

## 7 Literaturverzeichnis

Abagyan, R.A. , and T., M.M. (1994a). Biased probability Monte Carlo conformational searches and electrostatic calculations for peptides and proteins. *J Mol Biol* 235, 935-1002.

Abagyan, R.A., T., M.M., and Kuznetsov, D.N. (1994b). ICM - a new method for protein modelling and design. Applications to docking and structure prediction from the distorted native conformation. *J Comp Chem* 15, 488-506.

Abbas, A.K., Murphy, K.M., and Sher, A. (1996). Functional diversity of helper T-Lymphocytes. *Nature* 383, 787-793.

Ahmed, R., and Gray, D. (1996). Immunological memory and protective immunity: understanding their relation. *Science* 272, 54-60.

Akkaraju, S., Ho, W., Len, Y. , et al. (1997). A range of CD4 T cell tolerance: Partial inactivation to organ-specific antigen allows non-destructive thyreoiditis or insulinitis. *Immunity* 7, 255-271.

Anderson, A.C., Nicholson, L.B., Legge, K.L., et al. (2000). High frequency of auto reactive myelin proteolipid protein specific T Cells in the periphery of naïve mice: mechanism of selection of the self-reactive repertoire. *J Exp Med* 191, 761-770.

Atkinson, M.A., Bowman, M.A., Campbell, L., Darrow, B.L., Kaufman, D.L., and Maclaren, N.K. (1994). Cellular immunity to a determinant common to glutamate decarboxylase and coxsackie virus in insulin-dependent diabetes. *J. Clin. Invest* 94, 2125-2129.

Ausubel, J., Kwan, C.K., Sette, A., Kuchroo, V., and Hafler, D. (1996). Complementary mutations in an antigenic peptide allow for cross-reactivity of an auto reactive T cell clone. *Proc Natl Acad Sci USA* 93, 15317-15322.

Bachmaier, K., Neu, N., de la Maza, L.M., Pal, S., Hessel, A., and Penninger, J.M. (1999). Chlamydia infections and heart disease linkes through antigenic mimicry. *Science* 283, 1335-1339.

Badley, A.D., Dockrell, D., and Simpson, M. (1997). Macrophage-dependent apoptosis of CD4+ T lymphocytes from HIV-infected individuals is mediated by FasL and tumour necrosis factor. *J Exp Med* 85, 55-64.

Bairoch, A., Bucher, P., and Hofmann, K. (1997). The PROSITE database, its status in 1997. *Nucleic Acids Res* 25, 217-221.

Barnett, L.A., Whitton, J.L., Wang, L.Y., and Fujinami, R.S. (1996). Virus encoding an encephalitogenic peptide protects mice from experimental allergic encephalomyelitis. *J Neuroimmunol* 64, 163-173.

Barker, C.F., and Billingham, R.E. (1977). Immunologically privileged sites. *Adv Immunol* 25, 1-54.

Becker, K.G., Simon, R.M., and Bailey-Wilson, J.E. (1998). Clustering of non-major

- histocompatibility complex susceptibility candidate loci in human autoimmune diseases. *Proc Natl Acad Sci U S A* 95, 9979-9984.
- Bielekova, B., Goodwin, B., Richert, N., et al. (2000). Encephalitogenic potential of the myelin basic protein peptide (amino acids 83-99) in multiple sclerosis results of a phase II clinical trial with an altered peptide ligand. *Nat Med* 6 (10), 1167-1175.
- Bjorkmann, P.J., Saper, M., Samraoui, B., et al. (1987). Structure of the human class I histocompatibility antigen, HLA-A2. *Nature* 329, 506-512.
- Bjorkmann, P.J. (1997). MHC Restriction in Three Dimensions: A View of T Cell Receptor /Ligand Interactions. *Cell* 89, 167-170.
- Brehm, M.A., Pinto, A.K., Daniels, K.A., et al. (2002). T cell immunodominance and maintenance of memory regulated by unexpectedly cross-reactive pathogen. *Nat Immunol* 3, 627-634.
- Brown, J.H., Hartzetzky, T.S., Gorga, J.C., et al. (1993). Three-dimensional structure of the human class II histocompatibility antigen HLA-DR1. *Nature* 364, 33-39.
- Brown, C.R., and Reiner, S.L. (1999). Genetic control of experimental lyme arthritis in the absence of specific immunity. *Infect Immun* 67, 1967-1973.
- Busch, D.H., Jassoy, C., Brinckmann, U., Girschick, H., and Huppertz, H.I. (1996). Detection of *Borrelia burgdorferi* specific CD8<sup>+</sup> cytotoxic T cells in patients with Lyme arthritis. *J Immunol* 157(8), 3534-3541.
- Chambers, C.A., and Allison, J.P. (1999). Costimulatory regulation of T cell function. *Curr Opin Cell Biol* 11, 203-210.
- Chapoval, A.I., Ni, J., Lau, J.S., et al. (2001). B7-H3: A costimulatory molecule for T cell activation and IFN-gamma production. *Nature Immun* 2, 269-274.
- Chicz, R.M., Urban, R. G., Lane, W.S., et al. (1992). Predominant naturally processed peptides bound to HLA-DR1 are derived from MHC-related molecules and are heterogeneous in size. *Nature* 358, 764-768.
- Congia, M., Patel, S., Cope, A. P., De Virgillis, S., and Sonderstrup, G. (1998). T cell epitopes of insulin defined in HLA-DR4 transgenic mice are derived from pre-proinsulin and proinsulin. *Proc Natl Acad Sci USA* 95, 3833-3838.
- Conolly, M.L. (1983). Analytical molecular surface calculation. *J Appl Cryst* 16, 548-558.
- Coyle, A. J, Lehar, S., Lloyd, C., et al. (2000). The CD28-related molecule ICOS is required for effective Tcell-dependent immuneresponses. *Immunity* 13, 95-105.
- Craft, J.E., Grodzicki, R.L., Shrestha, M., Fischer, D.K., Garcia-Blanco, M., and Steere, A.C. (1984). The antibody response in Lyme disease. *Yale J Biol Med* 57, 561-565.

