7 Literaturverzeichnis

1. McDonald, J.A., *Extracellular matrix assembly.* Annu Rev Cell Biol, 1988. 4: p. 183-207.
2. Aumailley, M. and B. Gayraud, *Structure and biological activity of the extracellular matrix.* J Mol Med, 1998. 76(3-4): p. 253-65.
3. Shekhter, A.B., *Connective tissue as an integral system: role of cell-cell and cell-matrix interactions.* Connect Tissue Res, 1986. 15(1-2): p. 23-31.
4. Ortega, N. and Z. Werb, *New functional roles for non-collagenous domains of basement membrane collagens.* Journal of Cell Science, 2002. 115: p. 4201-4214.
5. Comoglio, P.M. and L. Trusolino, *Cancer: the matrix is now in control.* Nat Med, 2005. 11(11): p. 1156-9.
6. Labat-Robert, J., M. Bihari-Varga, and L. Robert, *Extracellular matrix.* FEBS Lett, 1990. 268(2): p. 386-93.
7. van der Rest, M. and R. Garrone, *Collagen family of proteins.* Faseb J, 1991. 5(13): p. 2814-23.
8. Löffler G, P.P., *Biochemie und Pathobiochemie.* Vol. 6. Auflage. 1997, Heidelberg: Springer-Verlag. 737-759.
9. Ayad S, B.-H.R., Humphries MJ, Kadler KE, Shuttleworth A, *The extracellular matrix facts book.* 1994: Academic Press, London 2.Auflage.
10. Matthews, v.H., Ahern, *Biochemistry*. third edition ed. 2002, San Francisco: Addison Wesley Longman.
11. Giannelli, G., V. Quaranta, and S. Antonaci, *Tissue remodelling in liver diseases.* Histol Histopathol, 2003. 18(4): p. 1267-74.
12. Schuppan, D., M. Ruehl, R. Somasundaram, et al., *Matrix as a modulator of hepatic fibrogenesis.* Semin Liver Dis, 2001. 21(3): p. 351-72.
13. Chan, V.C., J.A. Ramshaw, A. Kirkpatrick, et al., *Positional preferences of ionizable residues in Gly-X-Y triplets of the collagen triple-helix.* J Biol Chem, 1997. 272(50): p. 31441-6.
14. Knupp, C. and J.M. Squire, *A new twist in the collagen story--the type VI segmented supercoil.* Embo J, 2001. 20(3): p. 372-6.
15. Gerling, B., M. Becker, D. Staab, et al., *Prediction of liver fibrosis according to serum collagen VI level in children with cystic fibrosis.* N Engl J Med, 1997. 336(22): p. 1611-2.
16. Kuo, H.J., D.R. Keene, and R.W. Glanville, *The macromolecular structure of type-VI collagen. Formation and stability of filaments.* Eur J Biochem., 1995. 232(2): p. 364-72.
17. Pfaff, M., M. Aumailley, U. Specks, et al., *Integrin and Arg-Gly-Asp dependence of cell adhesion to the native and unfolded triple helix of collagen type VI.* Exp Cell Res., 1993. 206(1): p. 167-76.
18. Tillet, E., B. Gential, R. Garrone, et al., *NG2 proteoglycan mediates beta1 integrin-independent cell adhesion and spreading on collagen VI.* J Cell Biochem., 2002. 86(4): p. 726-36.
19. Vogel, W.F., *Collagen-receptor signaling in health and disease.* Eur J Dermatol., 2001. 11(6): p. 506-14.

20. Rühl, M., E. Sahin, M. Johannsen, et al., *Soluble Collagen VI Drives Serum-starved Fibroblasts through S Phase and Prevents Apoptosis via Down-regulation of Bax.* J Biol Chem, 1999. 274(48): p. 34361-34368.
21. Sahin, E., Schuppan, D., Rühl, M., Somasundaram, R., Bauer, S. und Zeitz, M., *Collagen VI as HSC survival factor.* Dissertation, UKBF Berlin, 2002.
22. Schuppan, D., Gressner AM, *Function and metabolism of collagens and other extracellular matrix proteins.* Textbook of Clinical Hepatology, 1999. 2: p. 381-407.
23. Schuppan, D., M. Schmid, R. Somasundaram, et al., *Collagens in the liver extracellular matrix bind hepatocyte growth factor.* Gastroenterology, 1998. 114(1): p. 139-52.
24. Somasundaram, R., M. Ruehl, N. Tiling, et al., *Collagens serve as an extracellular store of bioactive interleukin 2.* J Biol Chem, 2000. 275(49): p. 38170-5.
25. Ruehl, M., U. Erben, D. Schuppan, et al., *The elongated first fibronectin type III domain of collagen XIV is an inducer of quiescence and differentiation in fibroblasts and preadipocytes.* J Biol Chem., 2005. 280(46): p. 38537-43.
26. Gianelli, G., V. Quaranta, and S. Antonaci, *Tissue remodelling in liver diseases.* Histol Histopathol, 2003. 18(4): p. 1267-74.
27. Gressner, A.M., N. Krull, and M.G. Bachem, *Regulation of proteoglycan expression in fibrotic liver and cultured fat-storing cells.* Pathol Res Pract, 1994. 190(9-10): p. 864-82.
28. Li, D. and S.L. Friedman, *Liver fibrogenesis and the role of hepatic stellate cells: new insights and prospects for therapy.* J Gastroenterol Hepatol, 1999. 14(7): p. 618-33.
29. Nagase, H., R. Visse, and G. Murphy, *Structure and function of matrix metalloproteinases and TIMPs.* Cardiovasc Res., 2006. 69(3): p. 562-73.
30. Masure, S., G. Nys, P. Fiten, et al., *Mouse gelatinase B. cDNA cloning, regulation of expression and glycosylation in WEHI-3 macrophages and gene organisation.* Eur J Biochem, 1993. 218(1): p. 129-41.
