

7. REFERENCES

- Abbas, A. K., Murphy, K. M., and Sher, A. (1996). Functional diversity of helper T lymphocytes. *Nature* 383, 787-793.
- Aderem, A., and Underhill, D. M. (1999). Mechanisms of phagocytosis in macrophages. *Annu Rev Immunol* 17, 593-623.
- Akashi, K., Traver, D., Miyamoto, T., and Weissman, I. L. (2000). A clonogenic common myeloid progenitor that gives rise to all myeloid lineages. *Nature* 404, 193-197.
- Albert, M. L., Sauter, B., and Bhardwaj, N. (1998). Dendritic cells acquire antigen from apoptotic cells and induce class I-restricted CTLs. *Nature* 392, 86-89.
- Angenieux, C., Salamero, J., Fricker, D., Cazenave, J. P., Goud, B., Hanau, D., and de La Salle, H. (2000). Characterization of CD1e, a third type of CD1 molecule expressed in dendritic cells. *J Biol Chem* 275, 37757-37764.
- Ardavin, C. (2003). Origin, precursors and differentiation of mouse dendritic cells. *Nat Rev Immunol* 3, 582-590.
- Ardavin, C., Wu, L., Li, C. L., and Shortman, K. (1993). Thymic dendritic cells and T cells develop simultaneously in the thymus from a common precursor population. *Nature* 362, 761-763.
- Asseman, C., Mauze, S., Leach, M. W., Coffman, R. L., and Powrie, F. (1999). An essential role for interleukin 10 in the function of regulatory T cells that inhibit intestinal inflammation. *J Exp Med* 190, 995-1004.
- Banchereau, J., Briere, F., Caux, C., Davoust, J., Lebecque, S., Liu, Y. J., Pulendran, B., and Palucka, K. (2000). Immunobiology of dendritic cells. *Annu Rev Immunol* 18, 767-811.
- Banchereau, J., and Steinman, R. M. (1998). Dendritic cells and the control of immunity. *Nature* 392, 245-252.
- Bell, D., Young, J. W., and Banchereau, J. (1999). Dendritic cells. *Adv Immunol* 72, 255-324.
- Bellingan, G. J., Caldwell, H., Howie, S. E., Dransfield, I., and Haslett, C. (1996). In vivo fate of the inflammatory macrophage during the resolution of inflammation: inflammatory macrophages do not die locally, but emigrate to the draining lymph nodes. *J Immunol* 157, 2577-2585.
- Bender, A., Sapp, M., Schuler, G., Steinman, R. M., and Bhardwaj, N. (1996). Improved methods for the generation of dendritic cells from nonproliferating progenitors in human blood. *J Immunol Methods* 196, 121-135.
- Bluestone, J. A., and Tang, Q. (2005). How do CD4⁺CD25⁺ regulatory T cells control autoimmunity? *Curr Opin Immunol* 17, 638-642.

- Bondanza, A., Zimmermann, V. S., Dell'Antonio, G., Dal Cin, E., Capobianco, A., Sabbadini, M. G., Manfredi, A. A., and Rovere-Querini, P. (2003). Cutting edge: dissociation between autoimmune response and clinical disease after vaccination with dendritic cells. *J Immunol* 170, 24-27.
- Borregaard, N., and Cowland, J. B. (1997). Granules of the human neutrophilic polymorphonuclear leukocyte. *Blood* 89, 3503-3521.
- Bousso, P. (2008). T-cell activation by dendritic cells in the lymph node: lessons from the movies. *Nat Rev Immunol* 8, 675-684.
- Brossart, P., Grunebach, F., Stuhler, G., Reichardt, V. L., Mohle, R., Kanz, L., and Brugger, W. (1998). Generation of functional human dendritic cells from adherent peripheral blood monocytes by CD40 ligation in the absence of granulocyte-macrophage colony-stimulating factor. *Blood* 92, 4238-4247.
- Buelens, C., Bartholome, E. J., Amraoui, Z., Boutriaux, M., Salmon, I., Thielemans, K., Willems, F., and Goldman, M. (2002). Interleukin-3 and interferon beta cooperate to induce differentiation of monocytes into dendritic cells with potent helper T-cell stimulatory properties. *Blood* 99, 993-998.
- Butz, E. A., and Bevan, M. J. (1998). Massive expansion of antigen-specific CD8+ T cells during an acute virus infection. *Immunity* 8, 167-175.
- Carroll, M. C., and Fischer, M. B. (1997). Complement and the immune response. *Curr Opin Immunol* 9, 64-69.
- Caux, C., Dezutter-Dambuyant, C., Schmitt, D., and Banchereau, J. (1992). GM-CSF and TNF-alpha cooperate in the generation of dendritic Langerhans cells. *Nature* 360, 258-261.
- Caux, C., Favre, C., Saeland, S., Duvert, V., Durand, I., Mannoni, P., and Banchereau, J. (1991). Potentiation of early hematopoiesis by tumor necrosis factor-alpha is followed by inhibition of granulopoietic differentiation and proliferation. *Blood* 78, 635-644.
- Caux, C., Massacrier, C., Vanbervliet, B., Dubois, B., Van Kooten, C., Durand, I., and Banchereau, J. (1994). Activation of human dendritic cells through CD40 cross-linking. *J Exp Med* 180, 1263-1272.
- Cavanagh, L. L., and Von Andrian, U. H. (2002). Travellers in many guises: the origins and destinations of dendritic cells. *Immunol Cell Biol* 80, 448-462.
- Cella, M., Engering, A., Pinet, V., Pieters, J., and Lanzavecchia, A. (1997a). Inflammatory stimuli induce accumulation of MHC class II complexes on dendritic cells. *Nature* 388, 782-787.