- Craft, J.E., Fischer, D.K., Shimamoto, G.T., and Steere, A.C. (1986). Antigens of *Borrelia burgdorferi* recognized during Lyme disease. Appearance of a new immunoglobulin M response and expansion of the immunoglobulin G response late in the illness. *J Clin Invest* 78, 934-939.
- Christen, U., Edelmann, K., Wolfe, T., et al.. Acceleration of primed autoimmunity but not de novo induction of auto-aggressive lymphocytes by molecular mimicry, submitted for publication.
- Croke, C.L., Munson, E.L., Lovrich, S.D., et al. (2000). Occurrence of severe destructive lyme arthritis in hamsters vaccinated with outer-surface protein A and challenged with *Borrelia burgdorferi*. *Infect Immun* 68, 658-663.
- Damian, R. T. (1964). Molecular mimicry: antigen sharing by parasite and host and its consequences. *Am Nat* 98, 129-149.
- DeSilva, D.R., Feeser, W.S., Tancula, E.J., and Scherle, P.A. (1996). Anergic T cells are defective in both NH<sub>2</sub>-terminal kinase and mitogen-activated protein kinase signaling pathways. *J Exp Med* 183, 2017-2023.
- Delves, P.J. and Roitt, I. (2000). The immune system (2). *N Engl J Med* 343, 108-117.
- Dhein, J., Walczak, H., Baumler, C., Debatin, K.M., and Krammer, P.H. (1995). Autocrine T cell suicide mediated by APO-1/(Fas/CD95). *Nature* 373, 438-441.
- Dighe, A.S., Campbell, D., Hsieh, C.S., et al. (1995). Tissue-specific targeting of cytokine unresponsiveness in transgenic mice. *Immunity* 3, 657-666.
- Ding, Y.H., Smith, K.J., Garboczi, D.N., Utz, U., Biddison, W. E., and Wiley, D.C. (1998). Two human T cell receptors bind in a similar diagonal mode to the HLA-A2/Tax peptide complex using different TCR amino acids. *Immunity* 8, 403-411.
- Ding, Y.H., Baker, B.M., Garboczi, D.N., Biddison, W.E., and Wiley, D.C. (1999). Four A6 TCR/peptide/HLA-A2 structures that generate very different T cell signals are nearly identical. *Immunity* 11(1), 45-56.
- Dustin, M.L., Olive, D., and Springer, T.A. (1989). Correlation of CD2 binding and functional properties of multimeric and monomeric lymphocyte function-associates antigen 3. *J Exp Med* 169, 503-517.
- Dustin, M.L., and Springer, T.A. (1989). T cell receptor cross-linking transiently stimulates adhesiveness through LFA-1. *Nature* 341, 619-624.
- Ehl, S., Hombach, J., Aichele, P., Hengartner, H., and Zinkernagel, R.M. (1997). Bystander activation of cytotoxic T cells: studies on the mechanism and evaluation of in vivo significance in a transgenic mouse model. *J Exp Med* 185, 1241-1251.
- Evavold, B.D., Sloan-Lancaster, J., Wilson, K.J., Rothbard, J.B., and Allen, P.M. (1995). Specific T cell recognition of minimally homologous peptides: evidence for multiple endogenous ligands. *Immunity* 2, 655-663.

