Silymarin

Silymarin, a widely used “liver herb”, is frequently used for the protection against various hepatobiliary problems. However, the effectiveness of silymarin in central nervous system (CNS), especially in spinal cord, is not firmly established. The present work evaluates the effects of silymarin and its major constituent, silybin, on oxidative stress and lipopolysaccharide (LPS) stimulation in primary neuronal/glial cell cultures and in vivo. Silymarin or silybin inhibited glial cell proliferation in a concentration-dependent manner. Furthermore, it protected glial cells against peroxide-induced reactive oxygen species (ROS) formation, ATP depletion, and cell damage. Interestingly, the inhibition of peroxide-induced ROS by silybin could be partially attenuated by inhibitors of NFκB or protein kinase C (PKC), suggesting an involvement of NFκB and PKC signaling pathways. In mixed neuronal/glial cell cultures from cerebral cortex or spinal cord, silymarin or silybin effectively attenuated peroxide-induced ROS formation, with silymarin being more effective than silybin, implicating other constituents of silymarin that may be involved. Consistently, silymarin reduced LPS-induced injures in spinal neuronal/glial cell cultures. In vivo, intrathecal administration of silymarin immediately after eliciting contusive SCI effectively improved hindlimb locomotor behavior in the rats. Taken together, silymarin or silybin shows promise in protecting the CNS cells from toxin- or injury-induced damages and might be used to treat head- or spinal cord-injuries related to free radical assault [1)].

Inflammatory response mediates secondary injury during intracerebral hemorrhage (ICH).

Hirayama et al. examined the effects of silymarin, which was extracted from Silybum marianum, on delayed neuronal cell death in the rat hippocampus. Rats were divided into four groups: sham-operated rats (sham group), rats which underwent ischemic surgery (control group), rats which were treated with silymarin before and after ischemic surgery (pre group), and rats which were treated with silymarin after ischemic surgery only (post group). They performed the ischemic surgery by occluding the bilateral carotid arteries for 20min and sacrificed the rats one week after the surgery. Silymarin was administered orally at 200mg/kg body weight. Smaller numbers of delayed cell deaths were noted in the rat CA1 region of the pre- and post-groups, and no significant difference was observed between these groups. There were few apoptotic cell deaths in all groups. Compared to the control group, significantly fewer cell deaths by autophagy were found in the pre- and post-group. They concluded that silymarin exerts a preservation effect on delayed neuronal cell death in the rat hippocampus and this effect has nothing to do with the timing of administering of silymarin [2)].

In a study, Yuan et al. determined oxidative stress and involvement of NLRP3 in ICH injury and analyzed whether silymarin might offer protective effect against ICH injury. Post 24h after ICH injury there was increased oxidative stress markers (reactive oxygen species (ROS) and lipid peroxides) compared to sham group. Silymarin (200mg/kg) treatment 30 mins post ICH injury prevented increase in oxidative stress markers and up-regulated antioxidant status. Further, there was significant increase in nuclear levels of NF-κB-p65 and pro-inflammatory cytokine expressions post ICH injury. NLRP3 inflammasome activation and downstream targets such as caspase-1 and IL-1β expressions were significantly up regulated in ICH injury. Silymarin treatment significantly down regulated the inflammatory responses by suppressing NF-κB-p65 levels and inflammasome-mediated caspase-1/IL-1β expressions. Further, treatment with silymarin post ICH injury increased Nrf-2/HO-1 and thereby improved overall cytoprotection. These findings together show that silymarin acts as neuroprotective compound by preventing inflammatory activation and up regulating Nrf-2/HO-1 signaling post ICH injury [3)].

1)
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