- Cella, M., Sallusto, F., and Lanzavecchia, A. (1997b). Origin, maturation and antigen presenting function of dendritic cells. *Curr Opin Immunol* 9, 10-16.
- Chang, C. C., Wright, A., and Punnonen, J. (2000). Monocyte-derived CD1a⁺ and CD1a⁻ dendritic cell subsets differ in their cytokine production profiles, susceptibilities to transfection, and capacities to direct Th cell differentiation. *J Immunol* 165, 3584-3591.
- Chapuis, F., Rosenzweig, M., Yagello, M., Ekman, M., Biberfeld, P., and Gluckman, J. C. (1997). Differentiation of human dendritic cells from monocytes in vitro. *Eur J Immunol* 27, 431-441.
- Chicha, L., Jarrossay, D., and Manz, M. G. (2004). Clonal type I interferon-producing and dendritic cell precursors are contained in both human lymphoid and myeloid progenitor populations. *J Exp Med* 200, 1519-1524.
- Comes, A., Di Carlo, E., Musiani, P., Rosso, O., Meazza, R., Chiodoni, C., Colombo, M. P., and Ferrini, S. (2002). IFN-gamma-independent synergistic effects of IL-12 and IL-15 induce anti-tumor immune responses in syngeneic mice. *Eur J Immunol* 32, 1914-1923.
- Cyster, J. G. (1999). Chemokines and the homing of dendritic cells to the T cell areas of lymphoid organs. *J Exp Med* 189, 447-450.
- Dalod, M., Salazar-Mather, T. P., Malmgaard, L., Lewis, C., Asselin-Paturel, C., Briere, F., Trinchieri, G., and Biron, C. A. (2002). Interferon alpha/beta and interleukin 12 responses to viral infections: pathways regulating dendritic cell cytokine expression in vivo. *J Exp Med* 195, 517-528.
- de la Salle, H., Mariotti, S., Angenieux, C., Gilleron, M., Garcia-Alles, L. F., Malm, D., Berg, T., Paoletti, S., Maitre, B., Mourey, L., *et al.* (2005). Assistance of microbial glycolipid antigen processing by CD1e. *Science* 310, 1321-1324.
- De Libero, G., and Mori, L. (2006a). How T lymphocytes recognize lipid antigens. *FEBS Lett* 580, 5580-5587.
- De Libero, G., and Mori, L. (2006b). Mechanisms of lipid-antigen generation and presentation to T cells. *Trends Immunol* 27, 485-492.
- Del Prete, G. (1998). The concept of type-1 and type-2 helper T cells and their cytokines in humans. *Int Rev Immunol* 16, 427-455.
- Della Bella, S., Nicola, S., Riva, A., Biasin, M., Clerici, M., and Villa, M. L. (2004). Functional repertoire of dendritic cells generated in granulocyte macrophage-colony stimulating factor and interferon-alpha. *J Leukoc Biol* 75, 106-116.
- den Haan, J. M., Lehar, S. M., and Bevan, M. J. (2000). CD8(+) but not CD8(-) dendritic cells cross-prime cytotoxic T cells in vivo. *J Exp Med* 192, 1685-1696.

- Donskoy, E., and Goldschneider, I. (2003). Two developmentally distinct populations of dendritic cells inhabit the adult mouse thymus: demonstration by differential importation of hematogenous precursors under steady state conditions. *J Immunol* *170*, 3514-3521.
- Dubois, B., Massacrier, C., Vanbervliet, B., Fayette, J., Briere, F., Banchereau, J., and Caux, C. (1998). Critical role of IL-12 in dendritic cell-induced differentiation of naive B lymphocytes. *J Immunol* *161*, 2223-2231.
- Dutronc, Y., and Porcelli, S. A. (2002). The CD1 family and T cell recognition of lipid antigens. *Tissue Antigens* *60*, 337-353.
- Ebner, S., Hofer, S., Nguyen, V. A., Furhapter, C., Herold, M., Fritsch, P., Heufler, C., and Romani, N. (2002). A novel role for IL-3: human monocytes cultured in the presence of IL-3 and IL-4 differentiate into dendritic cells that produce less IL-12 and shift Th cell responses toward a Th2 cytokine pattern. *J Immunol* *168*, 6199-6207.
- Eriksson, U., Ricci, R., Hunziker, L., Kurrer, M. O., Oudit, G. Y., Watts, T. H., Sonderegger, I., Bachmaier, K., Kopf, M., and Penninger, J. M. (2003). Dendritic cell-induced autoimmune heart failure requires cooperation between adaptive and innate immunity. *Nat Med* *9*, 1484-1490.
- Fearon, D. T., and Locksley, R. M. (1996). The instructive role of innate immunity in the acquired immune response. *Science* *272*, 50-53.
- Fitch, F. W., McKisic, M. D., Lancki, D. W., and Gajewski, T. F. (1993). Differential regulation of murine T lymphocyte subsets. *Annu Rev Immunol* *11*, 29-48.
- Fogg, D. K., Sibon, C., Miled, C., Jung, S., Aucouturier, P., Littman, D. R., Cumano, A., and Geissmann, F. (2006). A clonogenic bone marrow progenitor specific for macrophages and dendritic cells. *Science* *311*, 83-87.
- Gabrilovich, D. (2004). Mechanisms and functional significance of tumour-induced dendritic-cell defects. *Nat Rev Immunol* *4*, 941-952.
- Galli, S. J., Nakae, S., and Tsai, M. (2005). Mast cells in the development of adaptive immune responses. *Nat Immunol* *6*, 135-142.
- Gangenahalli, G. U., Gupta, P., Saluja, D., Verma, Y. K., Kishore, V., Chandra, R., Sharma, R. K., and Ravindranath, T. (2005). Stem cell fate specification: role of master regulatory switch transcription factor PU.1 in differential hematopoiesis. *Stem Cells Dev* *14*, 140-152.
- Geijtenbeek, T. B., Torensma, R., van Vliet, S. J., van Duijnhoven, G. C., Adema, G. J., van Kooyk, Y., and Figdor, C. G. (2000). Identification of DC-SIGN, a novel dendritic cell-specific ICAM-3 receptor that supports primary immune responses. *Cell* *100*, 575-585.