- Falb D., Briner T.J., Sunshine G.H., et al. (1996). Peripheral tolerance in T cell receptor transgenic mice: Evidence for T cell anergy. *Eur J Immunol* 26, 130-135.
- Ferber, I., Schönrich, G., Schenkel, J., et al. (1994). Levels of peripheral T cell tolerance induced by different doses of tolerogen. *Science* 263, 674-676.
- Fiorentino, D.F., Bond, M.W., and Mosmann, T. (1989). Th2 clones secrete a factor that inhibits cytokine production by Th1 clones. *J Exp Med* 170, 2081-2095.
- Förster, I., Hirose, R., Arbeit, J. M., Clausen, B.E., and Hanahan, D. (1995). Limited capacity for tolerization of CD 4+ T cells specific for a pancreatic beta cell neo-antigen. *Immunity* 2, 573-585.
- Fremont, D.H., Matsumura, M., Stura, E.A., Peterson, P.A., and Wilson, I.A. (1992). Crystal structures of two viral peptides in complex with murine MHC class I H-2K<sup>b</sup>. *Science* 257, 919-927.
- Fremont, D.H., Hendrickson, W.A., Marrack, P., and Kappler, J. (1996). Structures of an MHC class II molecule with covalently bound single peptides. *Science* 272, 1001-1004.
- Fugger, L., Michie, S.A., Rulifson, I., Lock, C.B., and Sonderstrup McDevitt, G. (1994). Expression of HLA-DR4 and human CD4 transgenes in mice determines the variable region beta-chain T-cell repertoire and mediates an HLA-DR-restricted immune response. *Proc Natl Acad Sci USA* 91, 6151-6155.
- Fujinami, R.S., and Oldstone, M. B. (1985). Amino acid homology between the encephalitogenic site of myelin basic protein and virus: mechanism for autoimmunity. *Science* 230, 1043-1045.
- Fung, B.P., McHugh, G.L., Leong, J.M., and Steere, A.C. (1994). Humoral immune response to outer surface protein C of *Borrelia burgdorferi* in Lyme disease: role of the immunoglobulin M response in the serodiagnosis of early infection. *Infect Immun* 62, 3213-3221.
- Garboczi, D.N., and Biddison, W.E. (1999). Shapes of MHC restriction. *Immunity* 10, 1-7.
- Garboczi, D.N., Ghosh, P., Utz, U., Fan, Q.R., Biddison, W.E., and Wiley, D.C. (1996). Structure of the complex between human T-cell receptor, viral peptide and HLA-A2. *Nature* 384, 134-141.
- Garcia, K.C., Degano, M., Stanfield, R.L., et al. (1996). An alpha-beta T cell receptor structure at 2.5 Å and its orientation in the TCR/MHC complex. *Science* 274, 209-219.
- Garcia, K.C., Degano, M., Pease, L.R., et al. (1998). Structural basis of Plasticity in T cell receptor recognition of a Self peptide-MHC Antigen. *Science* 279, 1666-1672.
- Germain, R.N. (1994). MHC-dependent antigen processing and peptide presentation: providing ligands for T lymphocyte activation. *Cell* 76, 287-299.
- Gosgrove, D., Gray, D., Dierich, A., et al. (1991). Mice lacking MHC class II molecules. *Cell* 66, 1051-1066.

