

REFERENCES

- Ahmad, A. & Ahmad, R. (2012). Understanding the Mechanism of Hepatic Fibrosis and Potential Therapeutic Approaches. *Saudi J Gast.* 18(3), 155–167.
- Bataller, R. & Brenner, DA. (2005). Liver Fibrosis. *J Clin Invest* 115(2), 209-218.
- Belay, A. & Gholap, A.V. (2009). Characterization and Determination of Chlorogenic Acids (CGA) in Coffee Beans by UV-Vis Spectroscopy. *A J P A C.* 3(11), 234–240.
- Bruun, J. M., Lihn, AS., Pedersen, SB., Richelsen, B. (2005). Monocyte Chemoattractant Protein-1 Release Is Higher in Visceral than Subcutaneous Human Adipose Tissue (AT): Implication of Macrophages Resident in the AT. *J Endocrin Metab.* 90(4), 2282–2289.
- Choudhury, R., Srai, S K., Debnam, E., Rice-Evans. (1999). Urinary Excretion of Hydroxycinnamates and Flavonoids after Oral and Intravenous Administration. *Free Radic Biol Med.* 27(3–4), 278–286.
- Clément, S., Juge-Aubry, C., Sgroi, A., Conzelmann, S., Paziienza, V., Cuenod, BP., Meier. C.A., Negro, F. (2008). Monocyte Chemoattractant Protein-1 Secreted by Adipose Tissue Induces Direct Lipid Accumulation in Hepatocytes. *Hepatology.* 48(3), 799–807.
- Cohen-Naftaly, M., & Friedman, S. L. (2011). Current Status of Novel Antifibrotic Therapies in Patients with Chronic Liver Disease. *Therap Adv Gastr.* 4(6), 391–417.
- Cojocar, E., Trandafirescu, M., Leon, M., Cotutiu, C., Foia, L. (2012). Immunohistochemical Expression of Anti-CD68 Antibody in Atherosclerotic Plaque. *Rom J Morpho embryo.* 53(1), 61–66.
- Deshmane, S.L, Kremlev, S., Amini, S., Sawaya, BE. (2009). Monocyte Chemoattractant Protein-1 (MCP-1). *J Interf Cyto Res.* 29(6), 313–326.
- Duffield, J.S., Forbes, S.J., Constandinou, C.M., Clay, S., Partolina, M., Vuthoori, S., Wu, S., Lang, R., Iredale, J.P. (2005). Selective Depletion of Macrophages Reveals Distinct, Opposing Roles during Liver Injury and Repair. *J Clin Invest.* 115(1), 56–65.
- Dultz, G., Gerber, L., Franik, H., Berger, A., A., Vermehren, J., Pleli, T., Zeuzem. S., Piiper, A., Kronenberger, B., Waidmann, O. (2015). Soluble CD163 Is an Indicator of Liver Inflammation and Fibrosis in Patients Chronically Infected with the Hepatitis B Virus. *J Viral Hepat.* 22(4), 427–432.
- Duval, F., Moreno-Cuevas, J. E., González-Garza, M. T., Maldonado-Bernal, C., & Cruz-Vega, D. E. (2015). Liver fibrosis and mechanisms of the protective action of medicinal plants targeting inflammation and the immune response. *Int J Inflam.* 943497. <https://doi.org/10.1155/2015/943497>
- Ehling, J., Bartneck, M., Wei, X., Gremse, F., Fech, V., Mockel, D., Baeck, C., Hittatiya, K., Eulberg, D., Luedde, T., Kiessling, F., Trautwein, C., Lammers, T., Tacke, F. (2014). CCL2-Dependent Infiltrating Macrophages Promote Angiogenesis in Progressive Liver Fibrosis. *PMC* 63(12), 1960–1971.
- Elenkov, I.J., Iezzoni, D.G., Daly, A., Harris, A.G., Chrousos, G.P. (2005). Cytokine Dysregulation, Inflammation and Well-Being.