- Geissmann, F., Jung, S., and Littman, D. R. (2003). Blood monocytes consist of two principal subsets with distinct migratory properties. *Immunity* *19*, 71-82.
- Geissmann, F., Prost, C., Monnet, J. P., Dy, M., Brousse, N., and Hermine, O. (1998). Transforming growth factor beta1, in the presence of granulocyte/macrophage colony-stimulating factor and interleukin 4, induces differentiation of human peripheral blood monocytes into dendritic Langerhans cells. *J Exp Med* *187*, 961-966.
- Ginhoux, F., Tacke, F., Angeli, V., Bogunovic, M., Loubreau, M., Dai, X. M., Stanley, E. R., Randolph, G. J., and Merad, M. (2006). Langerhans cells arise from monocytes in vivo. *Nat Immunol* *7*, 265-273.
- Gogolak, P., Rethi, B., Szatmari, I., Lanyi, A., Dezso, B., Nagy, L., and Rajnavolgyi, E. (2007). Differentiation of CD1a⁻ and CD1a⁺ monocyte-derived dendritic cells is biased by lipid environment and PPARgamma. *Blood* *109*, 643-652.
- Grouard, G., Rissoan, M. C., Filgueira, L., Durand, I., Banchereau, J., and Liu, Y. J. (1997). The enigmatic plasmacytoid T cells develop into dendritic cells with interleukin (IL)-3 and CD40-ligand. *J Exp Med* *185*, 1101-1111.
- Groux, H., O'Garra, A., Bigler, M., Rouleau, M., Antonenko, S., de Vries, J. E., and Roncarolo, M. G. (1997). A CD4⁺ T-cell subset inhibits antigen-specific T-cell responses and prevents colitis. *Nature* *389*, 737-742.
- Hargreaves, D. C., and Medzhitov, R. (2005). Innate sensors of microbial infection. *J Clin Immunol* *25*, 503-510.
- Hart, D. N. (1997). Dendritic cells: unique leukocyte populations which control the primary immune response. *Blood* *90*, 3245-3287.
- Hegde, S., Chen, X., Keaton, J. M., Reddington, F., Besra, G. S., and Gumperz, J. E. (2007). NKT cells direct monocytes into a DC differentiation pathway. *J Leukoc Biol* *81*, 1224-1235.
- Heufler, C., Koch, F., Stanzl, U., Topar, G., Wysocka, M., Trinchieri, G., Enk, A., Steinman, R. M., Romani, N., and Schuler, G. (1996). Interleukin-12 is produced by dendritic cells and mediates T helper 1 development as well as interferon-gamma production by T helper 1 cells. *Eur J Immunol* *26*, 659-668.
- Hochrein, H., Shortman, K., Vremec, D., Scott, B., Hertzog, P., and O'Keeffe, M. (2001). Differential production of IL-12, IFN-alpha, and IFN-gamma by mouse dendritic cell subsets. *J Immunol* *166*, 5448-5455.
- Hoffmann, J. A., Kafatos, F. C., Janeway, C. A., and Ezekowitz, R. A. (1999). Phylogenetic perspectives in innate immunity. *Science* *284*, 1313-1318.

- Inaba, K., Inaba, M., Deguchi, M., Hagi, K., Yasumizu, R., Ikehara, S., Muramatsu, S., and Steinman, R. M. (1993). Granulocytes, macrophages, and dendritic cells arise from a common major histocompatibility complex class II-negative progenitor in mouse bone marrow. *Proc Natl Acad Sci U S A* *90*, 3038-3042.
- Itano, A. A., McSorley, S. J., Reinhardt, R. L., Ehst, B. D., Ingulli, E., Rudensky, A. Y., and Jenkins, M. K. (2003). Distinct dendritic cell populations sequentially present antigen to CD4 T cells and stimulate different aspects of cell-mediated immunity. *Immunity* *19*, 47-57.
- Iwamoto, S., Iwai, S., Tsujiyama, K., Kurahashi, C., Takeshita, K., Naoe, M., Masunaga, A., Ogawa, Y., Oguchi, K., and Miyazaki, A. (2007). TNF-alpha drives human CD14+ monocytes to differentiate into CD70+ dendritic cells evoking Th1 and Th17 responses. *J Immunol* *179*, 1449-1457.
- Janeway, C. A., Jr. (1992). The immune system evolved to discriminate infectious nonself from noninfectious self. *Immunol Today* *13*, 11-16.
- Kamath, A. T., Henri, S., Battye, F., Tough, D. F., and Shortman, K. (2002). Developmental kinetics and lifespan of dendritic cells in mouse lymphoid organs. *Blood* *100*, 1734-1741.
- Kamath, A. T., Pooley, J., O'Keeffe, M. A., Vremec, D., Zhan, Y., Lew, A. M., D'Amico, A., Wu, L., Tough, D. F., and Shortman, K. (2000). The development, maturation, and turnover rate of mouse spleen dendritic cell populations. *J Immunol* *165*, 6762-6770.
- Kamogawa, Y., Minasi, L. A., Carding, S. R., Bottomly, K., and Flavell, R. A. (1993). The relationship of IL-4- and IFN gamma-producing T cells studied by lineage ablation of IL-4-producing cells. *Cell* *75*, 985-995.
- Karsunky, H., Merad, M., Cozzio, A., Weissman, I. L., and Manz, M. G. (2003). Flt3 ligand regulates dendritic cell development from Flt3+ lymphoid and myeloid-committed progenitors to Flt3+ dendritic cells in vivo. *J Exp Med* *198*, 305-313.
- Khader, S. A., Partida-Sanchez, S., Bell, G., Jelley-Gibbs, D. M., Swain, S., Pearl, J. E., Ghilardi, N., Desauvage, F. J., Lund, F. E., and Cooper, A. M. (2006). Interleukin 12p40 is required for dendritic cell migration and T cell priming after *Mycobacterium tuberculosis* infection. *J Exp Med* *203*, 1805-1815.
- Kiertscher, S. M., and Roth, M. D. (1996). Human CD14+ leukocytes acquire the phenotype and function of antigen-presenting dendritic cells when cultured in GM-CSF and IL-4. *J Leukoc Biol* *59*, 208-218.