- Grogan, J.L., Kramer, A., Nogai, A., Dong, L., Ohde, M., Schneider-Mergener, J., and Kamradt, T. (1999). Cross-reactivity of MBP-specific T cells with multiple microbial peptides: EAE-induction in TCR transgenic mice. *J Immunol* *163*, 3764-70.
- Gross, D.M., Steere, A.C., and Huber, B.T. (1998a). T helper 1 response is dominant and localized to the synovial fluid in patients with Lyme arthritis. *J Immunol* *160*, 1022-1028.
- Gross, D.M., Forsthuber, T., Tary-Lehmann, M., et al. (1998b). Identification of LFA-1 as a candidate autoantigen in treatment-resistant Lyme arthritis. *Science* *261*, 703-706.
- Guilherme, L., Cunha-Neto, E., Tanaka, A.C., Dulphy, N., Toubert, A., and Kalil, J. (2001). Heart-directed autoimmunity: the case of rheumatic fever. *J Autoimmun* *16*, 363-367.
- Hammer, J., Bono, E., Gallazi, F., Belunis, C., Nagy, Z., and Sinigaglia, F. (1994). Precise prediction of major histocompatibility complex class II-peptide interaction based on peptide side chain scanning. *J Exp Med* *180*, 2353-2358.
- Hammer, J., Gallazi, F., Bono, E., et al. (1995). Binding Specificity of HLA-AR4 Molecules: Correlation with Rheumatoid Arthritis Association. *J Exp Med* *181*, 1847-1855.
- Hansen, K., Hinderson, P., and Pedersen, N.S. (1998). Measurement of antibodies to the *Borrelia burgdorferi* flagellum improves serodiagnosis in Lyme disease. *J Clin Microbiol* *26*, 338-346.
- Hemmer, B., Fleckenstein, B., Vergelli, M., et al. (1997). Identification of high-potency microbial and self ligands for a human autoreactive class II restricted T Cell clone. *J Exp Med* *185*, 1651-1659.
- Hemmer, B., Vergelli, M., Pinilla, C., Houghten, R., and Martin, R. (1998). Probing degeneracy in T-cell recognition using combinatorial peptide libraries. *Immunol Today* *19*, 163-168.
- Hemmer, B., Vergelli, M., Gran, B., et al. (1998). Predictable TCR antigen recognition based on peptide scans leads to the identification of agonist ligands with no sequence homology. *J Immunol* *160*, 3631-3636.
- Hemmer, B., Gran, B., Zhao, Y., et al. (1999). Identification of high potency microbial and self ligands for a human autoreactive class II-restricted T cell clone. *J Exp Med* *185*, 1651-1659.
- Hemmer, B., Kondo, T., Gran, B., et al. (2000). Minimal peptide length requirements for CD4<sup>+</sup> T cell clones – implications for molecular mimicry and T cell survival. *Int Immunol* *12*, 375-383.
- Hennecke, J., and Wiley, D.C. (2002). Structure of a Complex of the Human  $\alpha/\beta$  T Cell Receptor (TCR) HA1.7, Influenza Haemagglutinin Peptide, and Major Histocompatibility Complex Class II Molecule, HLA-DR4 (DRA\*0101 and DRB1\*0401): Insight into TCR Cross-Restriction and Alloreactivity. *J Exp Med* *195*, 571-581.
- Hirschfeld, M., Kirschning, C.J., Schwandner, R., et al. (1999). Cutting edge: inflammatory signal *Borrelia burgdorferi* lipoproteins is mediated by toll-like receptor 2. *J Immunol* *163*, 2382-2386.

- Hogquist, K.A., Jameson, S.C., and Bevan, M.J. (1995). Strong agonist ligands for the T cell receptor do not mediate positive selection of functional CD8<sup>+</sup> T cells. *Immunity* 3(1), 79-86.
- Horwitz, M.S., Ilic, A., Rine, C., Rodriguez, E., and Sarvetnick, N. (2002). Presented antigen from damaged pancreatic  $\beta$ -cells activate autoreactive T Cells in virus-mediated autoimmune diabetes. *J Clin Invest* 109, 79-87.
- Infante-Duarte, C., and Kamradt, T. (1997). Lipopeptides of *Borrelia burgdorferi* outer surface proteins induce Th1 phenotype development in  $\alpha/\beta$ -TCR transgenic mice. *Infect Immun* 65, 4094-4099.
- Janeway CA, J. (1992). The immune system evolved to discriminate infectious non-self from non-infectious self. *Immunol Today* 13, 11-16.
- Jenkins, M.K., and Schwartz, R.H. (1987). Antigen presentation by chemically modified splenocytes induces antigen-specific T cell unresponsiveness *in vitro* and *in vivo*. *J Exp Med* 165, 302-319.
- Jenkins, M.K., Mueller, D., Schwartz, R.H., et al. (1991). Induction and maintenance of anergy in mature T cells. *Adv Exp Med Biol* 292, 167-176.
- Kalish, R.A., Leong, J.L., and Steere, A.C. (1993). Association of treatment-resistant chronic Lyme arthritis with HLA-DR4 and antibody reactivity to OspA and OspA of *Borrelia burgdorferi*. *Infect Immun* 61, 2774-2779.
- Kalish, R.A., Leong, J.M., and Steere, A.C. (1995). Early and late antibody response to full-length and truncated constructs of outer-surface protein A of *Borrelia burgdorferi* in Lyme disease. *Infect. Immun.* 63, 2228-2235.
- Kamradt, T. and Mitchison, N.A. (2001). Tolerance and autoimmunity. *N Engl J Med* 344, 655-664.
- Kamradt, T. (2002). Lyme disease and current aspects of immunization. *Arthritis Res* 4, 20-29.
- Kawabe, Y., Ochi, A. (1991). Programmed cell death and extrathymic reduction of V $\beta$ 8<sup>+</sup> CD4<sup>+</sup> T cells in mice tolerant to Staphylococcus aureus enterotoxin B. *Nature* 349, 245-248.
- Kersh, E.N., Shaw, A.S., and Allen, P.M. (1998). Fidelity of T cell activation through multistep T cell receptor zeta phosphorylation. *Science* 281, 572-575.
- Kersh, G. J., and Allen, P.M. (1996). Essential flexibility in the T-cell recognition of antigen. *Nature* 380, 495-498.
- Kersh, G.J., Miley, M.J., Nelson, C.A., et al. (2001). Structural and functional consequences of altering a peptide MHC anchor residue. *J Immunol* 166, 3345-3354.
- Kirberg, J., Berns, A. and Von Boehmer, H. (1997). Peripheral T cell survival requires continual ligation of the T cell receptor to major histocompatibility complex-encoded molecules. *J Exp Med* 186, 1269-1275.