31. Ortega, N., D. Behonick, D. Stickens, et al., *How proteases regulate bone morphogenesis.* Ann N Y Acad Sci, 2003. 995: p. 109-16.
32. Apte, S.S., N. Fukai, D.R. Beier, et al., *The matrix metalloproteinase-14 (MMP-14) gene is structurally distinct from other MMP genes and is co-expressed with the TIMP-2 gene during mouse embryogenesis.* J Biol Chem, 1997. 272(41): p. 25511-7.
33. Reponen, P., C. Sahlberg, P. Huhtala, et al., *Molecular cloning of murine 72-kDa type IV collagenase and its expression during mouse development.* J Biol Chem, 1992. 267(11): p. 7856-62.
34. Nagase, H., *Activation mechanisms of matrix metalloproteinases.* Biol Chem, 1997. 378(3-4): p. 151-60.
35. Rodgers, W.H., L.M. Matrisian, L.C. Giudice, et al., *Patterns of matrix metalloproteinase expression in cycling endometrium imply differential functions and regulation by steroid hormones.* J Clin Invest, 1994. 94(3): p. 946-53.
36. Egeblad, M. and Z. Werb, *New functions for the matrix metalloproteinases in cancer progression.* Nature Rev Cancer, 2002. 2(3): p. 161-74.
37. Forget, M.A., R.R. Desrosiers, and R. Beliveau, *Physiological roles of matrix metalloproteinases: implications for tumor growth and metastasis.* Can J Physiol Pharmacol, 1999. 77(7): p. 465-80.

38. Shapiro, S., *Matrix metalloproteinase degradation of extracellular matrix: biological consequences.* Cur Opin Cell Biol, 1998. 10: p. 602-608.
39. Milani, S., H. Herbst, D. Schuppan, et al., *Differential expression of matrix-metalloproteinase-1 and -2 genes in normal and fibrotic human liver.* Am J Pathol, 1994. 144(3): p. 528-37.
40. Manicourt, D.H., N. Fujimoto, K. Obata, et al., *Levels of circulating collagenase, stromelysin-1, and tissue inhibitor of matrix metalloproteinases 1 in patients with rheumatoid arthritis. Relationship to serum levels of antigenic keratan sulfate and systemic parameters of inflammation.* Arthritis Rheum, 1995. 38(8): p. 1031-9.
41. Stamenkovic, I., *Extracellular matrix remodelling: the role of matrix metalloproteinases.* J Pathol, 2003. 200(4): p. 448-64.
42. Geisler, S., R. Lichtinghagen, K.H. Boker, et al., *Differential distribution of five members of the matrix metalloproteinase family and one inhibitor (TIMP-1) in human liver and skin.* Cell Tissue Res, 1997. 289(1): p. 173-83.
43. Bode, W., C. Fernandez-Catalan, H. Tschesche, et al., *Structural properties of matrix metalloproteinases.* Cell Mol Life Sci, 1999. 55(4): p. 639-52.
44. Van Wart, H.E. and H. Birkedal-Hansen, *The cysteine switch: a principle of regulation of metalloproteinase activity with potential applicability to the entire matrix metalloproteinase gene family.* Proc Natl Acad Sci U S A, 1990. 87(14): p. 5578-82.
45. Woessner, J.F., *The Family of Matrix Metalloproteinases.* Ann N.Y. Acad. Sci., 1994. 732: p. 11-21.
46. Becker, J.W., A.I. Marcy, L.L. Rokosz, et al., *Stromelysin-1: three-dimensional structure of the inhibited catalytic domain and of the C-truncated proenzyme.* Protein Sci, 1995. 4(10): p. 1966-76.
47. Springman, E.B., E.L. Angleton, H. Birkedal-Hansen, et al., *Multiple modes of activation of latent human fibroblast collagenase: evidence for the role of a Cys73 active-site zinc complex in latency and a "cysteine switch" mechanism for activation.* Proc Natl Acad Sci U S A, 1990. 87(1): p. 364-8.
48. Vallee, B.L. and D.S. Auld, *Active-site zinc ligands and activated H2O of zinc enzymes.* Proc Natl Acad Sci U S A, 1990. 87(1): p. 220-4.
49. Bjorklund, M. and E. Koivunen, *Gelatinase-mediated migration and invasion of cancer cells.* Biochim Biophys Acta., 2005. 1755(1): p. 37-69. Epub 2005 Apr 12.
50. Borkakoti, N., *Structural studies of matrix metalloproteinases.* J Mol Med, 2000. 78(5): p. 261-8.
51. Stöcker, W. and U.B. F. Grams, P. Reinemer, F.X. Gomis-Rüth, D.B. McKay u. W. Bode, *The metzincins-Topological and sequential relations between the astacins, adamalysins, serralysins, and matrixins (collagenases) define a superfamily of zinc-peptidases.* Protein Science, 1995. 4: p. 823-840.
52. Overall, C.M., *Matrix metalloproteinase substrate binding domains, modules and exosites. Overview and experimental strategies.* Methods Mol Biol, 2001. 151: p. 79-120.
53. Jenne, D. and K.K. Stanley, *Nucleotide sequence and organization of the human S-protein gene: repeating peptide motifs in the "pexin" family and a model for their evolution.* Biochemistry, 1987. 26(21): p. 6735-42.
54. Massova, I., L.P. Kotra, R. Fridman, et al., *Matrix metalloproteinases: structures, evolution, and diversification.* Faseb J, 1998. 12(12): p. 1075-95.
55. Nagase, H. and J.F. Woessner, *Matrix Metalloproteinases.* J Biol Chem, 1999. 274(31): p. 21491-21494.

56. Gomis-Ruth, F.X., U. Gohlke, M. Betz, et al., *The helping hand of collagenase-3 (MMP-13): 2.7 A crystal structure of its C-terminal haemopexin-like domain.* J Mol Biol, 1996. 264(3): p. 556-66.
