

8 Literatur

- Abeijon, C., und Hirschberg, C. B. (1987). Subcellular site of synthesis of the N-acetylgalactosamine (alpha 1-0) serine (or threonine) linkage in rat liver. *J Biol Chem* 262, 4153-4159.
- Altmann, F., Staudacher, E., Wilson, I. B., und Marz, L. (1999). Insect cells as hosts for the expression of recombinant glycoproteins. *Glycoconj J* 16, 109-123.
- Angenstein, F., Staak, S., und Jork, R. (1992). Phorbol ester-induced changes in rat hippocampal glycoprotein fucosylation. *Neurosci Lett* 135, 269-272.
- Bandlish, U., Prabhakar, B. R., und Virmani, U. (1991). Serum fucose levels in gynaecological disorders including carcinoma cervix. *J Indian Med Assoc* 89, 250-251.
- Becker, D. J., und Lowe, J. B. (2003). Fucose: biosynthesis and biological function in mammals. *Glycobiology* 13, 41R-53R.
- Benjamini, E., Wan, A. M., Langton, B. C. und Andria, M. L. (1986). Cell activation and immunogenicity. *Dev Biol Stand* 63, 29-39.
- Birnboim, H. C., und Doly, J. (1979). A rapid alkaline extraction procedure for screening recombinant plasmid DNA. *Nucleic Acids Res* 7, 1513-1523.
- Bork, P., Sander, C., und Valencia, A. (1992). An ATPase domain common to prokaryotic cell cycle proteins, sugar kinases, actin, and hsp70 heat shock proteins. *Proc Natl Acad Sci U S A* 89, 7290-7294.
- Bradford, M. M. (1976). A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Anal Biochem* 72, 248-254.
- Bullock, S., Potter, J., und Rose, S. P. (1990). Effects of the amnesic agent 2-deoxygalactose on incorporation of fucose into chick brain glycoproteins. *J Neurochem* 54, 135-142.
- Butler, W., und Serif, G. S. (1985). Fucokinase, its anomeric specificity and mechanism of phosphate group transfer. *Biochim Biophys Acta* 829, 238-243.
- Chang, S., Duerr, B., und Serif, G. (1988). An epimerase-reductase in L-fucose synthesis. *J Biol Chem* 263, 1693-1697.
- Charles, I. G., Chubb, A., Gill, R., Clare, J., Lowe, P. N., Holmes, L. S., Page, M., Keeling, J. G., Moncada, S., und Riveros-Moreno, V. (1993). Cloning and expression of a rat neuronal nitric oxide synthase coding sequence in a baculovirus/insect cell system. *Biochem Biophys Res Commun* 196, 1481-1489.
- Cline, J., Braman, J. C., und Hogrefe, H. H. (1996). PCR fidelity of pfu DNA polymerase and other thermostable DNA polymerases. *Nucleic Acids Res* 24, 3546-3551.
- Coffey, J. W., Miller, O. N., und Sellinger, O. Z. (1964). The Metabolism of L-Fucose in the Rat. *J Biol Chem* 239, 4011-4017.
- Coyne, M. J., Reinap, B., Lee, M. M., und Comstock, L. E. (2005). Human symbionts use a host-like pathway for surface fucosylation. *Science* 307, 1778-1781.

Davis, T. R., Wickham, T. J., McKenna, K. A., Granados, R. R., Shuler, M. L., und Wood, H. A. (1993). Comparative recombinant protein production of eight insect cell lines. In Vitro Cell Dev Biol Anim 29A, 388-390.

Etzioni, A., Frydman, M., Pollack, S., Avidor, I., Phillips, M. L., Paulson, J. C., und Gershoni-Baruch, R. (1992). Brief report: recurrent severe infections caused by a novel leukocyte adhesion deficiency. N Engl J Med 327, 1789-1792.

Etzioni, A., Sturla, L., Antonellis, A., Green, E. D., Gershoni-Baruch, R., Berninsone, P. M., Hirschberg, C. B., und Tonetti, M. (2002). Leukocyte adhesion deficiency (LAD) type II/carbohydrate deficient glycoprotein (CDG) IIc founder effect and genotype/phenotype correlation. Am J Med Genet 110, 131-135.

Flowers, H. M. (1981). Chemistry and biochemistry of D- and L-fucose. Adv Carbohydr Chem Biochem 39, 279-345.

