Doxycycline and Caffeic Acid Phenetyl Ester synergistically reduces oxidative stress status and apoptosis levels in experimentally induced periodontitis model of rats

Umut Yiğit¹, Fatma Yeşim Kirzıoğlu¹, Özlem Özmen⁴, A.Cihangir Uğuz²,³

¹ Department of Periodontology, School of Dentistry, Süleyman Demirel University, Isparta, Turkey.

² Department of Biophysics, School of Medicine, Süleyman Demirel University, Isparta, Turkey.

³ Neuroscience Research Center, Süleyman Demirel University, Isparta, Turkey.

⁴ Department of Pathology, School of Veterinary Medicine, Mehmet Akif Ersoy University, Burdur, Turkey.

Low-dose doxycycline (LDD) have been widely used to treat periodontal diseases with the aim of enzymatic inhibition and its related anti-inflammatory properties. Caffeic acid phenethyl ester (CAPE) is one of the bioactive compound of propolis extract. Nowadays there are increasing numbers of literature search which elaborate that CAPE possesses antioxidant, antimicrobial and anti-inflammatory properties.

The basic aim of the present study is to verify the possible effects of LDD and CAPE on experimentally induced periodontitis model in rats. This model will help us to clarify their effects against oxidative stress in relation to periodontal tissue loss associated with ligature-induced experimental periodontal disease in rats.

Forty-eight adult Wistar Albino rats were divided into five study groups as follows: 1) group 1 = Control; 2) group 2 = CAPE; 3) group 3 = DOX; 4) group 4 = Periodontitis; and 5) group 5 = CAPE + DOX + Periodontitis.

We evaluated GSH, GSH-Px and LP values from the serum samples of rats and also apoptosis levels in periodontal tissue. When we evaluated LP levels, we determined significant decrease in CAPE and DOX group for all of oxidative stress parameters (p<0.001). We also determined increased GSH and GSH-Px levels. We determined that CAPE has the strongest protective effect for apoptosis levels. CAPE + DOX combination also reduced apoptosis levels comparing to the Periodontitis group. Histopathological findings that we obtained from the current study demonstrates that CAPE is more efficient than DOX administration. Histomorphometric results overlap with the findings written above. The most bone loss was determined in periodontitis group, however CAPE and DOX administration reversed this situation.

The general findings of the current study clearly demonstrate that DOX and CAPE are an effective therapeutic agents against periodontitis induced oxidative stress model in rats. Their combination is also contribute for protection.