57. Woessner, J.F., *The Matrix Metalloproteinase Family*, in *In Matrix Metalloproteinases*, e. W.C. Parks and R. P. Mecham, Editor. 1998: (London: Academic Press). p. 1-14.
58. Knauper, V., S.M. Wilhelm, P.K. Seperack, et al., *Direct activation of human neutrophil procollagenase by recombinant stromelysin.* Biochem J, 1993. 295(Pt 2): p. 581-6.
59. De Souza, S.J., H.M. Pereira, S. Jacchieri, et al., *Collagen/collagenase interaction: does the enzyme mimic the conformation of its own substrate?* Faseb J, 1996. 10(8): p. 927-30.
60. Corcoran, M.L., R.E. Hewitt, D.E. Kleiner, Jr., et al., *MMP-2: expression, activation and inhibition.* Enzyme Protein, 1996. 49(1-3): p. 7-19.
61. Lehti, K., H. Valtanen, S. Wickstrom, et al., *Regulation of membrane-type-1 matrix metalloproteinase activity by its cytoplasmic domain.* J Biol Chem, 2000. 275(20): p. 15006-13.
62. Hirose, T., C. Patterson, T. Pourmotabbed, et al., *Structure-function relationship of human neutrophil collagenase: identification of regions responsible for substrate specificity and general proteinase activity.* Proc Natl Acad Sci U S A, 1993. 90(7): p. 2569-73.
63. Okazaki, I., T. Watanabe, S. Hozawa, et al., *Molecular mechanism of the reversibility of hepatic fibrosis: with special reference to the role of matrix metalloproteinases.* J Gastroenterol Hepatol, 2000. 15(Suppl): p. D26-32.
64. Lauer-Fields, J.L., H. Nagase, and G.B. Fields, *Use of Edman degradation sequence analysis and matrix-assisted laser desorption/ionization mass spectrometry in designing substrates for matrix metalloproteinases.* J Chromatogr A, 2000. 890(1): p. 117-25.
65. Steffensen, B., U.M. Wallon, and C.M. Overall, *Extracellular matrix binding properties of recombinant fibronectin type II-like modules of human 72-kDa gelatinase/type IV collagenase. High affinity binding to native type I collagen but not native type IV collagen.* J Biol Chem, 1995. 270(19): p. 11555-66.
66. Lauer-Fields, J.L., T. Sritharan, M.S. Stack, et al., *Selective hydrolysis of triple-helical substrates by matrix metalloproteinase-2 and -9.* J Biol Chem, 2003. 278(20): p. 18140-5.
67. Nagase, H., Y. Ogata, K. Suzuki, et al., *Substrate specificities and activation mechanisms of matrix metalloproteinases.* Biochem Soc Trans, 1991. 19(3): p. 715-8.
68. Murphy, G., M.I. Cockett, R.V. Ward, et al., *Matrix metalloproteinase degradation of elastin, type IV collagen and proteoglycan. A quantitative comparison of the activities of 95 kDa and 72 kDa gelatinases, stromelysins-1 and -2 and punctuated metalloproteinase (PUMP).* Biochem J, 1991. 277(Pt 1): p. 277-9.
69. Lichtinghagen, R., O. Huegel, T. Seifert, et al., *Expression of matrix metalloproteinase-2 and -9 and their inhibitors in peripheral blood cells of patients with chronic hepatitis C.* Clin Chem, 2000. 46(2): p. 183-92.
70. Lichtinghagen, R., K. Breitenstein, B. Arndt, et al., *Comparison of matrix metalloproteinase expression in normal and cirrhotic human liver.* Virchows Arch, 1998. 432(2): p. 153-8.
71. Arthur, M.J., *Fibrosis and altered matrix degradation.* Digestion, 1998. 59(4): p. 376-80.

72. Watanabe, T., M. Niioka, A. Ishikawa, et al., *Dynamic change of cells expressing MMP-2 mRNA and MT1-MMP mRNA in the recovery from liver fibrosis in the rat.* J Hepatol, 2001. 35(4): p. 465-73.
73. Benyon, R.C., J.P. Iredale, S. Goddard, et al., *Expression of tissue inhibitor of metalloproteinases 1 and 2 is increased in fibrotic human liver.* Gastroenterology, 1996. 110(3): p. 821-31.
74. Tam, E.M., Y.I. Wu, G.S. Butler, et al., *Collagen binding properties of the membrane type-1 matrix metalloproteinase (MT1-MMP) hemopexin C domain. The ectodomain of the 44-kDa autocatalytic product of MT1-MMP inhibits cell invasion by disrupting native type I collagen cleavage.* J Biol Chem, 2002. 277(41): p. 39005-14.
75. Patterson, M.L., S.J. Atkinson, V. Knauper, et al., *Specific collagenolysis by gelatinase A, MMP-2, is determined by the hemopexin domain and not the fibronectin-like domain.* FEBS Lett, 2001. 503(2-3): p. 158-62.
76. Aimes, R.T. and J.P. Quigley, *Matrix metalloproteinase-2 is an interstitial collagenase. Inhibitor-free enzyme catalyzes the cleavage of collagen fibrils and soluble native type I collagen generating the specific 3/4- and 1/4-length fragments.* J Biol Chem, 1995. 270(11): p. 5872-6.
77. Lauer-Fields, J.L., K.A. Tuzinski, K. Shimokawa, et al., *Hydrolysis of triple-helical collagen peptide models by matrix metalloproteinases.* J Biol Chem, 2000. 275(18): p. 13282-90.
78. Ottl, J., D. Gabriel, G. Murphy, et al., *Recognition and catabolism of synthetic heterotrimeric collagen peptides by matrix metalloproteinases.* Chem Biol, 2000. 7(2): p. 119-32.
79. Gehrmann, M.L., J.T. Douglas, L. Banyai, et al., *Modular autonomy, ligand specificity, and functional cooperativity of the three in-tandem fibronectin type II repeats from human matrix metalloproteinase 2.* J Biol Chem, 2004. 279(45): p. 46921-9. Epub 2004 Aug 17.
