Impact of amoxicillin, gentamicin and cefazolin sodium antibiotics on antioxidant gene expression and enzymatic activities in mouse liver

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Reactive oxygen species (ROS) are highly reactive molecules, which are produced by living organisms as a natural byproduct of the normal metabolism and environmental factors. Living organisms have the antioxidant defense systems to block harmful effects of ROS. The imbalance between oxidants and antioxidants is termed oxidative stress. The antioxidant defense mechanisms are divided into two groups as enzymatic and non-enzymatic defenses. Enzymatic defense mechanisms consist of enzymes like superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glucose-6-phosphate dehydrogenase (G6PD) and glutathione-S-transferase (GST).

The present study was designed to determine the effects of gentamicin, amoxicillin and cefazolin sodium antibiotics on the hepatic antioxidant system and to determine any possible correlation between enzymatic and molecular levels. For this reason, effects of these antibiotics on the transcription of the antioxidant system has been investigated by real time PCR, and then the enzyme activity of these enzymes have been measured in whole liver homogenate obtained from control group and the drug administered groups mice.

Our results demonstrate that administering antibiotics led to crucial inhibition of all antioxidant enzyme activity. While significant transcriptional activation for Sod and Cat was seen in the gentamicin treated group, the transcription of Gs and G6pd was decreased. However transcriptional activation was seen for Sod and Cat in amoxicillin administered group, the transcription of Gs was decreased as compared with the control group. In the cefazolin sodium treated group, while Cat and Gs transcription were elevated significantly, the expression of Sod and G6pd were decreased.

In conclusion, gentamicin, amoxicillin and cefazolin sodium affect the hepatic antioxidant system at the molecular and protein level. This work was supported by Scientific Research Project of Ataturk University of Turkey (Grant no: 2013/296).