- Kim, C. H., Johnston, B., and Butcher, E. C. (2002). Trafficking machinery of NKT cells: shared and differential chemokine receptor expression among V alpha 24(+)V beta 11(+) NKT cell subsets with distinct cytokine-producing capacity. *Blood* *100*, 11-16.
- Kobayashi, S. D., Voyich, J. M., Burlak, C., and DeLeo, F. R. (2005). Neutrophils in the innate immune response. *Arch Immunol Ther Exp (Warsz)* *53*, 505-517.
- Kondo, M., Weissman, I. L., and Akashi, K. (1997). Identification of clonogenic common lymphoid progenitors in mouse bone marrow. *Cell* *91*, 661-672.
- Krutzik, S. R., Tan, B., Li, H., Ochoa, M. T., Liu, P. T., Sharfstein, S. E., Graeber, T. G., Sieling, P. A., Liu, Y. J., Rea, T. H., *et al.* (2005). TLR activation triggers the rapid differentiation of monocytes into macrophages and dendritic cells. *Nat Med* *11*, 653-660.
- Lambrecht, B. N., and Hammad, H. (2003). Taking our breath away: dendritic cells in the pathogenesis of asthma. *Nat Rev Immunol* *3*, 994-1003.
- Lanier, L. L. (2005). NK cell recognition. *Annu Rev Immunol* *23*, 225-274.
- Lanzavecchia, A., and Sallusto, F. (2001). Regulation of T cell immunity by dendritic cells. *Cell* *106*, 263-266.
- Le Borgne, M., Etchart, N., Goubier, A., Lira, S. A., Sirard, J. C., van Rooijen, N., Caux, C., Ait-Yahia, S., Vicari, A., Kaiserlian, D., and Dubois, B. (2006). Dendritic cells rapidly recruited into epithelial tissues via CCR6/CCL20 are responsible for CD8+ T cell crosspriming in vivo. *Immunity* *24*, 191-201.
- Leon, B., Lopez-Bravo, M., and Ardavin, C. (2007). Monocyte-derived dendritic cells formed at the infection site control the induction of protective T helper 1 responses against *Leishmania*. *Immunity* *26*, 519-531.
- Levings, M. K., Bacchetta, R., Schulz, U., and Roncarolo, M. G. (2002). The role of IL-10 and TGF-beta in the differentiation and effector function of T regulatory cells. *Int Arch Allergy Immunol* *129*, 263-276.
- Lewis, J. S., Lee, J. A., Underwood, J. C., Harris, A. L., and Lewis, C. E. (1999). Macrophage responses to hypoxia: relevance to disease mechanisms. *J Leukoc Biol* *66*, 889-900.
- Li, M. O., Sanjabi, S., and Flavell, R. A. (2006). Transforming growth factor-beta controls development, homeostasis, and tolerance of T cells by regulatory T cell-dependent and -independent mechanisms. *Immunity* *25*, 455-471.
- Liu, G., Ng, H., Akasaki, Y., Yuan, X., Ehtesham, M., Yin, D., Black, K. L., and Yu, J. S. (2004). Small interference RNA modulation of IL-10 in human monocyte-derived dendritic cells enhances the Th1 response. *Eur J Immunol* *34*, 1680-1687.

