Histological effects of cinnamon on nephrotoxicity resulted from Gentimicin in rats


1Islamic Azad University, Jahrom Branch, Department of Biology and Secretary of Education in Hormozgan, Iran.
2Department of agriculture, Shahrkord branch, Islamic Azad University, Shahrkord, Iran
3Department of Biology, Jahrom branch, Islamic Azad University, Jahrom, Iran
4Assistant Professor, Department of Microbiology, Jahrom branch, Islamic Azad University, Jahrom, Iran.
5Department of agriculture, Jahrom branch, Islamic Azad University, Jahrom, Iran.
6Department of Phytochemistry, Tehran branch, Payam Noor University, Tehran, Iran.

ARTICLE INFO
Article history:
Received 25 June 2014
Received in revised form
8 July 2014
Accepted 14 October 2014
Available online 16 November 2014

Keywords:
cinnamon, Gentimicin, nephrotoxicity.

ABSTRACT
Background and objective: Gentimicin is an antibiotic from the family of Aminoglycosides used in the treatment of infections resulted from Gram-negative bacteria, the use of which is limited due to its nephrotoxicity. In this study the histological effect of cinnamon on the nephrotoxicity resulted from Gentimicin in rats is investigated because of the Antioxidant properties of cinnamon. Materials and methodology: in this study 36 immature female Wistar rats were divided into 6 equal groups. The control group did not receive any solution or medication. Every day The control group 1 received 200mg/kg hydro-alcoholic extract of cinnamon in Gavage form, the control group 2 received 80 mg/kg Gentimicin in intraperitoneal injection form, and empirical groups 1, 2 and 3 received 80 mg/kg Gentimicin in intraperitoneal injection form and 50, 100 and 200 mg Hydro-alcoholic extract of cinnamon in Gavage form for 14 days, respectively. Findings: results indicate that the cortex diameter in control groups 2 and empirical group 2 increase significantly (P<0.05) compared to control group and control group 1. Diameter of medulla did not increase significantly in different groups. In contrast, diameter of the proximal tubule showed a significant increase (P<0.05) in control group 2, compared to other groups. Also the glomerular diameter in empirical and control groups 2 increased significantly compared to control group and control group 1 Conclusion: the results of the study show that cinnamon apart from having phenolic compounds and antioxidant properties, can cure the tubular injury resulted from Gentimicin.

INTRODUCTION

Gentimicin is one of the Aminoglycosized antibiotics used to cure infections, especially the gram-negative bacteria [1 and 2]. Nephrotoxicity is a serious side-effect of using Gentimicin and it is believed that this effect is resulted from the production of reactive oxygen species (ROS=Radical) in kidney [3-5]. Although most of the medication is urinated, some of it is aggregated in kidney cortex and leads to cell damage in the kidney [6]. Gentimicin produces superoxide anion, hydrogen peroxide and hydroxyl radical in kidney mitochondria [7-8]. Moreover, the production of hydrogen peroxide, Lipo-peroxidation and Nitro tyrosine protein carbonyl content increases and Glutathione decreases in the kidney cortex of Gentimicin-treated mice [9-11]. Therefore, using compounds that have antioxidant components [12] can reduce the severity of kidney injury resulted from Gentimicin [13-15]. Cinnamon is one of the oldest medicinal plants which was used as an important medication in traditional medicine. Different parts of this plant such as its bark has many health benefits, such that using it strengthens the heart, stomach and intestines, improvement of kidney activity and increase in sexual force [16]. Its medical value is due to its volatile oil. The main constituents of this essence include Cinnamaldehyde, Eugenol and Saffron which acts like insulin and can be used in treatment of diabetes [17]. They also have positive effects on the reduction of triglyceride, cholesterol and blood LDL [18]. Considering the side-effects of using Aminoglycosides and the increasing resistance of microorganisms against this group, especially


Corresponding Author: Alaeyan Jahromi Zahra, Department of Biology, Jahrom branch, Islamic Azad University, Jahrom, Iran.
E-mail: zahraalaeyan@yahoo.com
Gentamicin, it is necessary to introduce an alternative medicine or materials whose concomitant use with Gentamicin decrease its side-effects for the kidney. The purpose of this study is to determine the preventive effect of cinnamon extract on nephrotoxicity resulted from Gentamicin and to probably detect the medical effect of cinnamon on rats’ kidney injury after the injury.

Materials and methodology:
In this research the big laboratory Wistar rats (90±20 grams) of Islamic Azad University of Jahrom were used. The samples were randomly divided into 6 groups of six (total number 36) including: control group, control 1, control 2, experimental 1, experimental 2 and experimental 3. Each of these groups was placed in a different cage. During the two weeks of samples' compatibility with experimental environment and during injection period, all rats used available water and food, constant temperature of 28-32 C and natural light.