- Kitze, B., Pette, M., Rohrbach, E., Stadt, D., Kappos, L., and Wekerle, H. (1988). Myelin-specific T lymphocytes in multiple sclerosis patients and healthy individuals. *J Neuroimmunol* 20, 237.
- Klein L., Klugmann M., Nave K.A., and Kyewski, B. (2000). Shaping of the autoreactive T cell repertoire by a splice variant of self-protein expressed in thymic epithelial cells. *Nat Med* 6, 56-61.
- Kouskoff, V., Korganow, A.S., Duchatelle, V., Degott, C., Benoist, C., and Mathis, D. (1996). Organ-specific disease provoked by systemic autoimmunity. *Cell* 87, 811-822.
- Kramer, A., and Schneider-Mergener, J. (1997). Synthesis and application of peptide libraries bound to continuous cellulose membranes. *Meth Mol Biol* 87, 25-39.
- Lafaille, J.J., Nagashima, K., Katsuki, M., and Tonegawa, S. (1994). High incidence of spontaneous autoimmune encephalomyelitis in immunodeficient anti-myelin basic protein T cell receptor transgenic mice. *Cell* 78, 399-408.
- Lamb, J.R., Skidmore, B.J., Green, N., Chiller, J.M., and Feldmann, M. (1983). Induction of tolerance in influenza virus-immune T lymphocyte clones with synthetic peptides of influenza haemagglutinin. *J Exp Med* 157, 1434-1447.
- Lanzavecchia, A. (1998). License to kill. *Nature* 393, 413-414.
- Lawrance, S.K., Karlsson, L., and Price, J. (1989). Transgenic HLA-DR $\alpha$  faithfully reconstitutes IE controlled immune functions and induces cross-tolerance to E $\alpha$  in E $\alpha$ <sup>o</sup> mutant mice. *Cell* 58, 583-594.
- Lawson, C.M. (2000). Evidence for mimicry by viral antigens in animal models of autoimmune disease including myocarditis. *Cell Mol. Life Sci.* 57, 552-560.
- Lengl-Janssen, B., Strauss, A. F., Steere, A.C., and Kamradt, T. (1994). T helper cell response in Lyme arthritis: differential recognition of *Borrelia burgdorferi* outer surface protein A in patients with treatment-resistant or treatment-responsive Lyme arthritis. *J Exp Med* 180, 2069-2078.
- Lim, L.C., England, D.M., and DuChateau, B.K. (1994). Development of destructive arthritis in vaccinated hamsters challenged with *Borrelia burgdorferi*. *Infect Immun* 62, 2825-2833.
- Lipton, H. L. (1975). Theiler's virus infection in mice: an unusual biphasic disease process leading to demyelisation. *Infect Immun* 11, 1147-1155.
- Long, E.O. (1994). Regulation of immune response through inhibitory receptors. *Annu Rev Immunol* 17, 875-904.
- Lühder F., Chambers, C., Allison, J.P., Benoist, C., and Mathis, D. (2000). Pinpointing when T cell costimulation receptor CTLA-4 must be engaged to dampen diabetogenic T cells. *Proc Natl Acad Sci USA* 97, 12204-12209.

