ABSTRACT

Background

Tobacco smoke is a toxic gas-phase cocktail consisting of a broad range of organics, and free radical intermediates. The formation of smoke from a burning cigarette depends on a series of mechanisms, including generation of products by pyrolysis and combustion, aerosol formation, and physical mass transfer processes.

Methods

The current study simulates the deposition of particulate matter on the human lung surface by trapping the tobacco smoke particulates in situ on silica gel. To mimic this phenomenon, the cigarette was smoked directly on siliga gel. The surface morphology of smoke condensate trapped on silica gel, and pure silica gel (control) was investigated using a scanning electron microscope (SEM). Electron paramagnetic resonance (EPR) was used to explore the presence of free radicals on the particulate matter trapped on silica. Standard procedures for cigarette smoking (ISO 3402:1999) were adopted. The char yields of tobacco cigarette in the temperature range 200–700 °C was also investigated in an inert atmosphere using a quartz reactor.

Results

SEM images showed the surface morphology of pure silica gel was smooth while silica gel on which cigarette smoke was smoked on contained particulates of various sizes. Generally, the particulate size of cigarette smoke adsorbed on silica was found to be 2.47 ± 0.0043 μm (~$PM_{2.5}$). Electron paramagnetic resonance (EPR) results showed a g-value of 2.0037 typically that of a carbon-centred radical.

Conclusions

It is therefore evident from this investigation that cigarette smoke contains surface bound radicals considered harmful to the health of cigarette smokers. The particulate size of tobacco smoke ($PM_{2.5}$) can impact severely on the lives of the cigarette smoking community because of its near ultrafine nature. This significantly small particulate size in cigarette smoke can be

inhaled deeper into the lungs thus causing serious cell injury and possible tumour growth in addition to other grave diseases.