

8. Literaturverzeichnis

- Amasheh, S., Meiri, N., Gitter, A. H., Schöneberg, T., Mankertz, J., Schulzke, J. D., and Fromm, M. (2002). Claudin-2 expression induces cation-selective channels in tight junctions of epithelial cells. *J Cell Sci* 115, 4969-4976.
- Anderson, J. M. (2001). Molecular structure of tight junctions and their role in epithelial transport. *News Physiol Sci* 16, 126-130.
- Ando-Akatsuka, Y., Saitou, M., Hirase, T., Kishi, M., Sakakibara, A., Itoh, M., Yonemura, S., Furuse, M., and Tsukita, S. (1996). Interspecies diversity of the occludin sequence: cDNA cloning of human, mouse, dog, and rat-kangaroo homologues. *J Cell Biol* 133, 43-47.
- Balda, M. S., and Anderson, J. M. (1993). Two classes of tight junctions are revealed by ZO-1 isoforms. *Am J Physiol* 264, C918-924.
- Balda, M. S., and Matter, K. (2000a). The tight junction protein ZO-1 and an interacting transcription factor regulate ErbB-2 expression. *Embo J* 19, 2024-2033.
- Balda, M. S., and Matter, K. (2000b). Transmembrane proteins of tight junctions. *Semin Cell Dev Biol* 11, 281-289.
- Bazzoni, G. (2003). The JAM family of junctional adhesion molecules. *Curr Opin Cell Biol* 15, 525-530
- Bruewer, M., Luegering, A., Kucharzik, T., Parkos, C. A., Madara, J. L., Hopkins, A. M., and Nusrat, A. (2003). Proinflammatory cytokines disrupt epithelial barrier function by apoptosis-independent mechanisms. *J Immunol* 171, 6164-6172.
- Bürgel, N., Bojarski, C., Mankertz, J., Zeitz, M., Fromm, M., and Schulzke, J. D. (2002). Mechanisms of diarrhea in collagenous colitis. *Gastroenterology* 123, 433-443.
- Cannistra, S.A., Rambaldi, A., Spriggs, D. R., Hermann, F., Kufe, D., and Griffin, J.D. (1987). Human granulocyte-macrophage colony-stimulating factor induces expression of the tumor necrosis factor gene by the U937 cell line and by normal human monocytes. *J. Clin. Invest.* 79: 1720-1728.
- Citi, S., and Cordenonsi, M. (1998). Tight junction proteins. *Biochim Biophys Acta* 1448, 1-11.
- Clarke, H., Marano, C. W., Peralta Soler, A., and Mullin, J. M. (2000). Modification of tight junction function by protein kinase C isoforms. *Adv Drug Deliv Rev* 41, 283-301.
- Colegio, O. R., Van Itallie, C. M., McCrea, H. J., Rahner, C., and Anderson, J. M. (2002). Claudins create charge-selective channels in the paracellular pathway between epithelial cells. *Am J Physiol Cell Physiol* 283, C142-147.
- Coyne, C. B., Vanhook, M. K., Gambling, T. M., Carson, J. L., Boucher, R. C., and Johnson, L. G. (2002). Regulation of airway tight junctions by proinflammatory cytokines. *Mol Biol Cell* 13, 3218-3234.
- Denker, B. M., and Nigam, S. K. (1998). Molecular structure and assembly of the tight junction. *Am J Physiol* 274, F1-9.
- Diamond, J.M. (1977). The epithelial junction: bridge, gate, and fence. *Physiologist* 20: 10-18.
- Dodane, V., and Kachar, B. (1996). Identification of isoforms of G proteins and PKC that colocalize with tight junctions. *J Membr Biol* 149, 199-209.
- Duffy, H. S., John, G. R., Lee, S. C., Brosnan, C. F., and Spray, D. C. (2000). Reciprocal regulation of the junctional proteins claudin-1 and connexin43 by interleukin-1beta in primary human fetal astrocytes. *J Neurosci* 20, RC114.

- Fanning, A. S., Mitic, L. L., and Anderson, J. M. (1999). Transmembrane proteins in the tight junction barrier. *J Am Soc Nephrol* 10, 1337-1345.
- Fromm, M. (2004). Transport in Membranen und Epithelien. In: *Physiologie des Menschen*. Schmidt, R.F., Lang, F., Thews, G. (Hrsg.), 29. Auflage, Springer, Berlin Heidelberg NewYork, Kapitel 3.
- Fromm, M., Hegel, U., and Wiederholt, M. (1994). Epithelien. In *Pathophysiologie des Menschen.*, K. Hierholzer, and R. F. Schmidt, eds. (Weinheim, Verlag Chemie), pp. 5.1 - 5.19.