- Liu, Y., and Janeway, C. A., Jr. (1991). Microbial induction of co-stimulatory activity for CD4 T-cell growth. *Int Immunol* 3, 323-332.
- Liu, Y., and Janeway, C. A., Jr. (1992). Cells that present both specific ligand and costimulatory activity are the most efficient inducers of clonal expansion of normal CD4 T cells. *Proc Natl Acad Sci U S A* 89, 3845-3849.
- Liu, Y. J. (2005). IPC: professional type 1 interferon-producing cells and plasmacytoid dendritic cell precursors. *Annu Rev Immunol* 23, 275-306.
- Livak, K. J., and Schmittgen, T. D. (2001). Analysis of relative gene expression data using real-time quantitative PCR and the 2^{(-Delta Delta C(T))} Method. *Methods* 25, 402-408.
- Ma, A., Koka, R., and Burkett, P. (2006). Diverse functions of IL-2, IL-15, and IL-7 in lymphoid homeostasis. *Annu Rev Immunol* 24, 657-679.
- Maggi, E., Parronchi, P., Manetti, R., Simonelli, C., Piccinni, M. P., Ruggi, F. S., De Carli, M., Ricci, M., and Romagnani, S. (1992). Reciprocal regulatory effects of IFN-gamma and IL-4 on the in vitro development of human Th1 and Th2 clones. *J Immunol* 148, 2142-2147.
- Manz, M. G., Traver, D., Miyamoto, T., Weissman, I. L., and Akashi, K. (2001). Dendritic cell potentials of early lymphoid and myeloid progenitors. *Blood* 97, 3333-3341.
- Maraskovsky, E., Brasel, K., Teepe, M., Roux, E. R., Lyman, S. D., Shortman, K., and McKenna, H. J. (1996). Dramatic increase in the numbers of functionally mature dendritic cells in Flt3 ligand-treated mice: multiple dendritic cell subpopulations identified. *J Exp Med* 184, 1953-1962.
- Maraskovsky, E., Daro, E., Roux, E., Teepe, M., Maliszewski, C. R., Hoek, J., Caron, D., Lebsack, M. E., and McKenna, H. J. (2000). In vivo generation of human dendritic cell subsets by Flt3 ligand. *Blood* 96, 878-884.
- Markowicz, S., and Engleman, E. G. (1990). Granulocyte-macrophage colony-stimulating factor promotes differentiation and survival of human peripheral blood dendritic cells in vitro. *J Clin Invest* 85, 955-961.
- Martin, P., Ruiz, S. R., del Hoyo, G. M., Anjuere, F., Vargas, H. H., Lopez-Bravo, M., and Ardavin, C. (2002). Dramatic increase in lymph node dendritic cell number during infection by the mouse mammary tumor virus occurs by a CD62L-dependent blood-borne DC recruitment. *Blood* 99, 1282-1288.
- Matsuda, J. L., Naidenko, O. V., Gapin, L., Nakayama, T., Taniguchi, M., Wang, C. R., Koezuka, Y., and Kronenberg, M. (2000). Tracking the response of natural killer T cells to a glycolipid antigen using CD1d tetramers. *J Exp Med* 192, 741-754.

- Matzinger, P. (1994). Tolerance, danger, and the extended family. *Annu Rev Immunol* 12, 991-1045.
- McKenna, H. J. (2001). Role of hematopoietic growth factors/flt3 ligand in expansion and regulation of dendritic cells. *Curr Opin Hematol* 8, 149-154.
- Medzhitov, R. (2007). Recognition of microorganisms and activation of the immune response. *Nature* 449, 819-826.
- Medzhitov, R., and Janeway, C. A., Jr. (1997a). Innate immunity: impact on the adaptive immune response. *Curr Opin Immunol* 9, 4-9.
- Medzhitov, R., and Janeway, C. A., Jr. (1997b). Innate immunity: the virtues of a nonclonal system of recognition. *Cell* 91, 295-298.
- Medzhitov, R., and Janeway, C. A., Jr. (1998). Innate immune recognition and control of adaptive immune responses. *Semin Immunol* 10, 351-353.
- Menges, M., Rossner, S., Voigtlander, C., Schindler, H., Kukutsch, N. A., Bogdan, C., Erb, K., Schuler, G., and Lutz, M. B. (2002). Repetitive injections of dendritic cells matured with tumor necrosis factor alpha induce antigen-specific protection of mice from autoimmunity. *J Exp Med* 195, 15-21.
- Merad, M., Hoffmann, P., Ranheim, E., Slaymaker, S., Manz, M. G., Lira, S. A., Charo, I., Cook, D. N., Weissman, I. L., Strober, S., and Engleman, E. G. (2004). Depletion of host Langerhans cells before transplantation of donor alloreactive T cells prevents skin graft-versus-host disease. *Nat Med* 10, 510-517.
- Mohamadzadeh, M., Berard, F., Essert, G., Chalouni, C., Pulendran, B., Davoust, J., Bridges, G., Palucka, A. K., and Banchereau, J. (2001). Interleukin 15 skews monocyte differentiation into dendritic cells with features of Langerhans cells. *J Exp Med* 194, 1013-1020.
- 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.
- 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.
- Naik, S. H., Metcalf, D., van Nieuwenhuijze, A., Wicks, I., Wu, L., O'Keeffe, M., and Shortman, K. (2006). Intrasplenic steady-state dendritic cell precursors that are distinct from monocytes. *Nat Immunol* 7, 663-671.

