Silybin and silymarin - new and emerging applications in medicine

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This review critically surveys the literature published mainly within this millennium on the new and emerging applications of silybin (pure, chemically defined substance) and silymarin (flavonoid complex from Silybum marianum - milk thistle seeds). These compounds used so far mostly as hepatoprotectants were shown to have other interesting activities, e.g. anticancer and canceroprotective and also hypocholesterolemic activity. These effects were demonstrated in a large variety of illnesses of different organs, e.g. prostate, lungs, CNS, kidneys, pancreas and also in the skin protection. Besides the cytoprotective activity of silybin mediated by its antioxidative and radical-scavenging properties also new functions based on the specific receptor interaction were discovered. These were studied on the molecular level and modulation of various cell-signaling pathways with silybin was disclosed--e.g. NF-kappaB, inhibition of EGFR-MAPK/ERK1/2 signaling, activity upon Rb and E2F proteins, IGF-receptor signaling. Proapoptotic activity of silybin in pre- and/or cancerogenic cells and anti-angiogenic activity of silybin are other important findings that bring silymarin preparations closer to respective application in the cancer treatment. Discovery of the inhibition and modulation of drug transporters, P-glycoproteins, estrogenic receptors, nuclear receptors by silybin and some of its new derivatives contribute further to the better understanding of silybin activity on the molecular level. Silymarin application in veterinary medicine is reviewed as well. Recent works using optically pure silybin diastereomers clearly indicate extreme importance of the use of optically active silybin namely in the receptor studies. Significance of silymarin and its components in the medicine is clearly indicated by an exponential growth of publications on this topic--over 800 papers in the last 5 years.