80. Banyai, L., H. Tordai, and L. Patthy, *The gelatin-binding site of human 72 kDa type IV collagenase (gelatinase A).* Biochem J, 1994. 298(Pt 2): p. 403-7.
81. Morgunova, E., A. Tuuttila, U. Bergmann, et al., *Structure of human pro-matrix metalloproteinase-2: activation mechanism revealed.* Science, 1999. 284(5420): p. 1667-70.
82. Collier, I.E., S. Saffarian, B.L. Marmer, et al., *Substrate recognition by gelatinase A: the C-terminal domain facilitates surface diffusion.* Biophys J, 2001. 81(4): p. 2370-7.
83. Tordai, H. and L. Patthy, *The gelatin-binding site of the second type-II domain of gelatinase A/MMP-2.* Eur J Biochem, 1999. 259(1-2): p. 513-8.
84. Briknarova, K., M. Gehrmann, L. Banyai, et al., *Gelatin-binding region of human matrix metalloproteinase-2: solution structure, dynamics, and function of the COL-23 two-domain construct.* J Biol Chem, 2001. 276(29): p. 27613-21.
85. Briknarova, K., A. Grishaev, L. Banyai, et al., *The second type II module from human matrix metalloproteinase 2: structure, function and dynamics.* Structure Fold Des, 1999. 7(10): p. 1235-45.
86. Gehrmann, M., K. Briknarova, L. Banyai, et al., *The col-1 module of human matrix metalloproteinase-2 (MMP-2): structural/functional relatedness between gelatin-binding fibronectin type II modules and lysine-binding kringle domains.* Biol Chem, 2002. 383(1): p. 137-48.

87. Roeb, E., K. Schleinkofer, T. Kernebeck, et al., *The matrix metalloproteinase 9 (mmp-9) hemopexin domain is a novel gelatin binding domain and acts as an antagonist.* J Biol Chem., 2002. 277(52): p. 50326-32.
88. Tam, E.M., T.R. Moore, G.S. Butler, et al., *Characterization of the distinct collagen binding and cleavage mechanisms of matrix metalloproteinase 2 and 14 (gelatinase A and MT1-MMP): The differential roles of the MMP hemopexin C domains and the MMP-2 fibronectin type II modules in collagen triple helicase activities.* J Biol Chem, 2004.
89. Woessner, J.F., Jr. and Z. Gunja-Smith, *Role of metalloproteinases in human osteoarthritis.* J Rheumatol Suppl, 1991. 27: p. 99-101.
90. Nagase, H., Suzuki, K., Itoh, Y., Kan, C. C., Gehring, M. R., Huang, W., and Brew, K., *Involvement of tissue inhibitors of metalloproteinases (TIMPS) during matrix metalloproteinase activation.* Adv Exp Med Biol, 1996. 389: p. 23-31.
91. Matrisian, L.M., *Metalloproteinases and their inhibitors in matrix remodeling.* TIG, 1990. 6(4): p. 121-125.
92. Birkedal-Hansen, H., *Role of matrix metalloproteinases in human periodontal diseases.* J Periodontol, 1993. 64(5 Suppl): p. 474-84.
93. Vincenti, M.P., I.M. Clark, and C.E. Brinckerhoff, *Using inhibitors of metalloproteinases to treat arthritis. Easier said than done?* Arthritis Rheum, 1994. 37(8): p. 1115-26.
94. Goetzl, E.J., M.J. Banda, and D. Leppert, *Matrix metalloproteinases in immunity.* J Immunol, 1996. 156(1): p. 1-4.
95. Feldmann, M., F.M. Brennan, and R.N. Maini, *Role of cytokines in rheumatoid arthritis.* Annu Rev Immunol, 1996. 14: p. 397-440.
96. Krane, S.M., *Clinical Importance of Metalloproteinases and Their Inhibitors.* Ann N.Y. Acad. Sci., 1994. 273: p. 1-10.
97. Huhtala, P., A. Tuuttila, L.T. Chow, et al., *Complete structure of the human gene for 92-kDa type IV collagenase. Divergent regulation of expression for the 92- and 72-kilodalton enzyme genes in HT-1080 cells.* J Biol Chem., 1991. 266(25): p. 16485-90.
98. Birkedal-Hansen, H., W.G. Moore, M.K. Bodden, et al., *Matrix metalloproteinases: a review.* Crit Rev Oral Biol Med, 1993. 4(2): p. 197-250.
99. Mazzocca, A., S. Cappadona Sciammetta, V. Carloni, et al., *Binding of hepatitis C virus envelope protein E2 to CD81 up-regulates MMP-2 in human hepatic stellate cells.* J Biol Chem, 2004. 16: p. 16.
100. Hipps, D.S., R.M. Hembry, A.J. Docherty, et al., *Purification and characterization of human 72-kDa gelatinase (type IV collagenase). Use of immunolocalisation to demonstrate the non- coordinate regulation of the 72-kDa and 95-kDa gelatinases by human fibroblasts.* Biol Chem Hoppe Seyler, 1991. 372(4): p. 287-96.
101. Carmeliet, P., L. Moons, R. Lijnen, et al., *Inhibitory role of plasminogen activator inhibitor-1 in arterial wound healing and neointima formation: a gene targeting and gene transfer study in mice.* Circulation, 1997. 96(9): p. 3180-91.
102. Lijnen, H.R., *Matrix metalloproteinases and cellular fibrinolytic activity.* Biochemistry (Mosc), 2002. 67(1): p. 92-8.
103. Moilanen, M., T. Sorsa, M. Stenman, et al., *Tumor-associated trypsinogen-2 (trypsinogen-2) activates procollagenases (MMP-1, -8, -13) and stromelysin-1 (MMP-3) and degrades type I collagen.* Biochemistry, 2003. 42(18): p. 5414-20.