Foster, D. W., und Ginsburg, V. (1961). Biosynthesis of L-fucose by mammalian tissue. Biochim Biophys Acta 54, 376-378.

Gerardy-Schahn, R., Oelmann, S., und Bakker, H. (2001). Nucleotide sugar transporters: biological and functional aspects. Biochimie 83, 775-782.

Günter, A., und Tollens, B. (1890). Ber, 23, 2585-2586.

Hammond, C., Braakman, I., und Helenius, A. (1994). Role of N-linked oligosaccharide recognition, glucose trimming, and calnexin in glycoprotein folding and quality control. Proc Natl Acad Sci U S A 91, 913-917.

Harris, J. R. und Markl, J. (1999). Keyhole limpet hemocyanin (KLH): a biomedical review. Micron 30, 597-623.

Helmus, Y., Denecke, J., Yakubenia, S., Robinson, P., Luhn, K., Watson, D. L., McGrogan, P. J., Vestweber, D., Marquardt, T., und Wild, M. K. (2006). Leukocyte adhesion deficiency II patients with a dual defect of the GDP-fucose transporter. Blood 107, 3959-3966.

Hidalgo, A., Ma, S., Peired, A. J., Weiss, L. A., Cunningham-Rundles, C., und Frenette, P. S. (2003). Insights into leukocyte adhesion deficiency type 2 from a novel mutation in the GDP-fucose transporter gene. Blood 101, 1705-1712.

Hinderlich, S., Berger, M., Blume, A., Chen, H., Ghaderi, D., und Bauer, C. (2002). Identification of human L-fucose kinase amino acid sequence. Biochem Biophys Res Commun 294, 650-654.

Hirschberg, C. B., Robbins, P. W., und Abeijon, C. (1998). Transporters of nucleotide sugars, ATP, and nucleotide sulfate in the endoplasmic reticulum and Golgi apparatus. Annu Rev Biochem 67, 49-69.

Hocher, B., Abou-Rebyeh, F., und Bauer, C. (1993). Influence of dopaminergic agonists/antagonists on fucose metabolism in the rat brain. Eur J Clin Chem Clin Biochem 31, 347-351.

Innis, M. A., Gelfand, D.H., Sninsky, JJ. and White T.J. (1989). PCR protocols: A guide to methods and applications, Academic Press, Inc.).

- Ishihara, H., und Heath, E. C. (1968). The metabolism of L-fucose. IV. The biosynthesis of guanosine diphosphate L-fucose in porcine liver. *J Biol Chem* 243, 1110-1115.
- Ishihara, H., Massaro, D. J., und Heath, E. C. (1968). The metabolism of L-fucose. 3. The enzymatic synthesis of beta-L-fucose 1-phosphate. *J Biol Chem* 243, 1103-1109.
- Johnston, D. S., Wright, W. W., Shaper, J. H., Hokke, C. H., Van den Eijnden, D. H., und Joziasse, D. H. (1998). Murine sperm-zona binding, a fucosyl residue is required for a high affinity sperm-binding ligand. A second site on sperm binds a nonfucosylated, beta-galactosyl-capped oligosaccharide. *J Biol Chem* 273, 1888-1895.
- Jork, R., Grecksch, G., und Matthies, H. (1986). Impairment of glycoprotein fucosylation in rat hippocampus and the consequences on memory formation. *Pharmacol Biochem Behav* 25, 1137-1144.
- Jork, R., Schmitt, M., Lossner, B., und Matthies, H. (1984). Dopamine stimulated L-fucose incorporation into brain proteins is related to an increase in fucokinase activity. *Biomed Biochim Acta* 43, 261-270.
- Kilker, R. D., Shuey, D. K., und Serif, G. S. (1979). Isolation and properties of porcine thyroid fucokinase. *Biochim Biophys Acta* 570, 271-283.
- Köhler, G. (1985). Derivation and diversification of monoclonal antibodies. *EMBO J* 4, 1359-1365.
- Laemmli, U. K. (1970). Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature* 227, 680-685.
- Leck, J. R., und Wiese, T. J. (2004). Purification and characterization of the L-fucose transporter. *Protein Expr Purif* 37, 288-293.
- Lee, K. M., Ma, K. W., Shaw, P. C., und Wong, K. B. (2006). A high-yield one-step purification method using copper-chelating chromatography for recombinant proteins fused with maltose-binding protein. *Anal Biochem*.
- Lefebvre, R., Lo, M. C., und Suarez, S. S. (1997). Bovine sperm binding to oviductal epithelium involves fucose recognition. *Biol Reprod* 56, 1198-1204.
- Listinsky, J. J., Siegal, G. P., und Listinsky, C. M. (1998). Alpha-L-fucose: a potentially critical molecule in pathologic processes including neoplasia. *Am J Clin Pathol* 110, 425-440.
- Lossner, B., Linke, I., Eppendorfer, B., und Jork, R. (1985). Dopamine-stimulated fucosylation of brain proteins in vitro is not inhibited by puromycin. *Biomed Biochim Acta* 44, 465-473.
- Lubke, T., Marquardt, T., Etzioni, A., Hartmann, E., von Figura, K., und Korner, C. (2001). Complementation cloning identifies CDG-IIc, a new type of congenital disorders of glycosylation, as a GDP-fucose transporter deficiency. *Nat Genet* 28, 73-76.
- Lucas, H., Bercegeay, S., Le Pendu, J., Jean, M., Mirallie, S., und Barriere, P. (1994). A fucose-containing epitope potentially involved in gamete interaction on the human zona pellucida. *Hum Reprod* 9, 1532-1538.
- Luhn, K., Laskowska, A., Pielage, J., Klammt, C., Ipe, U., Vestweber, D., und Wild, M. K. (2004). Identification and molecular cloning of a functional GDP-fucose transporter in *Drosophila melanogaster*. *Exp Cell Res* 301, 242-250.

