

8. Literaturverzeichnis

1. Drews, M. B., Ludwig, A. C., Leititis, J. U. & Daschner, F. D. Low birth weight and nosocomial infection of neonates in a neonatal intensive care unit. *J Hosp Infect* **30**, 65-72 (1995).
2. Stoll, B. J., Gordon, T., Korones, S. B., Shankaran, S., Tyson, J. E., Bauer, C. R., Fanaroff, A. A., Lemons, J. A., Donovan, E. F., Oh, W., Stevenson, D. K., Ehrenkranz, R. A., Papile, L. A., Verter, J. & Wright, L. L. Early-onset sepsis in very low birth weight neonates: a report from the National Institute of Child Health and Human Development Neonatal Research Network. *J Pediatr* **129**, 72-80 (1996).
3. Stoll, B. J., Hansen, N., Fanaroff, A. A., Wright, L. L., Carlo, W. A., Ehrenkranz, R. A., Lemons, J. A., Donovan, E. F., Stark, A. R., Tyson, J. E., Oh, W., Bauer, C. R., Korones, S. B., Shankaran, S., Laptook, A. R., Stevenson, D. K., Papile, L. A. & Poole, W. K. Changes in pathogens causing early-onset sepsis in very-low-birth-weight infants. *N Engl J Med* **347**, 240-7 (2002).
4. Drossou, V., Kanakoudi, F., Tzimouli, V., Sarafidis, K., Taparkou, A., Bougiouklis, D., Petropoulou, T. & Kremenopoulos, G. Impact of prematurity, stress and sepsis on the neutrophil respiratory burst activity of neonates. *Biol Neonate* **72**, 201-9 (1997).
5. Harris, M. C., Stroobant, J., Cody, C. S., Douglas, S. D. & Polin, R. A. Phagocytosis of group B streptococcus by neutrophils from newborn infants. *Pediatr Res* **17**, 358-61 (1983).
6. Sacchi, F., Rondini, G., Mingrat, G., Stronati, M., Gancia, G. P., Marseglia, G. L. & Siccardi, A. G. Different maturation of neutrophil chemotaxis in term and preterm newborn infants. *J Pediatr* **101**, 273-4 (1982).
7. Schibler, K. R., Liechty, K. W., White, W. L. & Christensen, R. D. Production of granulocyte colony-stimulating factor in vitro by monocytes from preterm and term neonates. *Blood* **82**, 2478-84 (1993).
8. Butcher, E. C. Leukocyte-endothelial cell recognition: three (or more) steps to specificity and diversity. *Cell* **67**, 1033-6 (1991).
9. Zarewych, D. M., Kindzelskii, A. L., Todd, R. F., 3rd & Petty, H. R. LPS induces CD14 association with complement receptor type 3, which is reversed by neutrophil adhesion. *J Immunol* **156**, 430-3 (1996).
10. Calvano, S. E., Thompson, W. A., Marra, M. N., Coyle, S. M., de Riesthal, H. F., Trousdale, R. K., Barie, P. S., Scott, R. W., Moldawer, L. L. & Lowry, S. F. Changes in polymorphonuclear leukocyte surface and plasma bactericidal/permeability-increasing protein and plasma lipopolysaccharide binding protein during endotoxemia or sepsis. *Arch Surg* **129**, 220-6 (1994).
11. Jahr, T. G., Sundan, A., Lichenstein, H. S. & Espevik, T. Influence of CD14, LBP and BPI in the monocyte response to LPS of different polysaccharide chain length. *Scand J Immunol* **42**, 119-27 (1995).
12. Rietschel, E. T., Kirikae, T., Schade, F. U., Mamat, U., Schmidt, G., Loppnow, H., Ulmer, A. J., Zahringer, U., Seydel, U., Di Padova, F. & et al. Bacterial endotoxin: molecular relationships of structure to activity and function. *Faseb J* **8**, 217-25 (1994).

13. Raetz, C. R. Biochemistry of endotoxins. *Annu Rev Biochem* **59**, 129-70 (1990).
14. Rietschel, E. T. & Brade, H. Bacterial endotoxins. *Sci Am* **267**, 54-61 (1992).
15. Buckle, A. M., Jayaram, Y. & Hogg, N. Colony-stimulating factors and interferon-gamma differentially affect cell surface molecules shared by monocytes and neutrophils. *Clin Exp Immunol* **81**, 339-45 (1990).
16. Wright, S. D., Ramos, R. A., Hermanowski-Vosatka, A., Rockwell, P. & Detmers, P. A. Activation of the adhesive capacity of CR3 on neutrophils by endotoxin: dependence on lipopolysaccharide binding protein and CD14. *J Exp Med* **173**, 1281-6 (1991).
17. Ziegler-Heitbrock, H. W. & Ulevitch, R. J. CD14: cell surface receptor and differentiation marker. *Immunol Today* **14**, 121-5 (1993).