104. Okada, Y., S. Watanabe, I. Nakanishi, et al., *Inactivation of tissue inhibitor of metalloproteinases by neutrophil elastase and other serine proteinases.* FEBS Lett, 1988. 229(1): p. 157-60.
105. Duncan, M.E., J.P. Richardson, G.I. Murray, et al., *Human matrix metalloproteinase-9: activation by limited trypsin treatment and generation of monoclonal antibodies specific for the activated form.* Eur J Biochem, 1998. 258(1): p. 37-43.
106. Imai, K., Y. Yokohama, I. Nakanishi, et al., *Matrix metalloproteinase 7 (matrilysin) from human rectal carcinoma cells. Activation of the precursor, interaction with other matrix metalloproteinases and enzymic properties.* J Biol Chem, 1995. 270(12): p. 6691-7.
107. Ogata, Y., J.J. Enghild, and H. Nagase, *Matrix metalloproteinase 3 (stromelysin) activates the precursor for the human matrix metalloproteinase 9.* J Biol Chem, 1992. 267(6): p. 3581-4.
108. Fridman, R., M. Toth, D. Pena, et al., *Activation of progelatinase B (MMP-9) by gelatinase A (MMP-2).* Cancer Res, 1995. 55(12): p. 2548-55.
109. Mayer, G., G. Boileau, and M. Bendayan, *Furin interacts with proMT1-MMP and integrin alphaV at specialized domains of renal cell plasma membrane.* J Cell Sci, 2003. 116(Pt 9): p. 1763-73.
110. Pei, D. and S.J. Weiss, *Furin-dependent intracellular activation of the human stromelysin-3 zymogen.* Nature, 1995. 375(6528): p. 244-7.
111. Sato, H., T. Takino, T. Kinoshita, et al., *Cell surface binding and activation of gelatinase A induced by expression of membrane-type-1-matrix metalloproteinase (MT1-MMP).* FEBS Lett, 1996. 385(3): p. 238-40.
112. Strongin, A.Y., I. Collier, G. Bannikov, et al., *Mechanism of cell surface activation of 72-kDa type IV collagenase. Isolation of the activated form of the membrane metalloprotease.* J Biol Chem, 1995. 270(10): p. 5331-8.
113. Okada, A., C. Tomasetto, Y. Lutz, et al., *Expression of matrix metalloproteinases during rat skin wound healing: evidence that membrane type-1 matrix metalloproteinase is a stromal activator of pro-gelatinase A.* J Cell Biol, 1997. 137(1): p. 67-77.
114. Cao, J., M. Drews, H.M. Lee, et al., *The propeptide domain of membrane type 1 matrix metalloproteinase is required for binding of tissue inhibitor of metalloproteinases and for activation of pro-gelatinase A.* J Biol Chem, 1998. 273(52): p. 34745-52.
115. Bernardo, M.M. and R. Fridman, *TIMP-2 (tissue inhibitor of metalloproteinase-2) regulates MMP-2 (matrix metalloproteinase-2) activity in the extracellular environment after pro-MMP-2 activation by MT1 (membrane type 1)-MMP.* Biochem J, 2003. 374(Pt 3): p. 739-45.
116. Galazka, G., L.J. Windsor, H. Birkedal-Hansen, et al., *APMA (4-aminophenylmercuric acetate) activation of stromelysin-1 involves protein interactions in addition to those with cysteine-75 in the propeptide.* Biochemistry, 1996. 35(34): p. 11221-7.
117. Koklitis, P.A., G. Murphy, C. Sutton, et al., *Purification of recombinant human prostromelysin. Studies on heat activation to give high-Mr and low-Mr active forms, and a comparison of recombinant with natural stromelysin activities.* Biochem J, 1991. 276(Pt 1): p. 217-21.
118. Tjaderhane, L., H. Larjava, T. Sorsa, et al., *The activation and function of host matrix metalloproteinases in dentin matrix breakdown in caries lesions.* J Dent Res, 1998. 77(8): p. 1622-9.

119. Gomez, D.E., D.F. Alonso, H. Yoshiji, et al., *Tissue inhibitors of metalloproteinases: structure, regulation and biological functions.* Eur J Cell Biol, 1997. 74(2): p. 111-22.
120. Tuuttila, A., E. Morgunova, U. Bergmann, et al., *Three-dimensional structure of human tissue inhibitor of metalloproteinases-2 at 2.1 A resolution.* J Mol Biol, 1998. 284(4): p. 1133-40.
121. Uria, J.A., A.A. Ferrando, G. Velasco, et al., *Structure and expression in breast tumors of human TIMP-3, a new member of the metalloproteinase inhibitor family.* Cancer Res, 1994. 54(8): p. 2091-4.
122. Lichtinghagen, R., D. Michels, C.I. Haberkorn, et al., *Matrix metalloproteinase (MMP)-2, MMP-7, and tissue inhibitor of metalloproteinase-1 are closely related to the fibroproliferative process in the liver during chronic hepatitis C.* J Hepatol, 2001. 34(2): p. 239-47.
123. Greene, J., M. Wang, Y.E. Liu, et al., *Molecular cloning and characterization of human tissue inhibitor of metalloproteinase 4.* J Biol Chem, 1996. 271(48): p. 30375-80.
124. Opdenakker, G., P.E. Van den Steen, B. Dubois, et al., *Gelatinase B functions as regulator and effector in leukocyte biology.* J Leukoc Biol, 2001. 69(6): p. 851-9.
125. Arthur, M.J., A. Stanley, J.P. Iredale, et al., *Secretion of 72 kDa type IV collagenase/gelatinase by cultured human lipocytes. Analysis of gene expression, protein synthesis and proteinase activity.* Biochem J, 1992. 287 (Pt 3): p. 701-7.
