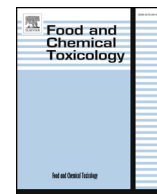




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Ameliorative effect of *Cyclocarya paliurus* polysaccharides against carbon tetrachloride induced oxidative stress in liver and kidney of mice

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ABSTRACT

Chemical liver and kidney injury have become a serious concern to human. Side effects occur when they are treated with medicine. The present study evaluated the preventive effect of *Cyclocarya paliurus* polysaccharides (CP) on hepatic and renal injury in carbon tetrachloride (CCl₄) induced mice. The results showed that CP treatment could effectively prevent H₂O₂-induced oxidative damage of NCTC-1469 cells. Administrated with CP could ameliorate the body weight loss and organ swelling of mice induced by the 0.2% CCl₄. Compared with the model group, CP groups have beneficial effects in decreasing ALT, AST, TBA and CRE levels in serum. In addition, the expression of CYP2E1 in the liver was also significantly decline after continuous administration of CP. Moreover, pre-administration of CP can improve the antioxidant status of liver and kidney (MDA and SOD, GSH-Px). Histopathological studies also supported the improvement of CP on liver and kidney of CCl₄-induced mice. These results indicate that CP may be of therapeutic value in ameliorating the hepatic and renal oxidative stress caused by CCl₄, through its antioxidant properties.

1. Introduction

As the largest metabolic and excretory organs in mammals, liver and kidney play important roles in maintaining homeostasis (Bechmann et al., 2012; Maschmeyer et al., 2015). Alcohol (Su et al., 2019), drugs (Medina-Caliz et al., 2018), heavy metals (Nwokocho et al., 2012) and environmental toxicants (Kanhar and Sahoo, 2019) can cause injury in liver and kidney, destroying physical functions and leading serious consequences of public health. Carbon tetrachloride (CCl₄), a typical environmental toxicants, is often used to establish animal models of acute or chronic liver and kidney disease (Chiang and Chao, 2018; Radulović et al., 2015; Zhu et al., 2019). Many studies have shown that hepatotoxicity and nephrotoxicity of CCl₄ are the result of oxidative stress. After entering the body, CCl₄ catalyzed by liver Cytochrome P450 2E1 (CYP2E1) to form $\cdot\text{CCl}_3$, $\cdot\text{OCCl}_3$ and reactive oxygen species (ROS) (Dong et al., 2015). Numerous ROS would attack macromolecules such as lipids, proteins and DNA, leading physiologic dysfunction (Lee et al., 2007). Long-term accumulation of ROS in the body also cause various severe liver and kidney chronic diseases (Ivanov et al., 2014; Zhang et al., 2018a). Currently, this usually has many side effects and limited efficacy on drugs for treating liver and kidney (Wang et al., 2019a). It is urgent to find a natural product to prevent liver and

kidney oxidative stress damage caused by chemical substances.

At present, natural antioxidants are expected to replace synthetic antioxidants as health products (Zhang et al., 2018b). Natural extracts from plants and seafood are considered to low toxicity and positive biological activities (Chen et al., 2020; Chen and Wang, 2019; Li et al., 2019b; Ma et al., 2018; Romano et al., 2016; Shang et al., 2019; Wu et al., 2019; Zhang et al., 2019b). Polysaccharide is a natural biomacromolecules polymer composed of more than 10 monosaccharide and often closely linked to a few proteins (Ding et al., 2019; Huang et al., 2019), which has received much attention for its good biological activities with low side effects (Cao et al., 2019; Liu et al., 2019; Xie et al., 2016a, 2020). Moreover, numerous researches have revealed that polysaccharides have significant protection effects on the liver and kidney. Kidney-yang deficiency caused by hydrocortisone can be reversed by *Semen cuscutae* polysaccharide (Yang et al., 2017). *Schisandra acid* polysaccharide protects liver from oxidative stress injury induced by ethanol (Yuan et al., 2018). *Lachnum* polysaccharide could alleviate lead-induced liver and kidney damage by regulating the antioxidant defense system (Hou et al., 2019). These studies show that polysaccharides have the potential to protect the liver and kidney from drugs and toxicants, and the main protective mechanism is by reducing oxidative stress.

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