- Fujita, K., Katahira, J., Horiguchi, Y., Sonoda, N., Furuse, M., and Tsukita, S. (2000). Clostridium perfringens enterotoxin binds to the second extracellular loop of claudin-3, a tight junction integral membrane protein. *FEBS Lett* 476, 258-261.
- Furuse, M., Fujita, K., Hiiragi, T., Fujimoto, K., and Tsukita, S. (1998a). Claudin-1 and -2: novel integral membrane proteins localizing at tight junctions with no sequence similarity to occludin. *J Cell Biol* 141, 1539-1550.
- Furuse, M., Furuse, K., Sasaki, H., and Tsukita, S. (2001). Conversion of zonulae occludentes from tight to leaky strand type by introducing claudin-2 into Madin-Darby canine kidney I cells. *J Cell Biol* 153, 263-272.
- Furuse, M., Hata, M., Furuse, K., Yoshida, Y., Haratake, A., Sugitani, Y., Noda, T., Kubo, A., and Tsukita, S. (2002). Claudin-based tight junctions are crucial for the mammalian epidermal barrier: a lesson from claudin-1-deficient mice. *J Cell Biol* 156, 1099-1111.
- Furuse, M., Hirase, T., Itoh, M., Nagafuchi, A., Yonemura, S., and Tsukita, S. (1993). Occludin: a novel integral membrane protein localizing at tight junctions. *J Cell Biol* 123, 1777-1788.
- Furuse, M., Itoh, M., Hirase, T., Nagafuchi, A., Yonemura, S., and Tsukita, S. (1994). Direct association of occludin with ZO-1 and its possible involvement in the localization of occludin at tight junctions. *J Cell Biol* 127, 1617-1626.
- Furuse, M., Sasaki, H., Fujimoto, K., and Tsukita, S. (1998b). A single gene product, claudin-1 or -2, reconstitutes tight junction strands and recruits occludin in fibroblasts. *J Cell Biol* 143, 391-401.
- Furuse, M., Sasaki, H., and Tsukita, S. (1999). Manner of interaction of heterogeneous claudin species within and between tight junction strands. *J Cell Biol* 147, 891-903.
- Gitter, A. H., Bendfeldt, K., Schulzke, J. D., and Fromm, M. (2000). Leaks in the epithelial barrier caused by spontaneous and TNF-alpha-induced single-cell apoptosis. *Faseb J* 14, 1749-1753.
- Gonzalez-Mariscal, L., Betanzos, A., Nava, P., and Jaramillo, B. E. (2003). Tight junction proteins. *Prog Biophys Mol Biol* 81, 1-44.
- Gumbiner, B., Lowenkopf, T., and Apatira, D. (1991). Identification of a 160-kDa polypeptide that binds to the tight junction protein ZO-1. *Proc Natl Acad Sci U S A* 88, 3460-3464.
- Halford, S., Spencer, P., Greenwood, J., Winton, H., Hunt, D. M., and Adamson, P. (2000). Assignment of claudin-1 (CLDN1) to human chromosome 3q28-->q29 with somatic cell hybrids. *Cytogenet Cell Genet* 88, 217.
- Inai, T., Kobayashi, J., and Shibata, Y. (1999). Claudin-1 contributes to the epithelial barrier function in MDCK cells. *Eur J Cell Biol* 78, 849-855.
- Ito, H. (2003). Anti-interleukin-6 therapy for Crohn's disease. *Curr Pharm Des* 9, 295-305.

- Itoh, M., Furuse, M., Morita, K., Kubota, K., Saitou, M., and Tsukita, S. (1999). Direct binding of three tight junction-associated MAGUKs, ZO-1, ZO-2, and ZO-3, with the COOH termini of claudins. *J Cell Biol* 147, 1351-1363.
- Itoh, M., Sasaki, H., Furuse, M., Ozaki, H., Kita, T., and Tsukita, S. (2001). Junctional adhesion molecule (JAM) binds to PAR-3: a possible mechanism for the recruitment of PAR-3 to tight junctions. *J Cell Biol* 154, 491-497.
- Katahira, J., Sugiyama, H., Inoue, N., Horiguchi, Y., Matsuda, M., and Sugimoto, N. (1997). Clostridium perfringens enterotoxin utilizes two structurally related membrane proteins as functional receptors in vivo. *J Biol Chem* 272, 26652-26658.
- Kelley, T. J., and Elmer, H. L. (2000). In vivo alterations of IFN regulatory factor-1 and PI-AS1 protein levels in cystic fibrosis epithelium. *J Clin Invest* 106, 403-410.