- Madrenas, J., and Germain, R.N. (1996). Variant TCR ligands: new insights into the molecular basis of antigen-dependent signal transduction and T-cell activation. *Semin Immunol* 8, 83-101.
- Maier, B., Molinger, M., Cope, A.P., Fugger, L., Schneider-Mergener, J., Sonderstrup, G., Kamradt, T., and Kramer, A. (2000). Multiple cross-reactive self ligands for *Borrelia burgdorferi* specific HLA-DR4-restricted T cells. *Eur J Immunol* 30, 448-457.
- Malissen, M., Trucy, J., Letourner, F., et al. (1988). A T cell clone expresses two T cell receptor alpha genes but uses one alpha beta heterodimer for allorecognition and self MHC-restricted antigen recognition. *Cell* 55(1), 49-59.
- Mason, D. (1998). A very high level of cross reactivity is an essential feature of the T-cell receptor. *Immunol Today* 19, 395-403.
- Matsumoto, I., Staub, A., Benoist, C., and Mathis, D. (1999). Arthritis provoked by linked T and B cell recognition of a glycolytic enzyme. *Science* 286, 1732-1735.
- Medzhitov, R., and Janeway Jr, C.A. (1997). Innate Immunity: Impact on the adaptive immune response. *Curr Opin Immunol* 9, 4-9.
- Montgomery, R.R., Nathanson, M.H., and Malawista, S.E. (1993). The fate of *Borrelia burgdorferi*, the agent for Lyme disease, in mouse macrophages. Destruction, survival, recovery. *J Immunol* 150, 909-915.
- Moosmann, T., and Coffmann, R.L. (1989). TH1 and TH2 cells: Different patterns of lymphokine secretion lead to different functional properties. *Annu Rev Immunology* 7, 145-173.
- Nanda, N. K., Arzoo, K.K., Geysen, H.M., Sette, A., and Sercarz, E.E. (1995). Recognition of Multiple Peptide Cores by a single T Cell Receptor. *J Exp Med* 182, 531-539.
- Naquet, P., Ellis, J., and Tibensky, D. (1988). T cell autoreactivity to insulin in diabetic and related non-diabetic individuals. *J Immunol* 140, 2569-2578.
- Nocton, J.J., Dressler, F., Rutledge, B.J., et al. (1994). Detection of *Borrelia burgdorferi*-DNA by polymerase chain reaction in synovial fluid in Lyme arthritis. *N Engl J Med* 330, 229-234.
- Nogai, A., Siffrin, V., Bonhagen, K., et al. (2005). Lipopolysaccharide Injection Induces Relapses of Experimental Autoimmune Encephalomyelitis in Nontransgenic Mice via Bystander Activation of Autoreactive CD4<sup>+</sup> Cells. *J Immunol* 175, 959-966.
- O'Connell, S., Granstrom, M., Gray, J.S., and Stanek, G. (1998). Epidemiology of European Lyme borreliosis. *Zentralbl Bakteriologie* 287, 229-240.
- Oldstone, M. B. (1987). Molecular mimicry and autoimmune disease. *Cell* 50, 819-820.
- Oldstone, M. B., Nerenberg, A., Southern, M., Price, P., and Lewicki, H. (1991). Virus infection triggers insulin-dependent diabetes mellitus in a transgenic model: role of anti-self (virus) immune response. *Cell* 65, 319-331.



- Ohashi, P.S., Oehen, S., and Buerki, K. (1991). Ablation of "tolerance" and induction of diabetes by virus infection in viral antigen transgenic mice. *Cell* 65, 305-317.
- Olson, J.K., Eagar, T.N. and Miller, S.D. (2002). Functional activation of myelin-specific T cells by virus-induced molecular mimicry. *J Immunol* 169, 2719-2726.
- Olson, J.K., Croxford, J.L., and Miller, S.D. (2004). Innate and adaptive immune requirements for induction of autoimmune demyelinating disease by molecular mimicry. *Molecular Immunol* 40, 1103-1108.
- Parry, S.L., Hall, F.C., Olson, T., Kamradt, T., and Sonderstrup, G. (1998). Autoreactivity versus autoaggression: a different perspective on human autoantigens. *Curr Opin Immunol* 10, 663-668.
- Picken, R.N., Starle, F., Picken, M.M., et al. (1998). Identification of three species of *Borrelia burgdorferi sensu lato* (*B. burgdorferi sensu stricto*, *B. garinii*, and *B. afzelii*) among isolates from acrodermatitis chronica atrophicans lesions. *J Invest Dermatol* 110(3), 211-214.
- Powrie, F., Carlino, J., Leach, M. W., Mauze, S., and Coffman, R.L. (1996). A critical role for transforming growth factor-beta but not interleukin 4 in the suppression of T helper type 1-mediated colitis by CD45RB (low) CD4+ T cells. *J Exp Med* 183, 2669-2674.
- Priem, S., Burmester, G.R., Kamradt, T., Wolbart, K., Rittig, M.G., and Krause, A. (1998). Detection of *Borrelia burgdorferi* by polymerase chain reaction in synovial membrane, but not in synovial fluid from patients with persisting Lyme arthritis after antibiotic therapy. *Ann Rheum Dis* 57, 118-121.
- Quarantino, S., Thorpe, C.J., Travers, P.J., and Londei, M. (1995). Similar antigenic surfaces, rather, than sequence homology, dictate T-cell epitope molecular mimicry. *Proc Natl Acad Sci USA* 92, 10398-10402.
- Radbruch, A. (1992). Flow cytometry and cell sorting. Springer-Verlag: Berlin.
- Radolf, J., Arndt, L.L., Akins, D.R., et al. (1995). Treponema pallidum and *Borrelia burgdorferi* lipoproteins and synthetic lipopeptides activate monocytes/macrophages. *J Immunol* 154, 2866-2877.
- Rammensee, H.G., T. Friede, and Stevanovic, S. (1995). MHC ligands and peptide motifs. First listing. *Immunogenetics* 41, 178-228.
- Reay, P.A., Kantor, R.M., and Davis, M.M. (1994). Use of global amino acid replacement to define the requirements of MHC-binding and T cell recognition of mouth cytochrome c (93-103). *J Immunol* 152, 3946-3957.
- Reinherz, E.L., Tan, K., Tang, L., et al. (1999). The Crystal Structure of a T Cell Receptor in Complex with Peptide and MHC class II. *Science* 286, 1913-1921.
- Reiser, J.B., Darnault, C., Guimezanes, A., et al. (2000). Crystal structure of a T cell receptor bound to an allergenic MHC molecule. *Nat Immunol* 1, 291-297.