126. Iredale, J.P., R.C. Benyon, M.J. Arthur, et al., *Tissue inhibitor of metalloproteinase-1 messenger RNA expression is enhanced relative to interstitial collagenase messenger RNA in experimental liver injury and fibrosis.* Hepatology, 1996. 24(1): p. 176-84.
127. Vyas, S.K., H. Leyland, J. Gentry, et al., *Rat hepatic lipocytes synthesize and secrete transin (stromelysin) in early primary culture.* Gastroenterology, 1995. 109(3): p. 889-98.
128. Theret, N., O. Musso, A. L'Helgoualc'h, et al., *Differential expression and origin of membrane-type 1 and 2 matrix metalloproteinases (MT-MMPs) in association with MMP2 activation in injured human livers.* Am J Pathol, 1998. 153(3): p. 945-54.
129. Benyon, R.C., C.J. Hovell, M. Da Gaca, et al., *Progelatinase A is produced and activated by rat hepatic stellate cells and promotes their proliferation.* Hepatology, 1999. 30(4): p. 977-86.
130. Iredale, J.P., *Tissue inhibitors of metalloproteinases in liver fibrosis.* Int J Biochem Cell Biol, 1997. 29(1): p. 43-54.
131. Bergers, G. and L.M. Coussens, *Extrinsic regulators of epithelial tumor progression: metalloproteinases.* Curr Opin Genet Dev, 2000. 10(1): p. 120-7.
132. Bergers, G., R. Brekken, G. McMahon, et al., *Matrix metalloproteinase-9 triggers the angiogenic switch during carcinogenesis.* Nat Cell Biol, 2000. 2(10): p. 737-44.
133. Nelson, A.R., B. Fingleton, M.L. Rothenberg, et al., *Matrix metalloproteinases: biologic activity and clinical implications.* J Clin Oncol, 2000. 18(5): p. 1135-49.
134. Pazzaglia, L., F. Ponticelli, G. Magagnoli, et al., *Activation of metalloproteinases-2 and -9 by interleukin-1alpha in S100A4-positive liposarcoma cell line: correlation with cell invasiveness.* Anticancer Res., 2004. 24(2B): p. 967-72.

135. Kondraganti, S., S. Mohanam, S.K. Chintala, et al., *Selective suppression of matrix metalloproteinase-9 in human glioblastoma cells by antisense gene transfer impairs glioblastoma cell invasion.* Cancer Res, 2000. 60(24): p. 6851-5.
136. Heikkila, P., O. Teronen, M. Moilanen, et al., *Bisphosphonates inhibit stromelysin-1 (MMP-3), matrix metalloelastase (MMP-12), collagenase-3 (MMP-13) and enamelysin (MMP-20), but not urokinase-type plasminogen activator, and diminish invasion and migration of human malignant and endothelial cell lines.* Anticancer Drugs, 2002. 13(3): p. 245-54.
137. Deryugina, E.I., G.X. Luo, R.A. Reisfeld, et al., *Tumor cell invasion through matrigel is regulated by activated matrix metalloproteinase-2.* Anticancer Res, 1997. 17(5A): p. 3201-10.
138. Maquoi, E., A. Noel, F. Frankenne, et al., *Inhibition of matrix metalloproteinase 2 maturation and HT1080 invasiveness by a synthetic furin inhibitor.* FEBS Lett, 1998. 424(3): p. 262-6.
139. Maquoi, E., F. Frankenne, A. Noel, et al., *Type IV collagen induces matrix metalloproteinase 2 activation in HT1080 fibrosarcoma cells.* Exp Cell Res, 2000. 261(2): p. 348-59.
140. Horn, F., *Biochemie des Menschen : das Lehrbuch für das Medizinstudium / Florian Horn ...* 2002, Stuttgart ; New York: Thieme. XX, 596 S.
141. Rohen, J.W.L.-D., E., *Funktionelle Histologie - Kurzgefasstes Lehrbuch der Zytologie, Histologie.....* Vol. 2. 1990, Stuttgart-New York: Schattauer.
142. Bataller, R. and D.A. Brenner, *Liver fibrosis.* The Journal of Clinical Investigation, 2005. 115(2): p. 209-218.
143. Bataller, R. and D.A. Brenner, *Hepatic stellate cells as a target for the treatment of liver fibrosis.* Semin Liver Dis, 2001. 21(3): p. 437-51.
144. Friedman, S.L. and D.M. Bissell, *Hepatic fibrosis: new insights into pathogenesis.* Hosp Pract (Off Ed), 1990. 25(5): p. 43-50.
145. Friedman, S.L., *Cytokines and fibrogenesis.* Semin Liver Dis, 1999. 19(2): p. 129-40.
146. Greenwel, P., M. Schwartz, M. Rosas, et al., *Characterization of fat-storing cell lines derived from normal and CCl4-cirrhotic livers. Differences in the production of interleukin-6.* Lab Invest., 1991. 65(6): p. 644-53.
147. Rasheed, S., W.A. Nelson-Rees, E.M. Toth, et al., *Characterization of a newly derived human sarcoma cell line (HT-1080).* Cancer, 1974. 33(4): p. 1027-33.
148. Atkinson, J.C., M. Ruhl, J. Becker, et al., *Collagen VI regulates normal and transformed mesenchymal cell proliferation in vitro.* Exp Cell Res, 1996. 228(2): p. 283-91.
149. Schuppan, D., T. Ruhlmann, and E.G. Hahn, *Radioimmunoassay for human type VI collagen and its application to tissue and body fluids.* Anal Biochem, 1985. 149(1): p. 238-47.
150. Somasundaram, R. and D. Schuppan, *Type I, II, III, IV, V, and VI collagens serve as extracellular ligands for the isoforms of platelet-derived growth factor (AA, BB, and AB).* J Biol Chem, 1996. 271(43): p. 26884-91.
151. Jonsson, U., L. Fagerstam, B. Ivarsson, et al., *Real-time biospecific interaction analysis using surface plasmon resonance and a sensor chip technology.* Biotechniques, 1991. 11(5): p. 620-7.
