Mainstream smoke of the waterpipe: does this environmental matrix reveal as significant source of toxic compounds?


Author information

1German Federal Institute for Risk Assessment (BfR), Department of Product Safety, Thielallee 88-92, 14195 Berlin, Germany. Jens.Schubert@bfr.bund.de

Abstract

In recent years the number of waterpipe smokers has increased substantially worldwide. Here we report on the concentrations of tobacco-specific nitrosamines (TSNAs) and polycyclic aromatic hydrocarbons (PAHs) in waterpipe smoke and the analysis of selected biomarkers indicative for the body burden in waterpipe users. We further identify high amounts of unburned humectants (glycerol and propylene glycol) in the waterpipe smoke as main part of the so-called "tar" fraction. These results give cause for serious concern. For standardization we applied a machine smoking protocol. Smoke was collected on glass fiber filters and analyzed for nicotine, water, humectants, TSNAs, and PAHs. In addition, we determined carbon monoxide and found high amounts in the smoke being causative for high levels of carboxyhemoglobin (COHb) in the blood of smokers. In comparison to the reference cigarette 3R4F, the nicotine contents were 10-times higher, but TSNA levels were found lower in waterpipe smoke. This finding explained the low levels of 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol detected in the urine of waterpipe smokers. Finally, the levels of benzo[a]pyrene were three times higher in waterpipe smoke compared to the reference cigarette. Altogether, the data presented in this study point to the health hazards associated with the consumption of waterpipes.