- Nestle, F. O., Turka, L. A., and Nickoloff, B. J. (1994). Characterization of dermal dendritic cells in psoriasis. Autostimulation of T lymphocytes and induction of Th1 type cytokines. *J Clin Invest* 94, 202-209.
- Nisini, R., Paroli, M., Accapezzato, D., Bonino, F., Rosina, F., Santantonio, T., Sallusto, F., Amoroso, A., Houghton, M., and Barnaba, V. (1997). Human CD4⁺ T-cell response to hepatitis delta virus: identification of multiple epitopes and characterization of T-helper cytokine profiles. *J Virol* 71, 2241-2251.
- O'Keeffe, M., Hochrein, H., Vremec, D., Caminschi, I., Miller, J. L., Anders, E. M., Wu, L., Lahoud, M. H., Henri, S., Scott, B., *et al.* (2002). Mouse plasmacytoid cells: long-lived cells, heterogeneous in surface phenotype and function, that differentiate into CD8(+) dendritic cells only after microbial stimulus. *J Exp Med* 196, 1307-1319.
- Palframan, R. T., Jung, S., Cheng, G., Weninger, W., Luo, Y., Dorf, M., Littman, D. R., Rollins, B. J., Zweerink, H., Rot, A., and von Andrian, U. H. (2001). Inflammatory chemokine transport and presentation in HEV: a remote control mechanism for monocyte recruitment to lymph nodes in inflamed tissues. *J Exp Med* 194, 1361-1373.
- Pape, K. A., Catron, D. M., Itano, A. A., and Jenkins, M. K. (2007). The humoral immune response is initiated in lymph nodes by B cells that acquire soluble antigen directly in the follicles. *Immunity* 26, 491-502.
- Paul, W. E., and Seder, R. A. (1994). Lymphocyte responses and cytokines. *Cell* 76, 241-251.
- Penna, G., Vulcano, M., Sozzani, S., and Adorini, L. (2002). Differential migration behavior and chemokine production by myeloid and plasmacytoid dendritic cells. *Hum Immunol* 63, 1164-1171.
- Pickl, W. F., Majdic, O., Kohl, P., Stockl, J., Riedl, E., Scheinecker, C., Bello-Fernandez, C., and Knapp, W. (1996). Molecular and functional characteristics of dendritic cells generated from highly purified CD14⁺ peripheral blood monocytes. *J Immunol* 157, 3850-3859.
- Piemonti, L., Bernasconi, S., Luini, W., Trobonjaca, Z., Minty, A., Allavena, P., and Mantovani, A. (1995). IL-13 supports differentiation of dendritic cells from circulating precursors in concert with GM-CSF. *Eur Cytokine Netw* 6, 245-252.
- Piqueras, B., Connolly, J., Freitas, H., Palucka, A. K., and Banchereau, J. (2006). Upon viral exposure, myeloid and plasmacytoid dendritic cells produce 3 waves of distinct chemokines to recruit immune effectors. *Blood* 107, 2613-2618.

- Prete, S. P., Giuliani, A., D'Atri, S., Graziani, G., Balduzzi, A., Oggioni, M. R., Iona, E., Girolomoni, G., Bonmassar, L., Romani, L., and Franzese, O. (2007). BCG-infected adherent mononuclear cells release cytokines that regulate group 1 CD1 molecule expression. *Int Immunopharmacol* 7, 321-332.
- Probst, H. C., and van den Broek, M. (2005). Priming of CTLs by lymphocytic choriomeningitis virus depends on dendritic cells. *J Immunol* 174, 3920-3924.
- Pulendran, B., Palucka, K., and Banchereau, J. (2001). Sensing pathogens and tuning immune responses. *Science* 293, 253-256.
- Qu, C., Edwards, E. W., Tacke, F., Angeli, V., Llodra, J., Sanchez-Schmitz, G., Garin, A., Haque, N. S., Peters, W., van Rooijen, N., *et al.* (2004). Role of CCR8 and other chemokine pathways in the migration of monocyte-derived dendritic cells to lymph nodes. *J Exp Med* 200, 1231-1241.
- Randolph, G. J., Angeli, V., and Swartz, M. A. (2005). Dendritic-cell trafficking to lymph nodes through lymphatic vessels. *Nat Rev Immunol* 5, 617-628.
- Randolph, G. J., Beaulieu, S., Lebecque, S., Steinman, R. M., and Muller, W. A. (1998). Differentiation of monocytes into dendritic cells in a model of transendothelial trafficking. *Science* 282, 480-483.
- Randolph, G. J., Inaba, K., Robbiani, D. F., Steinman, R. M., and Muller, W. A. (1999). Differentiation of phagocytic monocytes into lymph node dendritic cells in vivo. *Immunity* 11, 753-761.
- Relloso, M., Puig-Kroger, A., Pello, O. M., Rodriguez-Fernandez, J. L., de la Rosa, G., Longo, N., Navarro, J., Munoz-Fernandez, M. A., Sanchez-Mateos, P., and Corbi, A. L. (2002). DC-SIGN (CD209) expression is IL-4 dependent and is negatively regulated by IFN, TGF-beta, and anti-inflammatory agents. *J Immunol* 168, 2634-2643.
- Romagnani, S. (1992). Induction of TH1 and TH2 responses: a key role for the 'natural' immune response? *Immunol Today* 13, 379-381.
- Romagnani, S. (1994). Lymphokine production by human T cells in disease states. *Annu Rev Immunol* 12, 227-257.
- Romagnani, S. (2004). Immunologic influences on allergy and the TH1/TH2 balance. *J Allergy Clin Immunol* 113, 395-400.
- Romagnani, S. (2006). Regulation of the T cell response. *Clin Exp Allergy* 36, 1357-1366.
- Romani, N., Gruner, S., Brang, D., Kampgen, E., Lenz, A., Trockenbacher, B., Konwalinka, G., Fritsch, P. O., Steinman, R. M., and Schuler, G. (1994). Proliferating dendritic cell progenitors in human blood. *J Exp Med* 180, 83-93.

