

Extended Abstract

The Role of Electronic Cigarette on Periodontal Diseases

Introduction

Periodontal disease is a multifactorial disease that affects the tooth and tooth-supporting tissues. Although dental plaque is the main cause of periodontal diseases, the host response of the body is an important risk factor as well. If not treated, the teeth will gradually loosen from the gums. Smoking is a well-established risk factor for periodontal disease and it has a dose- and time-dependent cytotoxic effect. Smoking affects the function and proliferation of periodontal cells. The popularity of electronic cigarettes (e-cigarettes) has increased in the past years. Like traditional cigarettes, e-cigarettes also contain nicotine. They are replacement nicotine delivery methods. An electronic cigarette has a battery, heating element, a mixture of chemicals such as propylene glycol, vegetable glycerin, and nicotine. Despite the ongoing controversy regarding the harmful effects of e-cigarettes, recent data suggests that aerosol causes increased inflammatory responses, alters cellular function, and promotes cellular damage. The proinflammatory effects of matrix metalloproteinases play a central role in the destruction of periodontal tissues. They are a group of enzymes responsible for the degradation of extracellular matrix proteins. MMP-1 is an interstitial collagenase that is encoded by the MMP-1 gene. In this study, the cytotoxic effect of e-cigarette fluid on oral epithelial cells and its effect on MMP-1 release were investigated.

Methods

Gingival epithelial cells were used for this study. After the cells were grown, the confluent cells were stimulated with electronic cigarette fluid containing nicotine at concentrations of 0.01, 0.5, or 1.0 mg/mL. The liquid did not have fragrance-containing flavors. The cells were stimulated for 48 hours and the supernatants were collected. The commercially available ELISA kits and a colorimetric MTT assay for assessing cell metabolic activity were used.

Results

The results showed that the cytotoxic effect and the amount of MMP-1 increase ($p < 0.05$) with an increase in the amount of nicotine in the e-cigarette fluid.

Discussion

A number of experimental and clinical studies confirmed that nicotine impairs normal tissue turnover. The content of e-cigarettes includes many substances with different amounts of nicotine. In this study, the amount of nicotine in the fluid was changed the same main ingredients were used. In addition, none of the flavors were used.

This is important because there are more than 7,000 e-cigarette fluid flavors available for e-cigarette users, and most of them are toxic. This experiment provides a unique, more standardized design, which gives clarity about the effect of nicotine on gingival epithelial cells. The demonstrated nicotine-induced toxicity in epithelial cells depended on the amount of nicotine. Indeed, addition of nicotine not only increased the toxicity of the e-cigarette mixtures but also increased MMP-1 expression in a dose-dependent manner.