- Rieux-Laucat, F., L-D, F., Hivroz, C., et al. (1995). Mutations in Fas-associated with human lympho-proliferative syndrome and autoimmunity. *Science* 268, 1347-1349.
- Riley, J.L., Blair, P.J., Musser, J.T., et al. (2001). ICOS costimulation requires IL-2 and can be prevented by CTLA-4 engagement. *J Immunol* 166, 4943-4948.
- Röcken, M., and Shevach, E.M. (1996). Immune deviation-the third dimension of non-deletional T cell tolerance. *Immunol Rev* 149, 175-194.
- Rudolph, M.G. and Wilson, I.A. (2002). The specificity of TCR-pMHC interaction. *Curr Op Immunol* 14, 52-65.
- Ruiz, P.J., Garren, H., Hirschberg, D.L., et al. (1999). Microbial epitopes act as altered peptide ligands to prevent experimental autoimmune encephalomyelitis. *J Exp Med* 189, 1275-1284.
- Rutschmann, O.T., McCrory, D.C. and Matchar, D.B. (2002). Immunization and MS: A summary of published evidence and recommendations. *Neurology* 59, 1837-1843.
- Schaible, U.E., Gay, S., Museteanu, C., et al. (1990). Lyme borreliosis in the severe combined immunodeficiency (scid) mouse manifests predominantly in the joints, heart, and liver. *Am J Pathol* 137, 811-820.
- Schaible, U.E., Kramer, M.D., Wallich, R., Tran, T., and Simon, M.M. (1991). Experimental *Borrelia burgdorferi* infection in inbred mouse strains: antibody response and association of H-2 genes with resistance and susceptibility to development of arthritis. *Eur J Immunol* 21, 2397-2405.
- Schwartz, R.H. (1989). Acquisition of immunologic self-tolerance. *Cell* 5, 1073-1081.
- Schwartz, R.H. (1996). Models of T cell anergy: is there a common molecular mechanism? *J Exp Med* 184, 1-8.
- Selin, L.K., Lin, M.Y., Kraemer, K.A., et al. (1999). Attrition of T-cell memory: selective loss of LCMV epitope specific memory CD8 T cells following infections with heterologous viruses. *Immunity* 11, 733-742.
- Sette, A., Sidney, J., Oseroff, C., et al. (1993). HLA-DR4w4-binding motifs illustrate the biochemical basis of degeneracy and specificity in peptide-DR interactions. *J Immunol* 151, 3163-3170.
- Sigal, L.H. (1998). A vaccine consisting of recombinant *Borrelia burgdorferi* outer-surface protein A to prevent Lyme disease. *N Engl J Med* 339, 216-222.
- Silver, M.L., Guo, H.C., Strominger, J.I., and Wiley, D.C. (1992). Atomic structure of a human MHC molecule presenting an influenza virus peptide. *Nature* 360, 367-369.
- Sloan-Lancaster, J., Evavold, B.D., and Allen, P.M. (1993). Induction of T-cell anergy by altered T-cell-receptor ligand on live antigen-presenting cells. *Nature* 363, 156-159.