- Romani, N., Reider, D., Heuer, M., Ebner, S., Kampgen, E., Eibl, B., Niederwieser, D., and Schuler, G. (1996). Generation of mature dendritic cells from human blood. An improved method with special regard to clinical applicability. *J Immunol Methods* 196, 137-151.
- Rotta, G., Edwards, E. W., Sangaletti, S., Bennett, C., Ronzoni, S., Colombo, M. P., Steinman, R. M., Randolph, G. J., and Rescigno, M. (2003). Lipopolysaccharide or whole bacteria block the conversion of inflammatory monocytes into dendritic cells in vivo. *J Exp Med* 198, 1253-1263.
- Sakaguchi, S. (2004). Naturally arising CD4⁺ regulatory t cells for immunologic self-tolerance and negative control of immune responses. *Annu Rev Immunol* 22, 531-562.
- Sallusto, F., and Lanzavecchia, A. (1994). Efficient presentation of soluble antigen by cultured human dendritic cells is maintained by granulocyte/macrophage colony-stimulating factor plus interleukin 4 and downregulated by tumor necrosis factor alpha. *J Exp Med* 179, 1109-1118.
- Santiago-Schwarz, F., Belilos, E., Diamond, B., and Carsons, S. E. (1992). TNF in combination with GM-CSF enhances the differentiation of neonatal cord blood stem cells into dendritic cells and macrophages. *J Leukoc Biol* 52, 274-281.
- Santini, S. M., Lapenta, C., Logozzi, M., Parlato, S., Spada, M., Di Pucchio, T., and Belardelli, F. (2000). Type I interferon as a powerful adjuvant for monocyte-derived dendritic cell development and activity in vitro and in Hu-PBL-SCID mice. *J Exp Med* 191, 1777-1788.
- Savina, A., and Amigorena, S. (2007). Phagocytosis and antigen presentation in dendritic cells. *Immunol Rev* 219, 143-156.
- Schaerli, P., Willimann, K., Ebert, L. M., Walz, A., and Moser, B. (2005). Cutaneous CXCL14 targets blood precursors to epidermal niches for Langerhans cell differentiation. *Immunity* 23, 331-342.
- Schlesinger, L. S. (1993). Macrophage phagocytosis of virulent but not attenuated strains of *Mycobacterium tuberculosis* is mediated by mannose receptors in addition to complement receptors. *J Immunol* 150, 2920-2930.
- Schuler-Thurner, B., Schultz, E. S., Berger, T. G., Weinlich, G., Ebner, S., Woerl, P., Bender, A., Feuerstein, B., Fritsch, P. O., Romani, N., and Schuler, G. (2002). Rapid induction of tumor-specific type 1 T helper cells in metastatic melanoma patients by vaccination with mature, cryopreserved, peptide-loaded monocyte-derived dendritic cells. *J Exp Med* 195, 1279-1288.

- Segal, A. W., Geisow, M., Garcia, R., Harper, A., and Miller, R. (1981). The respiratory burst of phagocytic cells is associated with a rise in vacuolar pH. *Nature* 290, 406-409.
- Serbina, N. V., Salazar-Mather, T. P., Biron, C. A., Kuziel, W. A., and Pamer, E. G. (2003). TNF/iNOS-producing dendritic cells mediate innate immune defense against bacterial infection. *Immunity* 19, 59-70.
- Sher, A., and Coffman, R. L. (1992). Regulation of immunity to parasites by T cells and T cell-derived cytokines. *Annu Rev Immunol* 10, 385-409.
- Shortman, K., and Caux, C. (1997). Dendritic cell development: multiple pathways to nature's adjuvants. *Stem Cells* 15, 409-419.
- Shortman, K., and Liu, Y. J. (2002). Mouse and human dendritic cell subtypes. *Nat Rev Immunol* 2, 151-161.
- Shortman, K., and Naik, S. H. (2007). Steady-state and inflammatory dendritic-cell development. *Nat Rev Immunol* 7, 19-30.
- Soumelis, V., Reche, P. A., Kanzler, H., Yuan, W., Edward, G., Homey, B., Gilliet, M., Ho, S., Antonenko, S., Lauerma, A., *et al.* (2002). Human epithelial cells trigger dendritic cell mediated allergic inflammation by producing TSLP. *Nat Immunol* 3, 673-680.
- Steinman, R. M. (1991). The dendritic cell system and its role in immunogenicity. *Annu Rev Immunol* 9, 271-296.
- Steinman, R. M., and Cohn, Z. A. (1973). Identification of a novel cell type in peripheral lymphoid organs of mice. I. Morphology, quantitation, tissue distribution. *J Exp Med* 137, 1142-1162.
- Steinman, R. M., and Nussenzweig, M. C. (2002). Avoiding horror autotoxicus: the importance of dendritic cells in peripheral T cell tolerance. *Proc Natl Acad Sci U S A* 99, 351-358.
- Tan, T. T., and Coussens, L. M. (2007). Humoral immunity, inflammation and cancer. *Curr Opin Immunol* 19, 209-216.
- Tang, H. L., and Cyster, J. G. (1999). Chemokine Up-regulation and activated T cell attraction by maturing dendritic cells. *Science* 284, 819-822.
- Traidl-Hoffmann, C., Mariani, V., Hochrein, H., Karg, K., Wagner, H., Ring, J., Mueller, M. J., Jakob, T., and Behrendt, H. (2005). Pollen-associated phytoprostanes inhibit dendritic cell interleukin-12 production and augment T helper type 2 cell polarization. *J Exp Med* 201, 627-636.
- Trombetta, E. S., and Mellman, I. (2005). Cell biology of antigen processing in vitro and in vivo. *Annu Rev Immunol* 23, 975-1028.