18. Morabito, F., Prasthofer, E. F., Dunlap, N. E., Grossi, C. E. & Tilden, A. B. Expression of myelomonocytic antigens on chronic lymphocytic leukemia B cells correlates with their ability to produce interleukin 1. *Blood* **70**, 1750-7 (1987).
19. Labeta, M. O., Landmann, R., Obrecht, J. P. & Obrist, R. Human B cells express membrane-bound and soluble forms of the CD14 myeloid antigen. *Mol Immunol* **28**, 115-22 (1991).
20. Schumann, R. R., Leong, S. R., Flaggs, G. W., Gray, P. W., Wright, S. D., Mathison, J. C., Tobias, P. S. & Ulevitch, R. J. Structure and function of lipopolysaccharide binding protein. *Science* **249**, 1429-31 (1990).
21. Landmann, R., Knopf, H. P., Link, S., Sansano, S., Schumann, R. & Zimmerli, W. Human monocyte CD14 is upregulated by lipopolysaccharide. *Infect Immun* **64**, 1762-9 (1996).
22. Weingarten, R., Sklar, L. A., Mathison, J. C., Omidi, S., Ainsworth, T., Simon, S., Ulevitch, R. J. & Tobias, P. S. Interactions of lipopolysaccharide with neutrophils in blood via CD14. *J Leukoc Biol* **53**, 518-24 (1993).
23. Kusunoki, T. & Wright, S. D. Chemical characteristics of *Staphylococcus aureus* molecules that have CD14-dependent cell-stimulating activity. *J Immunol* **157**, 5112-7 (1996).
24. Gupta, D., Kirkland, T. N., Viriyakosol, S. & Dziarski, R. CD14 is a cell-activating receptor for bacterial peptidoglycan. *J Biol Chem* **271**, 23310-6 (1996).
25. Yoshimura, A., Lien, E., Ingalls, R. R., Tuomanen, E., Dziarski, R. & Golenbock, D. Cutting edge: recognition of Gram-positive bacterial cell wall components by the innate immune system occurs via Toll-like receptor 2. *J Immunol* **163**, 1-5 (1999).
26. Shimazu, R., Akashi, S., Ogata, H., Nagai, Y., Fukudome, K., Miyake, K. & Kimoto, M. MD-2, a molecule that confers lipopolysaccharide responsiveness on Toll-like receptor 4. *J Exp Med* **189**, 1777-82 (1999).
27. Qureshi, S. T., Lariviere, L., Leveque, G., Clermont, S., Moore, K. J., Gros, P. & Malo, D. Endotoxin-tolerant mice have mutations in Toll-like receptor 4 (Tlr4). *J Exp Med* **189**, 615-25 (1999).
28. Poltorak, A., He, X., Smirnova, I., Liu, M. Y., Van Huffel, C., Du, X., Birdwell, D., Alejos, E., Silva, M., Galanos, C., Freudenberg, M., Ricciardi-Castagnoli,

- P., Layton, B. & Beutler, B. Defective LPS signaling in C3H/HeJ and C57BL/10ScCr mice: mutations in Tlr4 gene. *Science* **282**, 2085-8 (1998).
29. Adachi, O., Kawai, T., Takeda, K., Matsumoto, M., Tsutsui, H., Sakagami, M., Nakanishi, K. & Akira, S. Targeted disruption of the MyD88 gene results in loss of IL-1- and IL-18-mediated function. *Immunity* **9**, 143-50 (1998).
 30. Schumann, R. R., Pfeil, D., Lamping, N., Kirschning, C., Scherzinger, G., Schlag, P., Karawajew, L. & Herrmann, F. Lipopolysaccharide induces the rapid tyrosine phosphorylation of the mitogen-activated protein kinases erk-1 and p38 in cultured human vascular endothelial cells requiring the presence of soluble CD14. *Blood* **87**, 2805-14 (1996).
 31. Hoffmann, J. A., Kafatos, F. C., Janeway, C. A. & Ezekowitz, R. A. Phylogenetic perspectives in innate immunity. *Science* **284**, 1313-8 (1999).
 32. Diamond, M. S., Staunton, D. E., de Fougerolles, A. R., Stacker, S. A., Garcia-Aguilar, J., Hibbs, M. L. & Springer, T. A. ICAM-1 (CD54): a counter-receptor for Mac-1 (CD11b/CD18). *J Cell Biol* **111**, 3129-39 (1990).
 33. Beller, D. I., Springer, T. A. & Schreiber, R. D. Anti-Mac-1 selectively inhibits the mouse and human type three complement receptor. *J Exp Med* **156**, 1000-9 (1982).
 34. Wright, S. D. & Jong, M. T. Adhesion-promoting receptors on human macrophages recognize Escherichia coli by binding to lipopolysaccharide. *J Exp Med* **164**, 1876-88 (1986).