- Southwood, S., Sidney, J., and Kondo, A. (1998). Several common HLA-DR types share largely overlapping peptide binding repertoires. *J Immunol* *160*, 3363-3373.
- Speir, J.A., Garcia, K.C., and Brunmark, A. (1998). Structural basis of 2C TCR allorecognition of H-2Ld peptide complexes. *Immunity* *8*(5), 533-562.
- Sprent, J., Lo, D., Gao, E.K., and Ron, Y. (1988). T cell selection in the thymus. *Immunol Rev* *101*, 173-190.
- Steere, A.C., Malawista S., and Syndman, D.R. (1977). An epidemic of oligoarticular arthritis in children and adults in three Connecticut communities. *Arthr Rheum* *20*, 7-17.
- Steere, A.C., Dwyer, E., and Winchester, R. (1990). Association of chronic Lyme arthritis with HLA-DR4 and HLA-DR2 alleles. *N Engl J Med* *323*, 219-223.
- Steere, A.C., Sikand, V.K., and Meurice, F. (1998). Vaccination against Lyme disease with recombinant *Borrelia burgdorferi* outer-surface lipoprotein A with adjuvant. Lyme Disease Vaccine Study Group. *N Engl J Med* *339*, 209-215.
- Steere, A.C. (2001). Lyme Disease. *N Engl J Med* *345*, 115-125.
- Stern, L.J., Brown, J.H., and Jardetzky, T.S. (1994). Crystal structure of the human class II MHC protein. *Nature* *368*, 215-221.
- Suda, T., Takahashi, T., Golstein, P., and Nagata, S. (1993). Molecular cloning and expression of the Fas ligand, a novel member of the tumor necrosis factor family. *Cell* *75*, 1169-1178.
- Tai, K.F., Ma, Y., and Weis, J.J. (1994). Normal human B lymphocytes and mononuclear cells respond to the mitogenic and cytokine-stimulatory activities of *Borrelia burgdorferi* and its lipoprotein OspA. *Infect Immun* *62*(2), 520-528.
- Trollmo, C., Meyer, A.L., Steere, A.C., Hafler, D.A., and Huber, B.T. (2001). Molecular mimicry in Lyme arthritis demonstrated at the single cell level: LFA-1aL is a partial agonist for outer surface protein A-reactive T cells. *J Immunol* *166*, 5286-5291.
- Tough, D.F., Borrow, P., and Sprent, J. (1996). Induction of bystander T cell proliferation by viruses and type I interferon in vivo. *Science* *145*, 1947-1950.
- Tough, D.F., Sun, S., and Sprent, J. (1997). T cell stimulation in vivo by lipopolysaccharide (LPS). *J Exp Med* *185*, 2089-2094.
- Vafiadis, P., Bennett, S.T., and Todd, J.A. (1997). Insulin expression in human thymus is modulated by INS VNTR alleles at the IDDM2 locus. *Nat Genet* *15*, 289-292.
- Van de Keere, F., and Tonegawa, S. (1998). CD4<sup>+</sup> T cells prevent spontaneous experimental autoimmune encephalomyelitis in anti-myelin basic protein T cell receptor transgenic mice. *J Exp Med* *188*, 1875-1882.

- Van Eden, W., Holoshitz, J., Nevo, Z., Frenkel, A., Kleinman, A., and Cohen, I.R. (1985). Arthritis induced by a T-lymphocyte clone that responds to *Mycobacterium tuberculosis* and to cartilage proteoglycans. *Proc Natl Acad Sci USA* 82, 5117-5120.
- Vergelli, M., Hemmer, B., Kalbus, M., et al. (1997). Modification of peptide-ligands enhancing T-cell responsiveness imply large numbers of stimulatory ligands for autoreactive T cells. *J Immunol* 158, 3746-3752.
- Von Boehmer, H., and Kisielow, P. (1993). Lymphocyte lineage commitment: instruction versus selection [comment]. *Cell* 73, 207-208.
- Walunas, T.L., Lenschow, D.J., Bakker, C.Y., et al. (1994). CTLA-4 can function as a negative regulator of T cell activation. *Immunity* 1, 405-413.
- Wang, G., van Dam, A.P., Schwartz, I., and Dankert, J. (1999). Molecular typing of *Borrelia burgdorferi sensu lato*: taxonomic, epidemiological, and clinical implications. *Clin Microbiol Rev* 12, 633-653.
- Watts, T.H., and DeBenedette, M.A. (1999). T cell co-stimulatory molecules other than CD28. *Curr Opin Immunol* 11, 286-293.
- White, J., Herman, A., Pullen, M., Kubo, J., Kappler, J.W., and Marrack, P. (1989). The V beta-specific superantigen staphylococcal enterotoxin B: stimulation of mature T cells and clonal deletion in neonatal mice. *Cell* 56, 27-35.
- Wilson, D.B., Pinilla, C., Wilson, D.H., et al. (1999). Immunogenicity I. Use of peptide libraries to identify epitopes that activate clonotypic CD4+ T cells and induce T cell responses to naïve peptide ligands. *J Immunol* 163, 6424-6434.
- Wormser, G.P., Nadelman, R.B., Dattwyler, R.J., et al. (2000). Practice guidelines for the treatment of Lyme disease. The Infectious Diseases Society of America *Clin Infect Dis* 31 Suppl 1, 1-14.
- Wucherpfennig, K.W., and Strominger, J.L. (1995a). Molecular mimicry in T cell mediated autoimmunity: Viral peptides activate human T cell clones specific for myelin basic protein. *Cell* 80, 695-705.
- Wucherpfennig, K.W., and Strominger, J.L. (1995b). Selective binding of self peptides to disease-associated major histocompatibility complex (MHC) molecules: A mechanism for MHC-linked susceptibility to human autoimmune disease. *J Exp Med* 181, 1597-1601.
- Young AC, Zhang, W., Sacchettini, J.C., and Nathenson, S.G. (1994). The three-dimensional structure of H-2Db at 2.4 Å resolution: Implications for antigen-determinant selection. *Cell* 76(1), 39-50.