Extraction method:
First of all cinnamon bark was powdered using the mill and 24 grams of the powder was dissolved in 20 CC medical ethyl alcohol 96%. The resulting mixture was maintained for 24 hours at room temperature (25 C). Then it was completely mixed for 4 minutes using magnetic stirring device (shaker) and filtrated using a Whatman paper whose initial weight was written down. The paper and the remaining powder were dried in 50 C for 1/5 hours using Avon devise. The amount of the dissolved powder was determined comparing the eight difference of the remaining dried powder on the filter paper and the initial amount of the cinnamon. The extraction achieved using this method (Forman) contains a large amount of alcohol (about 20 ml). In order to eliminate the alcohol, the extraction was placed in a pollution-free environment for 48 hours so that the additional alcohol is evaporated and reduced to the least possible amount (about 5 ml). Then the extract volume is increased to 150 ml using 9% saline (normal saline injection).

After the 14 days period, the rats of all groups were anesthetized using ether. All histopathologic studies were investigated by a pathologist and analyzed via SPSS Software and ANOVA and Duncan tests after the data were collected.

RESULTS AND DISCUSSION

Amino glycoside antibiotics, especially Gentamicin are used to treat gram-negative bacteria infection in humans and animals. Nephrotoxicity is one of the side-effects of using Gentamicin. In the beginning the Clinical demonstrations of aminoglycoside nephrotoxicity are dysfunction of glomerular or tubular and sometimes include Oliguria and renal failure [19-20]. This study was conducted with the aim of determining the histological effects of cinnamon on nephrotoxicity resulted from Gentamicin. In histopathologic studies of kidney conducted using optical microscope, the cortex diameter in control group 2 and experimental group 2 increased significantly at level P<0.05 compared to control group and control group 1. The diameter of the medullar was not significantly reduced or increased in different groups. However, the diameter of proximal Tubule in control group 2 increased significantly at level P<0.05. The diameter of Glomerul in experimental groups and control group 2 increased significantly compared to control group and control group 1.

According to other results of the current study, Gentamicin causes the serious necrosis in near curved pipes and using cinnamon extract in any of them, decreases the amount of tubular necrosis resulted from Gentamicin. These results correspond with findings of others [21-22]. The pathologic changes in kidney usually take place during the first weeks after Gentamicin injection [23]. Gentamicin in low values requires an increase in injection period because of the large storage capacity of the kidneys and their ability to compensate biochemical changes; however, in high values because of the drug retention in the kidney cortex it results in cell necrosis and therefore a reduction in glomerular filtration rate and tubular reabsorption [24]. The damage to Glomerul and pipes (tract obstruction by necrosis cells and hyaline molds) in the process of acute tubular necrosis causes the reduction in glomerular filtration rate and as a result the reduction in creatinin and urea nitrogen filtration rate [25-26]. Also the results indicate that the glomerular filtration rate is in congruence with the amount of waste. Cell necrosis resulted from Gentamicin mostly takes place where pipes are wrapped around [27-28],

Antioxidants play a special role in prevention and treatment of the diseases and the use of antioxidant materials with Gentamicin to some extent can reduce the tissue damages resulted from the use of Gentamicin in kidneys [29-31]. The researches conducted indicate the presence of antioxidant compounds in cinnamon [32]. According to the adverse effects of free radicals and oxidative stress reactions, presence of antioxidant compounds that can protect the body from the injuries of oxidative stresses, seems vital.
Comparison of various groups with respect to the studied parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>control group (C)</th>
<th>control group 1 (C200)</th>
<th>control group 2 (G80)</th>
<th>empirical group (GC50) 1</th>
<th>empirical group (GC100) 2</th>
<th>empirical group (GC200) 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortex diameter (mm)</td>
<td>0/1778a</td>
<td>0/1786a</td>
<td>0/1833b</td>
<td>0/1711b</td>
<td>0/1706b</td>
<td>0/1772ab</td>
</tr>
<tr>
<td>Diameter medulla (mm)</td>
<td>0/4711a</td>
<td>0/4183a</td>
<td>0/4583a</td>
<td>0/4078a</td>
<td>0/3906a</td>
<td>0/3717a</td>
</tr>
<tr>
<td>Glomerular (mm)/diameter</td>
<td>0/3961a</td>
<td>0/4008a</td>
<td>0/3789b</td>
<td>0/3822b</td>
<td>0/3911b</td>
<td>0/3894b</td>
</tr>
<tr>
<td>Diameter (mm)/proximal</td>
<td>0/0347a</td>
<td>0/0310a</td>
<td>0/0389b</td>
<td>0/0353a</td>
<td>0/0350a</td>
<td>0/0503a</td>
</tr>
</tbody>
</table>

*Columns that have at least one letter in common are not significantly different

REFERENCES