- Neuroimmunomodulation*. 12(5), 255–269.
- Environmental Protection Agency.(2008). Toxicological Profile for Carbon Tetrachloride. (*EPA*), 361.
- Fallowfield, J.A., Kendall, T.J., & Iredale, J.P.(2006). Reversal of Fibrosis: No Longer a Pipe Dream? *Clin Liver Dis*. 10(3), 481–497
- Fan, X., Zhang, Q., Li, S., Lv, Y., Su, H., Jiang, H., Hao, Z.(2013). Attenuation of CCl4 Induced Hepatic Fibrosis in Mice by Vaccinating against TGF- β 1. *PLoS One*.11; 8(12), e82190.
- Ghiassi-Nejad, Z., & Friedman, S.L.(2008). Advances in Antifibrotic Therapy. *Expert Rev Gastroenterol Hepatol*. 2(6), 803–816.
- Gonthier, M.P., Verny, M.A., Besson, C., Remesy, C., Scalbert, A.(2003). Chlorogenic Acid Bioavailability Largely Depends on Its Metabolism by the Gut Microflora in Rats. *J Nutr*. 133(6), 1853–1859.
- Halliwell, B., & Gutteridge, J.M.C.(1989). Free Radicals in Biology and Medicine. 4th edition. Clarendon Press.Oxford.
- Heymann, F., Trautwein, C. & Tacke, F.(2009). Monocytes and Macrophages as Cellular Targets in Liver Fibrosis. *Inflamm & allergy drug targets* 8(4), 307–318.
- Jena, N.R.(2012). DNA Damage by Reactive Species: Mechanisms, Mutation and Repair. *J Biosci* 37(3), 503–517.
- Karlmark, K.R., Weiskirchen, R., Zimmermann, H.W., Gassler, N., Ginhoux, F., Weber, C., Merad, M., Luedde, T., Trautwein, C., Tacke, F.(2009). Hepatic Recruitment of the Inflammatory Gr1 + Monocyte Subset upon Liver Injury Promotes Hepatic Fibrosis. *Hepatology*, 50(1), 261–274.
- kazankov, K., Barrera, F., Moller, H.J., Bibby, B.M., Vilstrup, H., George, J., Grønbaek, H.(2014). Soluble CD163, a Macrophage Activation Marker, Is Independently Associated with Fibrosis in Patients with Chronic Viral Hepatitis B and C. *Hepatology*, 60(2), 521–530.
- Korriem, K. M. M., & Soliman, R. E.(2014). Chlorogenic and Caftaric Acids in Liver Toxicity and Oxidative Stress Induced by Methamphetamine. *J Toxicol*. 583494.
- Lafay S., Gil-Izquierdo, A., Manach, C., Morand, C., Besson, C., Scalbert, A.(2006). Chlorogenic Acid Is Absorbed in Its Intact Form in the Stomach of Rats. *J Nutri*, 136(5), 1192–1197.
- Li, H., You, H., Fan, X., & Jia, J. (2016). Hepatic macrophages in liver fibrosis: pathogenesis and potential therapeutic targets. . *BMJ Open Gastro*, 3. <https://doi.org/10.1136/bmjgast-2016-000079>
- Mandrekar, P., Ambade, A., Lim, A., Szabo, G., & Catalano, D. (2011). An essential role for monocyte chemoattractant protein-1 in alcoholic liver injury: Regulation of proinflammatory cytokines and hepatic steatosis in mice. *Hepatology*, 54(6), 2185–2197. <https://doi.org/10.1002/hep.24599>
- Matei, M.F., Jaiswal, R. &Kuhnert, N.(2012). Investigating the Chemical Changes of Chlorogenic Acids during Coffee Brewing: Conjugate Addition of Water to the Olefinic Moiety of Chlorogenic Acids and Their Quinides. *J Agric Food Chem* 60(49),12105–12115.
- Medzhitov, R.(2008). Origin and Physiological Roles of Inflammation. *Nature*

454(7203), 428–435.

- Miura, K., Yang, L., Van, R.N., Ohnishi, H., Seki, E.(2012). Hepatic Recruitment of Macrophages Promotes Nonalcoholic Steatohepatitis through CCR2. *Am J Physiol Gastrointest Liver Physiol* 302(11), 1310-1321.
- Murray, P. J. & Wynn, T.A.(2011). Protective and Pathogenic Functions of Macrophage Subsets. *Nat Rev Immunol* 11(11), 723–737.
- Neubauer, K., Eichorst, S. Wilfling, T., Buchenau, M., Xia, L., Ramadori, G.(1998). Sinusoidal Intercellular Adhesion Molecule-1 up-Regulation Precedes the Accumulation of Leukocyte Function Antigen-1-Positive Cells and Tissue Necrosis in a Model of Carbontetrachloride-Induced Acute Rat Liver Injury. *Lab Invest; J Tech Meth and Pathol* 78(2), 185–194.
- Neurath, M. F.(2014). Cytokines in Inflammatory Bowel Disease. *Nat Rev Immunol*.14(5), 329–342.
- Park, H.J., Davis, S.R., Liang, H.Y., Rosenberg, D.W., Bruno, R.S.(2010). Chlorogenic Acid Differentially Alters Hepatic and Small Intestinal Thiol Redox Status Without Protecting Against Azoxymethane-Induced Colon Carcinogenesis in Mice. *Nutr Cancer*. 62(3), 362–370.
- Pradere, J.P., Kluwe, J., De Minicis, S., Jiao, J.J., Gwak, G.Y., Dapito, D.H., Jang, M.K., Guenther, N.D., Mederacke, I., Friedman, R., Dragomir, A.C., Aloman, C., Schwabe, R.F.(2013). Hepatic Macrophages but Not Dendritic Cells Contribute to Liver Fibrosis by Promoting the Survival of Activated Hepatic Stellate Cells in Mice. *Hepatology*(Baltimore,Md). 58(4), 1461–1473.
- Quinlan, G.J., Martin, G.S., & Evan, T.W.(2005). Albumin: Biochemical Properties and therapeutic potential. *Hepatology*, 41(6), 1211–1219.
- Ramachandran, P., Pellicoro, A., Vernon, M.A., Boulter, L., Aucott, R.L, Ali. A., Hartland, S.N, Snowdon, V.K., Cappon, A., Gordon-Walker, T.T., Williams, M.J, Dunbar, D.R.(2012). Differential Ly-6C Expression Identifies the Recruited Macrophage Phenotype, Which Orchestrates the Regression of Murine Liver Fibrosis. *Proc Natl Acad Sci U S A*, 109(46), 3186-3195.
- Ramachandran, P., Iredale, J.P., & Fallowfield, J.A.(2015). Resolution of Liver Fibrosis: Basic Mechanisms and Clinical Relevance. *Semin Liver Dis*, 35(2), 119–131.
- Ramadori, G., Moriconi, F., Malik, I., Dudas, J.(2008). Physiology and Pathophysiology of Liver Inflammation, Damage and Repair. *J Physiol Pharmacol*,59(SUPPL.1), 107–117.
- Ramadori, G, & Saile, B.(2004a). Inflammation, Damage Repair, Immune Cells, and Liver Fibrosis: Specific or Nonspecific, This Is the Question. *Gastroenterol* 127(3), 997–1000.
- Ramadori, G & Saile, B.(2004b). Portal Tract Fibrogenesis in the Liver. *Lab Invest* 84(2), 153–159.
- Rechner, A.R., Kuhnle, G., Bremner, P., Hubbard, G.P., Moore, K.P., Rice-Evans, C.A.(2002). The Metabolic Fate of Dietary Polyphenols in Humans. *Free Radi Bio Med*. 33(2), 220–235.
- Saile, B & Ramadori, G.(2007). Inflammation, Damage Repair and Liver Fibrosis- Role of Cytokines and Different Cell Types. *Z Gastroenterol*.

