# Ursodeoxycholic acid

Tauroursodeoxycholic acid (TUDCA) is the taurine conjugate of ursodeoxycholic acid (UDCA), a US Food and Drug Administration-approved hydrophilic bile acid for the treatment of certain cholestatic liver diseases. There is a growing body of research on the mechanism(s) of TUDCA and its potential therapeutic effect on a wide variety of non-liver diseases. Both UDCA and TUDCA are potent inhibitors of apoptosis, in part by interfering with the upstream mitochondrial pathway of cell death, inhibiting oxygen-radical production, reducing endoplasmic reticulum (ER) stress, and stabilizing the unfolded protein response (UPR). Several studies have demonstrated that TUDCA serves as an anti-apoptotic agent for a number of neurodegenerative diseases, including amyotrophic lateral sclerosis, Alzheimer's disease, Parkinson's disease, and Huntington's disease. In addition, Tauroursodeoxycholic acid TUDCA plays an important role in protecting against cell death in certain retinal disorders, such as retinitis pigmentosa. It has been shown to reduce ER stress associated with elevated glucose levels in diabetes by inhibiting caspase activation, up-regulating the UPR, and inhibiting reactive oxygen species. Obesity, stroke, acute myocardial infarction, spinal cord injury, and a long list of acute and chronic non-liver diseases associated with apoptosis are all potential therapeutic targets for T/UDCA. A growing number of pre-clinical and clinical studies underscore the potential benefit of this simple, naturally occurring bile acid, which has been used in Chinese medicine for more than 3000 years [1].

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Ursodeoxycholic acid (UDCA) inhibits the pro-inflammatory responses by lipopolysaccharide (LPS) in RAW 264.7 macrophages. UDCA also suppresses the phosphorylation by LPS on extracellular signal-regulated kinase (ERK), c-Jun N-terminal kinase (JNK), and p38 in MAPKs and NF-κB pathway. These results suggest that UDCA can serve as a useful antiinflammatory drug [2].

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The aim of a study was to investigate the anti-inflammatory effects by ursodeoxycholic acid (UDCA) in rats with a spinal cord injury (SCI). A moderate mechanical compression injury was imposed on adult Sprague-Dawley (SD) rats. The post-injury locomotor functions were assessed using the Basso, Beattie, and Bresnahan (BBB) locomotor scale and the tissue volume of the injured region was analyzed using hematoxylin and eosin staining. The pro-inflammatory factors were evaluated by immunofluorescence (IF) staining, a quantitative real-time polymerase chain reaction (qRT-PCR), and enzyme-linked immunosorbent assay (ELISA). The phosphorylation of the extracellular signal-regulated kinase (ERK), c-Jun N-terminal kinase (JNK), and p38 in mitogen-activated protein kinase (MAPK) signaling pathways related to inflammatory responses were measured by Western blot assays. UDCA improved the BBB scores and promoted the recovery of the spinal cord lesions. UDCA inhibited the expression of glial fibrillary acidic protein (GFAP), tumor necrosis factor-α (TNF-α), ionized calcium-binding adapter molecule 1 (iba1), and inducible nitric oxide synthase (iNOS). UDCA decreased the pro-inflammatory cytokines of TNF-α, interleukin 1-β (IL-1β), and interleukin 6 (IL-6) in the mRNA and protein levels. UDCA increased the anti-inflammatory cytokine interleukin 10 (IL-10) in the mRNA and protein levels. UDCA suppressed the phosphorylation of ERK, JNK, and the p38 signals. UDCA reduces pro-inflammatory responses and promotes functional recovery in SCI in rats. These results suggest that UDCA is a potential therapeutic drug for SCI [3].

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