- Keon, B. H., Schafer, S., Kuhn, C., Grund, C., and Franke, W. W. (1996). Symplekin, a novel type of tight junction plaque protein. *J Cell Biol* 134, 1003-1018.
- Kinugasa, T., Sakaguchi, T., Gu, X., and Reinecker, H. C. (2000). Claudins regulate the intestinal barrier in response to immune mediators. *Gastroenterology* 118, 1001-1011.
- Krämer, F., White, K., Kubbies, M., Swisshelm, K., and Weber, B. H. (2000). Genomic organization of claudin-1 and its assessment in hereditary and sporadic breast cancer. *Hum Genet* 107, 249-256.
- Kreusel, K. M., Fromm, M., Schulzke, J. D., and Hegel, U. (1991). Cl⁻ secretion in epithelial monolayers of mucus-forming human colon cells (HT-29/B6). *Am J Physiol* 261, C574-582.
- Lickert, H., Domon, C., Huls, G., Wehrle, C., Duluc, I., Clevers, H., Meyer, B. I., Freund, J. N., and Kemler, R. (2000). Wnt/(beta)-catenin signaling regulates the expression of the homeobox gene Cdx1 in embryonic intestine. *Development* 127, 3805-3813.
- Liebner, S., Fischmann, A., Rascher, G., Duffner, F., Grote, E. H., Kalbacher, H., and Wolburg, H. (2000a). Claudin-1 and claudin-5 expression and tight junction morphology are altered in blood vessels of human glioblastoma multiforme. *Acta Neuropathol (Berl)* 100, 323-331.
- Liebner, S., Kniesel, U., Kalbacher, H., and Wolburg, H. (2000b). Correlation of tight junction morphology with the expression of tight junction proteins in blood-brain barrier endothelial cells. *Eur J Cell Biol* 79, 707-717.
- Lorentz, O., Duluc, I., Arcangelis, A. D., Simon-Assmann, P., Kedinger, M., and Freund, J. N. (1997). Key role of the Cdx2 homeobox gene in extracellular matrix-mediated intestinal cell differentiation. *J Cell Biol* 139, 1553-1565.
- Madara, J. L., and Stafford, J. (1989). Interferon-gamma directly affects barrier function of cultured intestinal epithelial monolayers. *J Clin Invest* 83, 724-727.
- Mankertz, J., Hillenbrand, B., Tavalali, S., Huber, O., Fromm, M., and Schulzke, J. D. (2004). Functional crosstalk between Wnt signaling and Cdx-related transcriptional activation in the regulation of the claudin-2 promoter activity. *Biochem Biophys Res Commun* 314, 1001-1007.
- Mankertz, J., Tavalali, S., Schmitz, H., Mankertz, A., Riecken, E. O., Fromm, M., and Schulzke, J. D. (2000). Expression from the human occludin promoter is affected by tumor necrosis factor alpha and interferon gamma. *J Cell Sci* 113 (Pt 11), 2085-2090.
- Mankertz, J., Waller, J. S., Hillenbrand, B., Tavalali, S., Florian, P., Schoneberg, T., Fromm, M., and Schulzke, J. D. (2002). Gene expression of the tight junction protein occludin includes differential splicing and alternative promoter usage. *Biochem Biophys Res Commun* 298, 657-666.

- Martin-Padura, I., Lostaglio, S., Schneemann, M., Williams, L., Romano, M., Fruscella, P., Panzeri, C., Stoppacciaro, A., Ruco, L., Villa, A., et al. (1998). Junctional adhesion molecule, a novel member of the immunoglobulin superfamily that distributes at intercellular junctions and modulates monocyte transmigration. *J Cell Biol* 142, 117-127.
- Merzdorf, C. S., Chen, Y. H., and Goodenough, D. A. (1998). Formation of functional tight junctions in *Xenopus* embryos. *Dev Biol* 195, 187-203.
- Mitic, L.L., Van Itallie, C.M., and Anderson, J.M. (2000) Molecular Physiology and Pathophysiology of Tight Junctions. I. Tight junction structure and function: lessons from mutant animals and proteins. *Am J Physiol Gastrointest Liver Physiol* 279: G250–G254.
- Miwa, N., Furuse, M., Tsukita, S., Niikawa, N., Nakamura, Y., and Furukawa, Y. (2000). Involvement of claudin-1 in the beta-catenin/Tcf signaling pathway and its frequent upregulation in human colorectal cancers. *Oncol Res* 12, 469-476.
- Morita, K., Furuse, M., Fujimoto, K., and Tsukita, S. (1999a). Claudin multigene family encoding four-transmembrane domain protein components of tight junction strands. *Proc Natl Acad Sci U S A* 96, 511-516.
