

Pennsylvania State University Tobacco Center of Regulatory Science

Free Radical Exposure and Oxidative Stress from Conventional and Reduced Nicotine

Cigarettes (Project 3)

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Abstract:

The major source of smoking-related oxidative stress is from exposure to free radicals as tobacco smoke contains $>10^{16}$ reactive oxygen and nitrogen species (ROS/RNS) per puff. Considerable evidence indicates that these free radicals are playing fundamental roles in the development of many diseases including cancer and heart disease. Despite the mechanistic link between free radicals and disease development and the recent Surgeon General's Report, ROS/RNS are not included. We hypothesize that the content of ROS/RNS in mainstream cigarette smoke varies substantially between different tobacco brands and types of conventional cigarettes as well as in newer and developing low nicotine content products. Further, we hypothesize that smokers who switch to low nicotine products will change their smoking behavior in a manner consistent with higher levels of smoke exposure and ROS/RNS delivery. We also predict that the use by smokers of products delivering high levels of ROS/RNS will exhibit higher levels of biological oxidative stress and oxidative damage as assessed by measurement of biomarkers than those using products delivering lower levels of ROS/RNS. in the FDA list of HPHCs. This is due, in part, to a lack of information regarding the relative exposure of smokers of different tobacco products to ROS/RNS and the impact of this exposure on levels of levels of oxidative stress in smokers. As newer tobacco products are developed in response to FDA regulatory policies, an assessment of ROS/NOS is critical to help gauge the relative harm of these products.