TIME AND DOSE EFFECTS OF CIGARETTE SMOKE AND ACROLEIN ON PROTEIN CARBONYL FORMATION IN HACAT KERATINOCYTES

K. Avezov [1, 2], A.Z. Reznick [1], and D. Aizenbud [1, 2]

[1] Department of Anatomy and Cell Biology, Rappaport Faculty of Medicine, Technion - Israel Institute of Technology, P.O. Box 9649, Haifa, Israel, Reznick@technion.ac.il, katiaa007@gmail.com

[2] Orthodontic and Craniofacial Department, Graduate School of Dentistry Rambam Health Care Campus, P.O. Box 9602, Haifa, Israel, d_aizenbud@rambam.health.gov.il

Objectives: Cigarette smoke (CS) is an important environmental source of human exposure to a highly toxic and chemically active α,β-unsaturated aldehyde: acrolein. It is capable of causing protein carbonylation and dysfunction, especially in oral tissues of smokers, constantly exposed to CS toxic constituents. The foremost damage is considered to be cumulative, but even a short exposure can be potentially harmful. The objectives of the current study were to examine a short time and dose effects of direct CS and acrolein exposure on intracellular protein carbonylation in epithelial cells.

Methods: HaCaT-keratinocytes were exposed to different doses of acrolein and whole phase CS using a unique smoking simulator apparatus that mimics the exposure in smokers. The rate of intracellular protein carbonyl modification was examined 10-60 minutes after the exposure by Western blot. In addition, the effect of pre-incubation with a thiol scavenger N-acetylcysteine (NAC) was also assessed.

Results: Intracellular protein carbonyls increased as fast as 10 minutes after CS exposure and their concentration doubled after 20 minutes, with a slight elevation afterwards. Also, carbonyl levels increased gradually as CS and acrolein doses were elevated. Addition of 1 mM NAC neutralized part of the damage.

Conclusion: CS and acrolein intracellular protein carbonylation is dose and time dependent. Even a short time exposure to CS and its aldehydic constituents can be potentially harmful.