- Maina, C. V., Riggs, P. D., Grandea, A. G., 3rd, Slatko, B. E., Moran, L. S., Tagliamonte, J. A., McReynolds, L. A., und Guan, C. D. (1988). An Escherichia coli vector to express and purify foreign proteins by fusion to and separation from maltose-binding protein. *Gene* 74, 365-373.
- Marquardt, T., Luhn, K., Srikrishna, G., Freeze, H. H., Harms, E., und Vestweber, D. (1999). Correction of leukocyte adhesion deficiency type II with oral fucose. *Blood* 94, 3976-3985.
- McKibbin, J. M. (1978). Fucolipids. *J Lipid Res* 19, 131-147.
- Mellquist, J. L., Kasturi, L., Spitalnik, S. L., und Shakin-Eshleman, S. H. (1998). The amino acid following an asn-X-Ser/Thr sequon is an important determinant of N-linked core glycosylation efficiency. *Biochemistry* 37, 6833-6837.
- Michalski, J. C., und Klein, A. (1999). Glycoprotein lysosomal storage disorders: alpha- and beta-mannosidosis, fucosidosis and alpha-N-acetylgalactosaminidase deficiency. *Biochim Biophys Acta* 1455, 69-84.
- Miller, E. N., Rupp, A. L., Lindberg, M. K., und Wiese, T. J. (2005). Tissue distribution of L-fucokinase in rodents. *Comp Biochem Physiol B Biochem Mol Biol* 140, 513-520.
- Miyoshi, E., Noda, K., Yamaguchi, Y., Inoue, S., Ikeda, Y., Wang, W., Ko, J. H., Uozumi, N., Li, W., und Taniguchi, N. (1999). The alpha1-6-fucosyltransferase gene and its biological significance. *Biochim Biophys Acta* 1473, 9-20.
- Moloney, D. J., und Haltiwanger, R. S. (1999). The O-linked fucose glycosylation pathway: identification and characterization of a uridine diphosphoglucose: fucose-beta1,3-glucosyltransferase activity from Chinese hamster ovary cells. *Glycobiology* 9, 679-687.
- Moloney, D. J., Shair, L. H., Lu, F. M., Xia, J., Locke, R., Matta, K. L., und Haltiwanger, R. S. (2000). Mammalian Notch1 is modified with two unusual forms of O-linked glycosylation found on epidermal growth factor-like modules. *J Biol Chem* 275, 9604-9611.
- Mullis, K., Falloona, F., Scharf, S., Saiki, R., Horn, G., und Erlich, H. (1986). Specific enzymatic amplification of DNA in vitro: the polymerase chain reaction. *Cold Spring Harb Symp Quant Biol* 51, 263-273.
- Mullis, K. B., und Falloona, F. A. (1987). Specific synthesis of DNA in vitro via a polymerase-catalyzed chain reaction. *Methods Enzymol* 155, 335-350.
- Niittymaki, J., Mattila, P., Roos, C., Huopaniemi, L., Sjöblom, S., und Renkonen, R. (2004). Cloning and expression of murine enzymes involved in the salvage pathway of GDP-L-fucose. *Eur J Biochem* 271, 78-86.
- Ntefidou, M., Ludtke, T., Ahmad, M., und Hader, D. P. (2006). Heterologous Expression of Photoactivated Adenylyl Cyclase (PAC) Genes from the Flagellate Euglena gracilis in Insect Cells. *Photochem Photobiol. Epub*
- Park, S. H., Pastuszak, I., Drake, R., und Elbein, A. D. (1998). Purification to apparent homogeneity and properties of pig kidney L-fucose kinase. *J Biol Chem* 273, 5685-5691.
- Parodi, A. J. (2000). Protein glucosylation and its role in protein folding. *Annu Rev Biochem* 69, 69-93.

