and T cell activation. *J Immunol* **160**, 3259-3268.
- Zugel, U. and Kaufmann, S.H. (1999a). Immune response against heat shock proteins in infectious diseases. *Immunobiology* **201**, 22-35.
- Zugel, U. and Kaufmann, S.H. (1999b). Role of heat shock proteins in protection from and pathogenesis of infectious diseases. *Clin Microbiol Rev* **12**, 19-39.
- Zwang, Y. and Yarden, Y. (2006). p38 MAP kinase mediates stress-induced internalization of EGFR: implications for cancer chemotherapy. *EMBO J* **25**, 4195-4206.