45(1), 77–86.

- Salomone, F., Galvano, F., & Li Volti, G. (2017). Molecular Bases Underlying the Hepatoprotective Effect of Coffee Nutrients. 9(1). <https://doi.org/10.3390/nu9010085>.
- Sakihama, Y., Cohen, M.F., Grace, S.C., Yamasaki, H. (2002). Plant Phenolic Antioxidant and Prooxidant Activities: Phenolics-Induced Oxidative Damage Mediated by Metals in Plants. *Toxicology* 177, 67–80.
- Scalbert, A., Morand, C., Manach, C., Rémésy, C. (2002). Absorption and Metabolism of Polyphenols in the Gut and Impact on Health. *Biomed pharmacother.* 56(6), 276–282.
- Seki, E., De Minicis, S., Osterreicher, C.H., Kluwe, J., Osawa, Y., Brenner, D.A., Schwabe, R.F. (2007). TLR4 Enhances TGF- β Signaling and Hepatic Fibrosis. *Nat Med* 13(11), 1324–1332.
- Seki, E., De Minicis, S., Inokuchi, S., Taura, K., Miyai, K., van Rooijen, N. (2009). CCR2 Promotes Hepatic Fibrosis in Mice. *Hepatology*. 50(1), 185–197.
- Seki, E., & Schwabe, F. (2015). Hepatic Inflammation and Fibrosis: Functional Links and Key Pathways. *Hepatology* (Baltimore, Md.) 61(3), 1066–1079.
- Shi, H., Dong, L., Jiang, J., Zhao, J., Zhao, G., Dang, X., Lu, X., Jia, M. (2013). Chlorogenic Acid Reduces Liver Inflammation and Fibrosis through Inhibition of Toll-like Receptor 4 Signaling Pathway. *Toxicology*. 303, 107–114.
- Tan, H., He, Q., Li, R., Lei, F., Lei, X. (2016). Trillin Reduces Liver Chronic Inflammation and Fibrosis in Carbon Tetrachloride (CCl₄) Induced Liver Injury in Mice. *Immunolog invest.* 45(5), 371–382.
- Vong, S & Beth, B.P. (2004). Chronic Liver Disease Mortality in the United States, 1990-1998. *Hepatology* (Baltimore, Md.) 39(2), 476–483.
- Weber, S., Gressner, O.A., Hall, R., Grünhage, F., Lammert, F. (2008). Genetic Determinants in Hepatic Fibrosis: From Experimental Models to Fibrogenic Gene Signatures in Humans. *Clin in Liver Dis.* 12(4), 747–757.
- Wood, N. J. (2010). Liver: Nonobese Individuals in the Developing World Are at Risk of Nonalcoholic Fatty Liver and Liver Disease. *Nat Rev Gastroenterol Hepatology* 7(7), 357.
- World Health Organization. (1999). Carbon Tetrachloride. 199.
- Zhen Gao, Buettner, G.R., & Oberley, L.W. (2003). This Student Paper Was Written as an Assignment in the Graduate Course. *Phytochemistry* 71(17–18) 1–9.



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**THE ROLE OF CHLOROGENIC ACID IN HEPATIC FIBROSIS INDUCED BY CARBON TETRACHLORIDE
IN MICE MODEL:
EXPLORATION OF MACROPHAGE NUMBER, MONOCYTES CHEMOATTRACTANT PROTEIN-1
EXPRESSION (MCP-1), AND
ALBUMIN LEVEL**

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