 35. Detmers, P. A. & Wright, S. D. Adhesion-promoting receptors on leukocytes. *Curr Opin Immunol* **1**, 10-5 (1988).
 36. Patarroyo, M. & Makgoba, M. W. Leucocyte adhesion to cells in immune and inflammatory responses. *Lancet* **2**, 1139-42 (1989).
 37. Damme, J. v. *Interleukin-8 and related molecules: The cytokine handbook* (Academic Press, London, 1991).
 38. van Deventer, S. J., Hart, M., van der Poll, T., Hack, C. E. & Aarden, L. A. Endotoxin and tumor necrosis factor-alpha-induced interleukin-8 release in humans. *J Infect Dis* **167**, 461-54 (1993).
 39. Marty, C., Misset, B., Tamion, F., Fitting, C., Carlet, J. & Cavillon, J. M. Circulating interleukin-8 concentrations in patients with multiple organ failure of septic and nonseptic origin. *Crit Care Med* **22**, 673-9 (1994).
 40. DeForge, L. E., Kenney, J. S., Jones, M. L., Warren, J. S. & Remick, D. G. Biphasic production of IL-8 in lipopolysaccharide (LPS)-stimulated human whole blood. Separation of LPS- and cytokine-stimulated components using anti-tumor necrosis factor and anti-IL-1 antibodies. *J Immunol* **148**, 2133-41 (1992).
 41. Sinha, S., Watorek, W., Karr, S., Giles, J., Bode, W. & Travis, J. Primary structure of human neutrophil elastase. *Proc Natl Acad Sci U S A* **84**, 2228-32 (1987).
 42. Takahashi, H., Nukiwa, T., Yoshimura, K., Quick, C. D., States, D. J., Holmes, M. D., Whang-Peng, J., Knutsen, T. & Crystal, R. G. Structure of the human neutrophil elastase gene. *J Biol Chem* **263**, 14739-47 (1988).
 43. Lehrer, R. I. & Ganz, T. Antimicrobial polypeptides of human neutrophils. *Blood* **76**, 2169-81 (1990).

44. Cai, T. Q. & Wright, S. D. Human leukocyte elastase is an endogenous ligand for the integrin CR3 (CD11b/CD18, Mac-1, alpha M beta 2) and modulates polymorphonuclear leukocyte adhesion. *J Exp Med* **184**, 1213-23 (1996).
45. Belaouaj, A., McCarthy, R., Baumann, M., Gao, Z., Ley, T. J., Abraham, S. N. & Shapiro, S. D. Mice lacking neutrophil elastase reveal impaired host defense against gram negative bacterial sepsis. *Nat Med* **4**, 615-8 (1998).
46. Tkalcevic, J., Novelli, M., Phylactides, M., Iredale, J. P., Segal, A. W. & Roes, J. Impaired immunity and enhanced resistance to endotoxin in the absence of neutrophil elastase and cathepsin G. *Immunity* **12**, 201-10 (2000).
47. Othmer, M. & Zepp, F. Flow cytometric immunophenotyping: principles and pitfalls. *Eur J Pediatr* **151**, 398-406 (1992).
48. Dentener, M. A., Francot, G. J., Hiemstra, P. S., Tool, A. T., Verhoeven, A. J., Vandenabeele, P. & Buurman, W. A. Bactericidal/permeability-increasing protein release in whole blood ex vivo: strong induction by lipopolysaccharide and tumor necrosis factor-alpha. *J Infect Dis* **175**, 108-17 (1997).
49. Wright, S. D., Ramos, R. A., Tobias, P. S., Ulevitch, R. J. & Mathison, J. C. CD14, a receptor for complexes of lipopolysaccharide (LPS) and LPS binding protein. *Science* **249**, 1431-3 (1990).
50. Katz, S. S., Chen, K., Chen, S., Doerfler, M. E., Elsbach, P. & Weiss, J. Potent CD14-mediated signalling of human leukocytes by *Escherichia coli* can be mediated by interaction of whole bacteria and host cells without extensive prior release of endotoxin. *Infect Immun* **64**, 3592-600 (1996).
51. Wright, S. D. CD14 and innate recognition of bacteria. *J Immunol* **155**, 6-8 (1995).
52. Yang, R. B., Mark, M. R., Gray, A., Huang, A., Xie, M. H., Zhang, M., Goddard, A., Wood, W. I., Gurney, A. L. & Godowski, P. J. Toll-like receptor-2 mediates lipopolysaccharide-induced cellular signalling. *Nature* **395**, 284-8 (1998).
53. Heine, H., Kirschning, C. J., Lien, E., Monks, B. G., Rothe, M. & Golenbock, D. T. Cutting edge: cells that carry A null allele for toll-like receptor 2 are capable of responding to endotoxin. *J Immunol* **162**, 6971-5 (1999).