152. Kretschmann, E., *The determination of the optical constants of metals by excitation of surface plasmons.* Z Physics, 1971. 241: p. 313-24.

153. Johnsson, B., S. Lofas, and G. Lindquist, *Immobilization of proteins to a carboxymethyldextran-modified gold surface for biospecific interaction analysis in surface plasmon resonance sensors.* Anal Biochem, 1991. 198(2): p. 268-77.
154. Davis, T.M. and W.D. Wilson, *Determination of the refractive index increments of small molecules for correction of surface plasmon resonance data.* Anal Biochem, 2000. 284(2): p. 348-53.
155. Biacore, *BIAtechnology Handbook*. 1998: Biacore AB Sweden.
156. Alfthan, K., *Surface plasmon resonance biosensors as a tool in antibody engineering.* Biosens Bioelectron, 1998. 13(6): p. 653-63.
157. Myszka, D.G., X. He, M. Dembo, et al., *Extending the range of rate constants available from BIACORE: interpreting mass transport-influenced binding data.* Biophys J, 1998. 75(2): p. 583-94.
158. Khalifa, M.B., L. Choulier, H. Lortat-Jacob, et al., *BIACORE data processing: an evaluation of the global fitting procedure.* Anal Biochem, 2001. 293(2): p. 194-203.
159. Morton, T.A. and D.G. Myszka, *Kinetic analysis of macromolecular interactions using surface plasmon resonance biosensors.* Methods Enzymol, 1998. 295: p. 268-94.
160. Myszka, D.G., *Kinetic, equilibrium, and thermodynamic analysis of macromolecular interactions with BIACORE.* Methods Enzymol, 2000. 323: p. 325-40.
161. *[Matrix metalloproteinases. Point of attack for a new cancer therapy].* Med Monatsschr Pharm, 2001. 24(1): p. 2-5.
162. Lein, M., K. Jung, B. Ortel, et al., *The new synthetic matrix metalloproteinase inhibitor (Roche 28-2653) reduces tumor growth and prolongs survival in a prostate cancer standard rat model.* Oncogene, 2002. 21(13): p. 2089-96.
163. Knight, C.G., F. Willenbrock, and G. Murphy, *A novel coumarin-labelled peptide for sensitive continuous assays of the matrix metalloproteinases.* FEBS Lett, 1992. 296(3): p. 263-6.
164. Netzel-Arnett, S., S.K. Mallya, H. Nagase, et al., *Continuously recording fluorescent assays optimized for five human matrix metalloproteinases.* Anal Biochem, 1991. 195(1): p. 86-92.
165. Jones, L.J. and V.L. Singer, *Fluorescence microplate-based assay for tumor necrosis factor activity using SYTOX Green stain.* Anal Biochem., 2001. 293(1): p. 8-15.
166. Galardy, R.E., M.E. Cassabonne, C. Giese, et al., *Low molecular weight inhibitors in corneal ulceration.* Ann N Y Acad Sci., 1994. 732: p. 315-23.
167. Moser, T.L., J.J. Enghild, S.V. Pizzo, et al., *The extracellular matrix proteins laminin and fibronectin contain binding domains for human plasminogen and tissue plasminogen activator.* J Biol Chem., 1993. 268(25): p. 18917-23.
168. Lovejoy, B., A. Cleasby, A.M. Hassell, et al., *Structure of the catalytic domain of fibroblast collagenase complexed with an inhibitor.* Science, 1994. 263(5145): p. 375-7.
169. Lovejoy, B., A.R. Welch, S. Carr, et al., *Crystal structures of MMP-1 and -13 reveal the structural basis for selectivity of collagenase inhibitors.* Nat Struct Biol, 1999. 6(3): p. 217-21.
170. Bode, W., P. Reinemer, R. Huber, et al., *The X-ray crystal structure of the catalytic domain of human neutrophil collagenase inhibited by a substrate analogue reveals the essentials for catalysis and specificity.* Embo J, 1994. 13(6): p. 1263-9.

171. Murphy, G., F. Willenbrock, R.V. Ward, et al., *The C-terminal domain of 72 kDa gelatinase A is not required for catalysis, but is essential for membrane activation and modulates interactions with tissue inhibitors of metalloproteinases.* Biochem J, 1992. 283 (Pt 3): p. 637-41.
172. Overall, C.M., E. Tam, G.A. McQuibban, et al., *Domain interactions in the gelatinase A.TIMP-2.MT1-MMP activation complex. The ectodomain of the 44-kDa form of membrane type-1 matrix metalloproteinase does not modulate gelatinase A activation.* J Biol Chem, 2000. 275(50): p. 39497-506.
173. Ellerbroek, S.M., Y.I. Wu, and M.S. Stack, *Type I collagen stabilization of matrix metalloproteinase-2.* Arch Biochem Biophys, 2001. 390(1): p. 51-6.
174. Elkins, P.A., Y.S. Ho, W.W. Smith, et al., *Structure of the C-terminally truncated human ProMMP9, a gelatin-binding matrix metalloproteinase.* Acta Crystallogr D Biol Crystallogr, 2002. 58(Pt 7): p. 1182-92.
175. Bannikov, G.A., T.V. Karelina, I.E. Collier, et al., *Substrate binding of gelatinase B induces its enzymatic activity in the presence of intact propeptide.* J Biol Chem, 2002. 277(18): p. 16022-7.
176. Olaso, E., J.P. Labrador, L. Wang, et al., *Discoidin domain receptor 2 regulates fibroblast proliferation and migration through the extracellular matrix in association with transcriptional activation of matrix metalloproteinase-2.* J Biol Chem, 2002. 277(5): p. 3606-13.
177. Olaso, E., K. Ikeda, F.J. Eng, et al., *DDR2 receptor promotes MMP-2-mediated proliferation and invasion by hepatic stellate cells.* J Clin Invest, 2001. 108(9): p. 1369-78.