Pastuszak, I., Ketchum, C., Hermanson, G., Sjoberg, E. J., Drake, R., und Elbein, A. D. (1998). GDP-L-fucose pyrophosphorylase. Purification, cDNA cloning, and properties of the enzyme. *J Biol Chem* 273, 30165-30174.

Pohle, W., Ruthrich, H. L., Popov, N., und Matthies, H. (1979). Fucose incorporation into rat hippocampus structures after acquisition of a brightness discrimination. A histoautoradiographic analysis. *Acta Biol Med Ger* 38, 53-63.

Popov, N., Schmidt, S., Schulzeck, S., Jork, R., Lossner, B., und Matthies, H. (1983). Changes in activities of fucokinase and fucosyltransferase in rat hippocampus after acquisition of a brightness discrimination reaction. *Pharmacol Biochem Behav* 19, 43-47.

Puglielli, L., und Hirschberg, C. B. (1999). Reconstitution, identification, and purification of the rat liver golgi membrane GDP-fucose transporter. *J Biol Chem* 274, 35596-35600.

Quirk, S., und Seley, K. L. (2005). Substrate discrimination by the human GTP fucose pyrophosphorylase. *Biochemistry* 44, 10854-10863.

Quirk, S., und Seley-Radtke, K. L. (2006). Purification, crystallization and preliminary X-ray characterization of the human GTP fucose pyrophosphorylase. *Acta Crystallograph Sect F Struct Biol Cryst Commun* 62, 392-394.

Radhakrishnamurthy, B., Berenson, G. S., Pargaonkar, P. S., Voors, A. W., Srinivasan, S. R., Plavidal, F., Dolan, P., und Dalferes, E. R., Jr. (1976). Serum-free and protein-bound sugars and cardiovascular complications in diabetes mellitus. *Lab Invest* 34, 159-165.

Reutter, W., und Bauer, C. (1985). Inhibitors of glycoprotein biosynthesis. *Adv Enzyme Regul* 24, 405-416.

Richards, W. L., Kilker, R. D., und Serif, G. S. (1978). Metabolite control of L-fucose utilization. *J Biol Chem* 253, 8359-8361.

Richards, W. L., und Serif, G. S. (1977). Canine thyroid fucokinase. *Biochim Biophys Acta* 484, 353-367.

Ricken, J., Herting, M., und Vischer, P. (1990). Investigation of the metabolism of L-fucose in aortic tissue and cultured arterial wall cells. *Biochem Soc Trans* 18, 963-964.

Roos, C., Kolmer, M., Mattila, P., und Renkonen, R. (2002). Composition of *Drosophila melanogaster* proteome involved in fucosylated glycan metabolism. *J Biol Chem* 277, 3168-3175.

Saiki, R. K., Scharf, S., Faloona, F., Mullis, K. B., Horn, G. T., Erlich, H. A., und Arnheim, N. (1985). Enzymatic amplification of beta-globin genomic sequences and restriction site analysis for diagnosis of sickle cell anemia. *Science* 230, 1350-1354.

Sambrook, J., Fritsch, E., Maniatis, T. (1989). Molecular Cloning: A laboratory annual. (Cold Spring Harbor, Cold Spring Harbor Press).

Sanger, F., Nicklen, S., und Coulson, A. R. (1977). DNA sequencing with chain-terminating inhibitors. *Proc Natl Acad Sci U S A* 74, 5463-5467.

Shahhosseini, S., Guttikonda, S., Bhatnagar, P., und Suresh, M. R. (2006). Production and characterization of monoclonal antibodies against shope fibroma virus superoxide dismutase and glutathione-s-transferase. *J Pharm Pharm Sci* 9, 165-168.

