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Preventive effects of garlic powder on cisplatin-induced nephrotoxicity in male wister rats

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Abstract---Cisplatin is cancer chemotherapeutic agent that used in treatment of many types of solid cancers. However, cisplatin administration showed adverse effects including multi-organs toxicity including nephrotoxicity. Garlic is an anti-carcinogenic, antioxidant, anti-diabetic, Reno protective, anti-atherosclerotic, antibacterial, antifungal, and antihypertensive agent. Therefore, present study was conducted to investigate preventive effect of garlic powder on Cisplatin induced nephrotoxicity in male Wister rats. Twenty-one male Wister rats were assigned into three groups namely, C (as control negative group), CP (control positive) received two i.p injection of cisplatin at dose of 8 mg/kg and G-CP received two i.p injection of cisplatin at dose of 8 mg/kg and fed with 10% garlic powder diet. Serum samples were collected and kidney function parameters including creatinine, urea and uric acid levels were measured using colorimetric kits for these parameters creatinine results showed a significant increasing in CP group rats compared with G-CP group. Urea results showed a significant increasing in CP group rats compared with G-CP group. Also, uric acid results showed a significant increasing in CP group rats compared with G-CP group. In conclusion, rats that fed with 10% garlic powder diet reduced nephrotoxicity that induced by Cisplatin.

Keywords---Cisplatin, Nephrotoxicity, Garlic.

Introduction

Cisplatin is as platinum-based chemotherapeutic considered a chemotherapy have been based in treatment of many types of cancers. The anti-cancer activity of cisplatin depended on DNA cross-links and DNA adducts. Based on its

therapeutic implications, it is well-established as an anticancer medicinal agent. Cisplatin has been linked to a number of forms of systemic toxicity (Urba *et al.*, 2008). Neurotoxicity, also known as peripheral neuropathy, often manifests itself in human patients who are given a cumulative dosage (Berry *et al.*, 1990; William and Christopher 2009). Cisplatin may elicit nephrotoxicity in a variety of species (El-Sayyad *et al.*, 2009). Renal toxicity one of the main adverse effects of cisplatin that led to renal failure in some patients who received many cycles of cisplatin treatments (Miller *et al.*, 2010). Renal toxicity one of the main adverse effects of cisplatin that led to renal failure in some patients who received many cycles of cisplatin treatments (Hajian *et al.*, 2014). Cisplatin caused nephrotoxicity by inducing necrosis in epithelial cells of renal tubules depending on inducing oxidative stress in these cells (Hajian *et al.*, 2014; Soni *et al.*, 2018). Garlic, scientifically known as *Allium sativum* L., is both a culinary ingredient and a traditional treatment for a broad range of illnesses. Anti-carcinogenic, antioxidant, antidiabetic, reno-protective, anti-atherosclerotic, antibacterial, antifungal, and antihypertensive actions are only some of the biological qualities that have been attributed to it in traditional medicine. Garlic has high concentration of numerous constituents that are rich in the Sulphur element, including *alliin*, *allicin*, *ajoenes*, *vinylidithiins*, and *flavonoids* like quercetin. Extracts and isolated components of garlic have been tested for a wide variety of biological properties, such as those that are antibacterial, antiviral, antifungal, antiprotozoal, antioxidant, anti-inflammatory, and anticancer (Batiha *et al.*, 2020). Garlic's ability to scavenge reactive oxygen species (ROS), inhibit lipoprotein oxidation, induce endogenous antioxidant enzyme expressions, suppress inflammation, lower glucose levels, inhibit tumour growth, promote apoptosis, and arrest cell cycle progression are some of the mechanisms that have been partially elucidated (Bayan *et al.*, 2012; Trio *et al.*, 2014). The present study was conducted to investigate preventive effect of garlic powder on Cisplatin induced nephrotoxicity in male Wister rats.

Materials and Methods

Twenty-one male Wistar rats were assigned into three groups (each group seven rats) namely, C, G, CP and G-CP. Group C as control negative group, CP group rats were received two i.p injection of cisplatin at dose of 8 mg/kg of body weight at day one and day fourteen of experimental period and fed with basal diet. Group G-CP rats were received two i.p injection of cisplatin at dose of 8 mg/kg of body weight at day one and day fourteen of experimental period and fed with 10% garlic powder diet. Rats were euthanized after 28 days of experimental period. Peripheral blood samples were collected in gel plain tubes and let to clot for two hours at room temperature then centrifugation for 5 minutes at approximately 5000 rpm. Serum were collected in eppindroff tubes then stored in -200C for further use. Creatinine, Urea and uric acid levels were measured using method colorimetric method using Creatinine kinetic colorimetric (423005, Linear, Spain), Urea colorimetric (8022, Biolibo, france) and Enzymatic colorimetric (1161005, Linear, Spain) Kits to be detected creatinine, urea and Uric acid levels following the procedure provide by the manufacture.

Results and Discussion

Kidney function parameter results in present study involved creatinine, urea and uric acid levels. Creatinine, urea and uric acid considered as good indicator that used clinically to investigate kidney injury (Hajian *et al.*, 2014; El-Naga and Mahran, 2016). Creatinine levels was 0.497, 0.820 and 0.588 mg/dL in groups C, CP and G-CP, respectively. Urea level was 39.37, 71.75 and 51.71 mg/dL in groups C, CP and G-CP, respectively. Uric acid level was 3.9, 6.75 and 4.28 mg/dL in groups C, CP and G-CP, respectively. The statistical analysis of creatinine results showed a significant ($p<0.05$) increasing in CP group rats compared with other groups. Urea results showed a significant ($p<0.05$) increasing in CP group rats compared with other groups. Also, uric acid results showed a significant ($p<0.05$) increasing in CP group rats compared with other groups (table 1). However, creatinine, urea and uric acid levels showed a significant increasing in cisplatin only treated rats compared with garlic and cisplatin treated rats, indicating the ability of garlic to reduce the tubular injury in these rats.

Table 1: kidney function parameters (mg/dL)

Groups	Creatinine		Urea		Uric acid	
	Mean	±SD	Mean	±SD	Mean	±SD
C	.497	.062	39.37	3.73	3.90	.55
CP	.820 ^a	.049	71.75 ^a	1.70	6.57 ^a	.41
G-CP	.588	.037	51.71	2.13	4.28	.94

The superscript latter a indicate a significant increasing in group CP compared with other groups.

Conclusion

Kidney function parameter results showed that garlic powder showed the ability to reduce the creatine, urea and uric acid indicating that garlic powder reduced nephrotoxicity that induced by cisplatin administration.

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