- Morita, K., Sasaki, H., Fujimoto, K., Furuse, M., and Tsukita, S. (1999b). Claudin-11/OSP-based tight junctions of myelin sheaths in brain and Sertoli cells in testis. *J Cell Biol* 145, 579-588.
- Morita, K., Sasaki, H., Furuse, M., and Tsukita, S. (1999c). Endothelial claudin: claudin-5/TMVCF constitutes tight junction strands in endothelial cells. *J Cell Biol* 147, 185-194.
- Muller, W. A. (2003). Leukocyte–endothelial-cell interactions in leukocyte transmigration and the inflammatory response. *Trends Immunol* 24, 326-333.
- Muresan, Z., Paul, D. L., and Goodenough, D. A. (2000). Occludin 1B, a variant of the tight junction protein occludin. *Mol Biol Cell* 11, 627-634.
- Nasdala, I., Wolburg-Buchholz, K., Wolburg, H., Kuhn, A., Ebnet, K., Brachtendorf, G., Samulowitz, U., Kuster, B., Engelhardt, B., Vestweber, D., and Butz, S. (2002). A transmembrane tight junction protein selectively expressed on endothelial cells and platelets. *J Biol Chem* 277, 16294-16303.
- Nitta, T., Hata, M., Gotoh, S., Seo, Y., Sasaki, H., Hashimoto, N., Furuse, M., and Tsukita, S. (2003). Size-selective loosening of the blood-brain barrier in claudin-5-deficient mice. *J Cell Biol* 161, 653-660.
- Rahner, C., Mitic, L. L., and Anderson, J. M. (2001). Heterogeneity in expression and subcellular localization of claudins 2, 3, 4, and 5 in the rat liver, pancreas, and gut. *Gastroenterology* 120, 411-422.
- Sakaguchi, T., Gu, X., Golden, H. M., Suh, E., Rhoads, D. B., and Reinecker, H. C. (2002). Cloning of the human claudin-2 5'-flanking region revealed a TATA-less promoter with conserved binding sites in mouse and human for caudal-related homeodomain proteins and hepatocyte nuclear factor-1alpha. *J Biol Chem* 277, 21361-21370.
- Sakakibara, A., Furuse, M., Saitou, M., Ando-Akatsuka, Y., and Tsukita, S. (1997). Possible involvement of phosphorylation of occludin in tight junction formation. *J Cell Biol* 137, 1393-1401.
- Sanger, F., Nicklen, S., and Coulson, A. R. (1977). DNA sequencing with chain-terminating inhibitors. *Proc Natl Acad Sci U S A* 74, 5463-5467.
- Schmitz, H., Barmeyer, C., Fromm, M., Runkel, N., Foss, H. D., Bentzel, C. J., Riecken, E. O., and Schulzke, J. D. (1999a). Altered tight junction structure contributes to the impaired epithelial barrier function in ulcerative colitis. *Gastroenterology* 116, 301-309.

- Schmitz, H., Fromm, M., Bentzel, C. J., Scholz, P., Detjen, K., Mankertz, J., Bode, H., Epple, H. J., Riecken, E. O., and Schulzke, J. D. (1999b). Tumor necrosis factor-alpha (TNFalpha) regulates the epithelial barrier in the human intestinal cell line HT-29/B6. *J Cell Sci* 112 (Pt 1), 137-146.
- Schneeberger, E.E., Lynch, R.D. (2004). The tight junction: a multifunctional complex. *Am J Physiol Cell Physiol* 286, C1213-C1228.
- Simon, D. B., Lu, Y., Choate, K. A., Velazquez, H., Al-Sabban, E., Praga, M., Casari, G., Bettinelli, A., Colussi, G., Rodriguez-Soriano, J., et al. (1999). Paracellin-1, a renal tight junction protein required for paracellular Mg²⁺ resorption. *Science* 285, 103-106.
- Sirotkin, H., Morrow, B., Saint-Jore, B., Puech, A., Das Gupta, R., Patanjali, S. R., Skoultchi, A., Weissman, S. M., and Kucherlapati, R. (1997). Identification, characterization, and precise mapping of a human gene encoding a novel membrane-spanning protein from the 22q11 region deleted in velo-cardio-facial syndrome. *Genomics* 42, 245-251.
- Sonoda, N., Furuse, M., Sasaki, H., Yonemura, S., Katahira, J., Horiguchi, Y., and Tsukita, S. (1999). Clostridium perfringens enterotoxin fragment removes specific claudins from tight junction strands: Evidence for direct involvement of claudins in tight junction barrier. *J Cell Biol* 147, 195-204.
