Inhibitory Effects of Cinnamon Extract on Gentamicin-Induced Nephrotoxicity in Male Adult Wistar Rats

Sedigheh Tanomand, Mahmood Najafian

Department of Biology, Jahrom Branch, Islamic Azad University, Jahrom, Iran

ABSTRACT

Introduction: Among the factors that can cause kidney failure are taking medications with amino glycosides, especially gentamicin toxicity has special importance. Studies have shown that gentamicin will exercise their nephrotoxicity by virtue of Create free radicals. Cinnamon has antioxidant properties. In this study, the antioxidant properties of cinnamon reducing effect of gentamicin-induced nephrotoxicity were studied.

Material and methods: 42 mail adult wistar rats were randomly divided into 7 groups. Group C was given no medication. S group, the saline solution was injected intraperitoneally. Group Ci200 extract of cinnamon (200mg/kg B.W), Group G100 gentamicin (100mg/kg B.W), and Groups GCi50, GCi100 and GCi200 order gentamicin with the dosages of 50, 100 and 200 mg per kg body weight of ethanol extracts of cinnamon in the injections. During the experimental period was 28 days. Later samples were taken at the end of day 28, rats were killed and blood urea nitrogen, uric acid and creatinine levels were measured.

Results: The levels of blood urea nitrogen (BUN) has shown a significant increase in group G100 compared to group C (p <0.05). In Groups GCi50, GCi100 and GCi200, roughly proportional to the dose of cinnamon, blood urea nitrogen levels have been reduced. Creatinine concentration showed a significant increase in G100 than group C (p <0.05) and a significant reduction of GCi200 compared to G100 (p <0.05). Concentration of uric acid in the G100 group showed a significant increase compared to the C group. GCi200 and GCi100 groups showed a significant reduction compared to the group G100 (p<0.05).

Discussion and Conclusion: Cinnamon bark extract is able to protect against the nephrotoxicity induced by gentamicin. The protective effect maybe dependent to anti oxidant properties of cinnamon extract.

Key words: Gentamicin, Cinnamon, Rats, Nephrotoxicity.
including the skin, so that its use strengthens the heart, stomach and intestines, improving kidney function and increase sexual power [12]. Medicinal value of this plant is due to its volatile oil. The main components of this oil include cinnamaldehyde, eugenol and safrol with insulin-like activity and can be useful in the treatment of diabetes [13]. These combinations are involved in decreasing in triglycerides, and LDL cholesterol levels [14]. Cinnamon has anti-bacterial and anti-fungal properties [15]. Cinnamon in wound healing, it is also used to treat nausea and diarrhea [15-16]. In this study, the antioxidant properties of cinnamon reduce nephrotoxicity gentamicin-induced was studied.

Material And Methods

This study experimentally and is completely random. All animal experiments in this study comply with the code of conduct has been developed. 42 adult Wistar rats weighing 200±10 g and 75 days of age, was produced from Shiraz Razi Vaccine & Serum Research Center. The rats were housed in Islamic Azad University Jahrom Branch Animal House for 28 days under laboratory conditions include a temperature of 21±2° C and 12 h light and 12 h dark cycle was used. The mice were kept in cages; metal mesh doors and a standard rodent diet (pellete) were used. Glass bottles of water were also provided. Their food and water were free. Cage 3 times a week it was disinfected with 70% alcohol. Caspian to 100 mg in 2 mL ampules were bought from Gentamicin Pharmaceutical companies. Gentamicin dose of 100 mg per kg body weight in rats (100mg/kg Bw) was performed. Cinnamon extract for cinnamon peel powder using a mill and 24 g of powder was dissolved in 96% ethanol 200cc. The mixture was kept at room temperature for 24 hours. The mixture using a magnetic stirrer (Shaker) was mixed for 4 minutes and was flat on Whatman paper. Paper and powder residue on it in the oven set temperature of 50 ° C for 1.5 hour were dried. The powder was dissolved in saline and given weight in rats at doses 50, 100 and 200mg/kg-BW prepared.

Samples (cinnamon extract, gentamicin and saline solution) with 0.2ml insulin syringe volume were injected intraperitoneally at 9 am each day.