Smith, P. L., Myers, J. T., Rogers, C. E., Zhou, L., Petryniak, B., Becker, D. J., Homeister, J. W., und Lowe, J. B. (2002). Conditional control of selectin ligand expression and global fucosylation events in mice with a targeted mutation at the FX locus. *J Cell Biol* 158, 801-815.

Staudacher, E., Altmann, F., Wilson, I. B., und Marz, L. (1999). Fucose in N-glycans: from plant to man. *Biochim Biophys Acta* 1473, 216-236.

Sturla, L., Puglielli, L., Tonetti, M., Berninsone, P., Hirschberg, C. B., De Flora, A., und Etzioni, A. (2001). Impairment of the Golgi GDP-L-fucose transport and unresponsiveness to fucose replacement therapy in LAD II patients. *Pediatr Res* 49, 537-542.

Sturla, L., Rampal, R., Haltiwanger, R. S., Fruscione, F., Etzioni, A., und Tonetti, M. (2003). Differential terminal fucosylation of N-linked glycans versus protein O-fucosylation in leukocyte adhesion deficiency type II (CDG IIc). *J Biol Chem* 278, 26727-26733.

Sznyter, L. A., Slatko, B., Moran, L., O'Donnell, K. H., und Brooks, J. E. (1987). Nucleotide sequence of the Ddel restriction-modification system and characterization of the methylase protein. *Nucleic Acids Res* 15, 8249-8266.

Talevi, R., Gualtieri, R., Tartaglione, G., und Fortunato, A. (1997). Heterogeneity of the zona pellucida carbohydrate distribution in human oocytes failing to fertilize in vitro. *Hum Reprod* 12, 2773-2780.

Tonetti, M., Sturla, L., Bisso, A., Benatti, U., und De Flora, A. (1996). Synthesis of GDP-L-fucose by the human FX protein. *J Biol Chem* 271, 27274-27279.

Towbin, H., Staehelin, T., und Gordon, J. (1979). Electrophoretic transfer of proteins from polyacrylamide gels to nitrocellulose sheets: procedure and some applications. *Proc Natl Acad Sci U S A* 76, 4350-4354.

Waalkes, T. P., Gehrke, C. W., Tormey, D. C., Woo, K. B., Kuo, K. C., Synder, J., und Hansen, H. (1978). Biologic markers in breast carcinoma. IV. Serum fucose-protein ratio. Comparisons with carcinoembryonic antigen and human chorionic gonadotrophin. *Cancer* 41, 1871-1882.

Weiss, B., Thompson, A., und Richardson, C. C. (1968). Enzymatic breakage and joining of deoxyribonucleic acid. VII. Properties of the enzyme-adenylate intermediate in the polynucleotide ligase reaction. *J Biol Chem* 243, 4556-4563.

Wiese, T. J., Dunlap, J. A., und Yorek, M. A. (1994). L-fucose is accumulated via a specific transport system in eukaryotic cells. *J Biol Chem* 269, 22705-22711.

Wiese, T. J., Dunlap, J. A., und Yorek, M. A. (1997). Effect of L-fucose and D-glucose concentration on L-fucoprotein metabolism in human Hep G2 cells and changes in fucosyltransferase and alpha-L-fucosidase activity in liver of diabetic rats. *Biochim Biophys Acta* 1335, 61-72.

Wilkinson, E. J., Hause, L. L., Sasse, E. A., Pattillo, R. A., Milbrath, J. R., und Lewis, J. D. (1980). Carcinoembryonic antigen and L-fucose in malignant and benign mammary disease. *Am J Clin Pathol* 73, 669-675.

Yorek, M. A., Dunlap, J., Stefani, M., und Davidson, E. (1993). Increased glucose concentration inhibits myo-inositol metabolism by two different mechanisms in cultured mammalian cells. *Diabet Med* 10 Suppl 2, 21S-26S.

Yurchenco, P. D., und Atkinson, P. H. (1975). Fucosyl-glycoprotein and precursor pools in HeLa cells. *Biochemistry* 14, 3107-3114.

Zeitler, R., Danneschewski, S., Lindhorst, T., Thiem, J., und Reutter, W. (1997). Inhibition of L-fucokinase from rat liver by L-fucose analogues in vitro. *J Enzyme Inhib* 11, 265-273.