54. Chow, J. C., Young, D. W., Golenbock, D. T., Christ, W. J. & Gusovsky, F. Toll-like receptor-4 mediates lipopolysaccharide-induced signal transduction. *J Biol Chem* **274**, 10689-92 (1999).
55. Yang, R. B., Mark, M. R., Gurney, A. L. & Godowski, P. J. Signaling events induced by lipopolysaccharide-activated toll-like receptor 2. *J Immunol* **163**, 639-43 (1999).
56. Henneke, P., Takeuchi, O., van Strijp, J. A., Guttormsen, H. K., Smith, J. A., Schromm, A. B., Espevik, T. A., Akira, S., Nizet, V., Kasper, D. L. & Golenbock, D. T. Novel engagement of CD14 and multiple toll-like receptors by group B streptococci. *J Immunol* **167**, 7069-76 (2001).
57. Ferrero, E., Jiao, D., Tsuberi, B. Z., Tesio, L., Rong, G. W., Haziot, A. & Goyert, S. M. Transgenic mice expressing human CD14 are hypersensitive to lipopolysaccharide. *Proc Natl Acad Sci U S A* **90**, 2380-4 (1993).
58. Haziot, A., Ferrero, E., Kontgen, F., Hijiya, N., Yamamoto, S., Silver, J., Stewart, C. L. & Goyert, S. M. Resistance to endotoxin shock and reduced

- dissemination of gram-negative bacteria in CD14-deficient mice. *Immunity* **4**, 407-14 (1996).
59. McEvoy, L. T., Zakem-Cloud, H. & Tosi, M. F. Total cell content of CR3 (CD11b/CD18) and LFA-1 (CD11a/CD18) in neonatal neutrophils: relationship to gestational age. *Blood* **87**, 3929-33 (1996).
 60. Abughali, N., Berger, M. & Tosi, M. F. Deficient total cell content of CR3 (CD11b) in neonatal neutrophils. *Blood* **83**, 1086-92 (1994).
 61. Bruce, M. C., Baley, J. E., Medvik, K. A. & Berger, M. Impaired surface membrane expression of C3bi but not C3b receptors on neonatal neutrophils. *Pediatr Res* **21**, 306-11 (1987).
 62. Anderson, D. C., Freeman, K. L., Heerdt, B., Hughes, B. J., Jack, R. M. & Smith, C. W. Abnormal stimulated adherence of neonatal granulocytes: impaired induction of surface Mac-1 by chemotactic factors or secretagogues. *Blood* **70**, 740-50 (1987).
 63. Carr, R., Pumford, D. & Davies, J. M. Neutrophil chemotaxis and adhesion in preterm babies. *Arch Dis Child* **67**, 813-7 (1992).
 64. Rebuck, N., Gibson, A. & Finn, A. Neutrophil adhesion molecules in term and premature infants: normal or enhanced leucocyte integrins but defective L-selectin expression and shedding. *Clin Exp Immunol* **101**, 183-9 (1995).
 65. Antal-Szalmas, P., Strijp, J. A., Weersink, A. J., Verhoef, J. & Van Kessel, K. P. Quantitation of surface CD14 on human monocytes and neutrophils. *J Leukoc Biol* **61**, 721-8 (1997).
 66. Binder, R., Kress, A., Kan, G., Herrmann, K. & Kirschfink, M. Neutrophil priming by cytokines and vitamin D binding protein (Gc-globulin): impact on C5a-mediated chemotaxis, degranulation and respiratory burst. *Mol Immunol* **36**, 885-92 (1999).
 67. Fittschen, C., Sandhaus, R. A., Worthen, G. S. & Henson, P. M. Bacterial lipopolysaccharide enhances chemoattractant-induced elastase secretion by human neutrophils. *J Leukoc Biol* **43**, 547-56 (1988).
 68. Redl, H., Schlag, G., Bahrami, S., Schade, U., Ceska, M. & Stutz, P. Plasma neutrophil-activating peptide-1/interleukin-8 and neutrophil elastase in a primate bacteremia model. *J Infect Dis* **164**, 383-8 (1991).
 69. Endo, S., Inada, K., Ceska, M., Takakuwa, T., Yamada, Y., Nakae, H., Kasai, T., Yamashita, H., Taki, K. & Yoshida, M. Plasma interleukin 8 and polymorphonuclear leukocyte elastase concentrations in patients with septic shock. *J Inflamm* **45**, 136-42 (1995).
 70. Levy, O., Martin, S., Eichenwald, E., Ganz, T., Valore, E., Carroll, S. F., Lee, K., Goldmann, D. & Thorne, G. M. Impaired innate immunity in the newborn: newborn neutrophils are deficient in bactericidal/permeability-increasing protein. *Pediatrics* **104**, 1327-33 (1999).