- Ueno, H., Klechevsky, E., Morita, R., Aspod, C., Cao, T., Matsui, T., Di Pucchio, T., Connolly, J., Fay, J. W., Pascual, V., *et al.* (2007). Dendritic cell subsets in health and disease. *Immunol Rev* 219, 118-142.
- Valladeau, J., and Saeland, S. (2005). Cutaneous dendritic cells. *Semin Immunol* 17, 273-283.
- van Furth, R., and Cohn, Z. A. (1968). The origin and kinetics of mononuclear phagocytes. *J Exp Med* 128, 415-435.
- Varol, C., Landsman, L., Fogg, D. K., Greenshtein, L., Gildor, B., Margalit, R., Kalchenko, V., Geissmann, F., and Jung, S. (2007). Monocytes give rise to mucosal, but not splenic, conventional dendritic cells. *J Exp Med* 204, 171-180.
- Villadangos, J. A., and Heath, W. R. (2005). Life cycle, migration and antigen presenting functions of spleen and lymph node dendritic cells: limitations of the Langerhans cells paradigm. *Semin Immunol* 17, 262-272.
- Viola, A., and Lanzavecchia, A. (1996). T cell activation determined by T cell receptor number and tunable thresholds. *Science* 273, 104-106.
- Vremec, D., O'Keeffe, M., Hochrein, H., Fuchsberger, M., Caminschi, I., Lahoud, M., and Shortman, K. (2007). Production of interferons by dendritic cells, plasmacytoid cells, natural killer cells, and interferon-producing killer dendritic cells. *Blood* 109, 1165-1173.
- Vremec, D., Pooley, J., Hochrein, H., Wu, L., and Shortman, K. (2000). CD4 and CD8 expression by dendritic cell subtypes in mouse thymus and spleen. *J Immunol* 164, 2978-2986.
- Vremec, D., Zorbas, M., Scollay, R., Saunders, D. J., Ardavin, C. F., Wu, L., and Shortman, K. (1992). The surface phenotype of dendritic cells purified from mouse thymus and spleen: investigation of the CD8 expression by a subpopulation of dendritic cells. *J Exp Med* 176, 47-58.
- Weiner, H. L. (2001). Induction and mechanism of action of transforming growth factor-beta-secreting Th3 regulatory cells. *Immunol Rev* 182, 207-214.
- Wiktor-Jedrzejczak, W., Bartocci, A., Ferrante, A. W., Jr., Ahmed-Ansari, A., Sell, K. W., Pollard, J. W., and Stanley, E. R. (1990). Total absence of colony-stimulating factor 1 in the macrophage-deficient osteopetrotic (op/op) mouse. *Proc Natl Acad Sci U S A* 87, 4828-4832.
- Williams, M. A., and Bevan, M. J. (2007). Effector and memory CTL differentiation. *Annu Rev Immunol* 25, 171-192.

- Wirths, S., Reichert, J., Grunebach, F., and Brossart, P. (2002). Activated CD8⁺ T lymphocytes induce differentiation of monocytes to dendritic cells and restore the stimulatory capacity of interleukin 10-treated antigen-presenting cells. *Cancer Res* 62, 5065-5068.
- Woerly, G., Roger, N., Loiseau, S., Dombrowicz, D., Capron, A., and Capron, M. (1999). Expression of CD28 and CD86 by human eosinophils and role in the secretion of type 1 cytokines (interleukin 2 and interferon gamma): inhibition by immunoglobulin a complexes. *J Exp Med* 190, 487-495.
- Wu, L., Scollay, R., Egerton, M., Pearse, M., Spangrude, G. J., and Shortman, K. (1991). CD4 expressed on earliest T-lineage precursor cells in the adult murine thymus. *Nature* 349, 71-74.
- Yamazaki, K., Ohsawa, Y., and Yoshie, H. (2001). Elevated proportion of natural killer T cells in periodontitis lesions: a common feature of chronic inflammatory diseases. *Am J Pathol* 158, 1391-1398.
- Yi, H., Zhang, L., Zhen, Y., He, X., and Zhao, Y. (2007). Dendritic cells induced in the presence of GM-CSF and IL-5. *Cytokine* 37, 35-43.
- Yoneyama, H., Matsuno, K., Zhang, Y., Murai, M., Itakura, M., Ishikawa, S., Hasegawa, G., Naito, M., Asakura, H., and Matsushima, K. (2001). Regulation by chemokines of circulating dendritic cell precursors, and the formation of portal tract-associated lymphoid tissue, in a granulomatous liver disease. *J Exp Med* 193, 35-49.
- Yoneyama, H., Matsuno, K., Zhang, Y., Nishiwaki, T., Kitabatake, M., Ueha, S., Narumi, S., Morikawa, S., Ezaki, T., Lu, B., *et al.* (2004). Evidence for recruitment of plasmacytoid dendritic cell precursors to inflamed lymph nodes through high endothelial venules. *Int Immunol* 16, 915-928.
- Young, J. W., Szabolcs, P., and Moore, M. A. (1995). Identification of dendritic cell colony-forming units among normal human CD34⁺ bone marrow progenitors that are expanded by c-kit-ligand and yield pure dendritic cell colonies in the presence of granulocyte/macrophage colony-stimulating factor and tumor necrosis factor alpha. *J Exp Med* 182, 1111-1119.
- Zhang, A. L., Colmenero, P., Purath, U., Teixeira de Matos, C., Hueber, W., Klareskog, L., Tarner, I. H., Engleman, E. G., and Soderstrom, K. (2007). Natural killer cells trigger differentiation of monocytes into dendritic cells. *Blood* 110, 2484-2493.
- Zhu, J., and Paul, W. E. (2008). CD4 T cells: fates, functions, and faults. *Blood* 112, 1557-1569.

- Zou, G. M., and Tam, Y. K. (2002). Cytokines in the generation and maturation of dendritic cells: recent advances. *Eur Cytokine Netw* 13, 186-199.