178. Zeng, H., M. Briske-Anderson, J.P. Idso, et al., *The selenium metabolite methylselenol inhibits the migration and invasion potential of HT1080 tumor cells.* J Nutr., 2006. 136(6): p. 1528-32.
179. Beljaars, L., G. Molema, D. Schuppan, et al., *Successful targeting to rat hepatic stellate cells using albumin modified with cyclic peptides that recognize the collagen type VI receptor.* J Biol Chem, 2000. 275(17): p. 12743-51.
180. Beljaars, L., G. Molema, B. Weert, et al., *Albumin modified with mannose 6-phosphate: A potential carrier for selective delivery of antifibrotic drugs to rat and human hepatic stellate cells.* Hepatology, 1999. 29(5): p. 1486-93.
181. Zhang, X., N.C. Gonnella, J. Koehn, et al., *Solution structure of the catalytic domain of human collagenase-3 (MMP-13) complexed to a potent non-peptidic sulfonamide inhibitor: binding comparison with stromelysin-1 and collagenase-1.* J Mol Biol, 2000. 301(2): p. 513-24.
182. Moy, F.J., P.K. Chanda, J.M. Chen, et al., *High-resolution solution structure of the catalytic fragment of human collagenase-3 (MMP-13) complexed with a hydroxamic acid inhibitor.* J Mol Biol, 2000. 302(3): p. 671-89.
183. Moy, F.J., P.K. Chanda, J.M. Chen, et al., *NMR solution structure of the catalytic fragment of human fibroblast collagenase complexed with a sulfonamide derivative of a hydroxamic acid compound.* Biochemistry, 1999. 38(22): p. 7085-96.
184. Gonnella, N.C., Y.C. Li, X. Zhang, et al., *Bioactive conformation of a potent stromelysin inhibitor determined by X-nucleus filtered and multidimensional NMR spectroscopy.* Bioorg Med Chem., 1997. 5(12): p. 2193-201.
185. Iimuro, Y., T. Nishio, T. Morimoto, et al., *Delivery of matrix metalloproteinase-1 attenuates established liver fibrosis in the rat.* Gastroenterology, 2003. 124(2): p. 445-58.

186. Siller-Lopez, F., A. Sandoval, S. Salgado, et al., *Treatment with human metalloproteinase-8 gene delivery ameliorates experimental rat liver cirrhosis.* Gastroenterology., 2004. 126(4): p. 1122-33; discussion 949.
187. Van Lint, P., B. Wielockx, L. Puimege, et al., *Resistance of collagenase-2 (matrix metalloproteinase-8)-deficient mice to TNF-induced lethal hepatitis.* J Immunol., 2005. 175(11): p. 7642-9.
188. Arthur, M.J., *Fibrogenesis II. Metalloproteinases and their inhibitors in liver fibrosis.* Am J Physiol Gastrointest Liver Physiol, 2000. 279(2): p. G245-9.
189. Murphy, F., J. Waung, J. Collins, et al., *N-Cadherin cleavage during activated hepatic stellate cell apoptosis is inhibited by tissue inhibitor of metalloproteinase-1.* Comp Hepatol, 2004. 3 Suppl 1: p. S8.
190. Zhou, X., F.R. Murphy, N. Gehdu, et al., *Engagement of alphavbeta3 integrin regulates proliferation and apoptosis of hepatic stellate cells.* J Biol Chem, 2004. 279(23): p. 23996-4006.
191. Freije, J.M., I. Diez-Itza, M. Balbin, et al., *Molecular cloning and expression of collagenase-3, a novel human matrix metalloproteinase produced by breast carcinomas.* J Biol Chem, 1994. 269(24): p. 16766-73.
192. Ala-Aho, R., N. Johansson, A.H. Baker, et al., *Expression of collagenase-3 (MMP-13) enhances invasion of human fibrosarcoma HT-1080 cells.* Int J Cancer, 2002. 97(3): p. 283-9.
193. Pendas, A.M., J.A. Uria, M.G. Jimenez, et al., *An overview of collagenase-3 expression in malignant tumors and analysis of its potential value as a target in antitumor therapies.* Clin Chim Acta, 2000. 291(2): p. 137-55.
194. Comoglio, P.M. and L. Trusolino, *Cancer: the matrix is now in control.* Nat Med, 2005. 11(11): p. 1156-9.
195. Radisky, D.C., *Epithelial-mesenchymal transition.* J Cell Sci, 2005. 118(Pt 19): p. 4325-6.
196. Giannelli, G., C. Bergamini, E. Fransvea, et al., *Laminin-5 with transforming growth factor-beta1 induces epithelial to mesenchymal transition in hepatocellular carcinoma.* Gastroenterology, 2005. 129(5): p. 1375-83.
197. Sternlicht, M.D., A. Lochter, C.J. Sympson, et al., *The stromal proteinase MMP3/stromelysin-1 promotes mammary carcinogenesis.* Cell, 1999. 98(2): p. 137-46.
198. Remy, L. and C. Trespeuch, *[Matrilysin-1 and cancer pathology].* Med Sci (Paris). 2005. 21(5): p. 498-502.
199. Ii, M., H. Yamamoto, Y. Adachi, et al., *Role of matrix metalloproteinase-7 (matrilysin) in human cancer invasion, apoptosis, growth, and angiogenesis.* Exp Biol Med (Maywood). 2006. 231(1): p. 20-7.
200. Gao, Z.H., M.S. Tretiakova, W.H. Liu, et al., *Association of E-cadherin, matrix metalloproteinases, and tissue inhibitors of metalloproteinases with the progression and metastasis of hepatocellular carcinoma.* Mod Pathol., 2006. 19(4): p. 533-40.
201. Atkinson, J.C., M. Rühl, J. Becker, et al., *Collagen VI regulates normal and transformed mesenchymal cell proliferation in vitro.* Exp Cell Res, 1996. 228(2): p. 283-91.