- Stevenson, B. R., and Keon, B. H. (1998). The tight junction: morphology to molecules. *Annu Rev Cell Dev Biol* 14, 89-109.
- Suh, E., Chen, L., Taylor, J., and Traber, P. G. (1994). A homeodomain protein related to caudal regulates intestine-specific gene transcription. *Mol Cell Biol* 14, 7340-7351.
- Swisshelm, K., Machl, A., Planitzer, S., Robertson, R., Kubbies, M., and Hosier, S. (1999). SEMP1, a senescence-associated cDNA isolated from human mammary epithelial cells, is a member of an epithelial membrane protein superfamily. *Gene* 226, 285-295.
- Takai, Y., and Nakanishi, H. (2003). Nectin and afadin: novel organizers of intercellular junctions. *J Cell Sci* 116, 17-27.
- Tavalali, S. (1999) Identifizierung und funktionelle Analyse des Promotors für das humane tight junction Protein Occludin. Diplomarbeit, Fachbereich Chemie, Freie Universität Berlin.
- Tsukita, S., and Furuse, M. (1999). Occludin and claudins in tight-junction strands: leading or supporting players? *Trends Cell Biol* 9, 268-273.
- Tsukita, S., and Furuse, M. (2000). Pores in the wall: claudins constitute tight junction strands containing aqueous pores. *J Cell Biol* 149, 13-16.
- Tsukita, S., and Furuse, M. (2002). Claudin-based barrier in simple and stratified cellular sheets. *Curr. Opin. Cell Biol.* 14: 531-536
- Turksen, K., and Troy, T. C. (2001). Claudin-6: a novel tight junction molecule is developmentally regulated in mouse embryonic epithelium. *Dev Dyn* 222, 292-300.
- Turksen, K., and Troy, T. C. (2002). Permeability barrier dysfunction in transgenic mice overexpressing claudin 6. *Development* 129, 1775-1784.
- Van Itallie, C., Rahner, C., and Anderson, J. M. (2001). Regulated expression of claudin-4 decreases paracellular conductance through a selective decrease in sodium permeability. *J Clin Invest* 107, 1319-1327.
- Wachtel, M., Bolliger, M. F., Ishihara, H., Frei, K., Bluethmann, H., and Gloor, S. M. (2001). Down-regulation of occludin expression in astrocytes by tumour necrosis factor (TNF) is mediated via TNF type-1 receptor and nuclear factor-kappaB activation. *J Neurochem* 78, 155-162.

- Wang, L., Walia, B., Evans, J., Gewirtz, A. T., Merlin, D., and Sitaraman, S. V. (2003). IL-6 induces NF-kappa B activation in the intestinal epithelia. *J Immunol* 171, 3194-3201.
- Wittig, B. M., Duchmann, R., Stallmach, A., and Zeitz, M. (2001). [Modulation of cytokines in chronic inflammatory bowel diseases]. *Internist (Berl)* 42, 47-54.
- Wojnarowski, C., Frischer, T., Hofbauer, E., Grabner, C., Mosgoeller, W., Eichler, I., and Ziesche, R. (1999). Cytokine expression in bronchial biopsies of cystic fibrosis patients with and without acute exacerbation. *Eur Respir J* 14, 1136-1144.
- Yamamoto, T., Harada, N., Kano, K., Taya, S., Canaani, E., Matsuura, Y., Mizoguchi, A., Ide, C., and Kaibuchi, K. (1997). The Ras target AF-6 interacts with ZO-1 and serves as a peripheral component of tight junctions in epithelial cells. *J Cell Biol* 139, 785-795.
- Yap, A. S., Mullin, J. M., and Stevenson, B. R. (1998). Molecular analyses of tight junction physiology: insights and paradoxes. *J Membr Biol* 163, 159-167.
- Zahraoui, A., Joberty, G., Arpin, M., Fontaine, J. J., Hellio, R., Tavitian, A., and Louvard, D. (1994). A small rab GTPase is distributed in cytoplasmic vesicles in non polarized cells but colocalizes with the tight junction marker ZO-1 in polarized epithelial cells. *J Cell Biol* 124, 101-115.
- Zehetner, G., and Lehrach, H. (1994). The Reference Library System--sharing biological material and experimental data. *Nature* 367, 489-491.
- Zeissig, S., Bojarski, C., Buerge, N., Mankertz, J., Zeitz, M., Fromm, M., and Schulzke, J. D. (2004). Downregulation of epithelial apoptosis and barrier repair in active Crohn's disease by TNFalpha antibody treatment. *Gut in press*.