42 rats were divided randomly into 7 groups as follows:

**Group C:** were maintained on normal without any medication.

**Group S:** Rats in this group received saline solution as solvent of cinnamon extract and gentamicin.

**Group Ci200:** Rats in this group received cinnamon extract 200mg/kg B.W.

**Group G100:** Rats in this group received gentamicin 100mg/kg B.W.

**Group GCi50:** Rats in this group received Gentamicin 100mg/kg B.W with cinnamon extract 50mg/kg B.W.

**Group GCi100:** Rats in this group received Gentamicin 100mg/kg B.W with cinnamon extract 100mg/kg B.W.

**Group GCi200:** Rats in this group received gentamicin 100mg/kg B.W with cinnamon extract 200mg/kg B.W.

After 28 days, rats of all groups were comatose after weighing by Ether and the heart by syringe, 5 ml blood was measured after separating the serum concentration of urea nitrogen, uric acid and creatinine were measured in serum. To express the results, compare the amount and distribution of column charts are used to express the values are given as Mean ± SD. One way analysis of variance (ANOVA) followed by Tukey’s post hoc test for multiple comparisons were used to compare difference between experimental groups. The criterion for statistical significant was P<0.05. For all data analysis software SPSS version 18.0 statistical doing tests were used.

**Results:**

The results showed that the concentration of blood urea nitrogen (BUN) in groups G100, GCi50 and GCi100 is a significant increase compared to the C group. BUN concentration in groups GCi50, GCi100 and GCi200 compared to G100 were reduced with a dose dependent manner pattern. (P<0.05).

As shown in figure 2, serum creatinine concentrations were significantly increased in G100 and GCi50 groups compared to C group. The GCi200 group was significantly decreased compared to G100 and GCi50 (P<0.05).

The results show that the serum uric acid concentration was significantly increased in G100 group compared to the C group. The group GCi50 is a significant decrease compared to G100 group. In GCi100 and GCi200 is a significant reduction compared to G100 and GCi50 (P<0.05).
Fig. 1: Effect of gentamicin and cinnamon extract on BUN. The columns that have at least one common letter, have not significant different from each other at the level of P<0.05.

Fig. 2: Effect of Gentamycine and cinnamon extract on creatinine. The columns that have at least one common letter, have not significant different from each other at the level of P <0.05.

Fig. 3: Effect of Gentamycine and cinnamon extract on uric acid. The columns that have at least one common letter, have not significant different from each other at the level of P <0.05.
**Discussion:**

Antibiotics such as gentamicin have high consumption. This medication is used to treat infections of Gram-negative bacteria in humans and animals, the effects of gentamicin are renal toxicity (nephrotoxicity) [2-3]. Body toxins, such as urea, uric acid, creatinine and bilirubin metabolites are excreted through the kidneys. Since the kidney is a major problem in today's society, so pay careful attention to the structure and function, it can be important for the health of the individual [17]. The results of this study indicate that gentamicin has a significant effect on serum BUN, uric acid and creatinine. This expression is induced nephrotoxicity induced by gentamicin [18]. BUN levels were significantly increased in group G100 compared to group C (P <0.05), indicating the gentamicin-induced renal failure [18]. Groups GCi50, GCi100 and the GCi200, there was significant dose-dependent decrease in BUN levels and this indicates the positive effect of cinnamon on gentamicin-induced nephrotoxicity. Serum creatinine was significantly increased in group G100 compared to group C (P <0.05) that this is in line with gentamicin-induced renal injury [19]. In GCi200 group, serum creatinine has a significant decrease compared to a G100. This expression is a gentamicin-induced nephrotoxicity antioxidant effect of cinnamon in reducing complications. Serum uric acid in group G100 receiving gentamicin G100 was a significant increase in the gentamicin-induced renal injury [18]. Uric acid has a significant decrease in groups which receive gentamicin and cinnamon compared to groups which receive just gentamicin and this indicates cinnamon, as Antioxidants, can decrease side effects induced from gentamicin[20].

Antioxidants combined with gentamicin gentamicin-induced tissue damage has been slightly reduced in the kidneys [21-23]. Studies indicate the presence of antioxidant compounds in cinnamon [24]. Researchers know antioxidant effect of cinnamon more related to eugenol and methyl hydroxyl chalcone. Oral administration of a eugenol cause normal activity of glutathione peroxidase and glutathione in cells is increased [25]. Due to the adverse effects of free radicals and oxidative stress responses, antioxidant compounds that can protect the body from damage caused by oxidative stress may be necessary. Antioxidants play a special role in the prevention and treatment of diseases [26-27]. See generally, indicates damage in groups received Gentamicin and extract simultaneously, compared to the group receiving gentamicin alone which observed renal decline indicating the positive effects of cinnamon extract.

**Conclusion:**

Due to above, using cinnamon is effective in decreasing Blood urea nitrogen, serum creatinine and uric acid gentamicin – induced. So that further improvements can be seen at higher doses. Due to the low cost of Cinnamon, ease of use and minimal side effects seem to be less gentamicin as an adjuvant treatment in order to minimize damage to the kidney.

**References**