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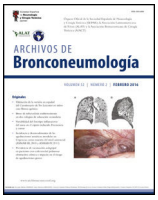

Editorial

Is smoking outside an enclosed space enough to prevent second and third-hand exposure?☆

¿Salir a fumar fuera de un ambiente cerrado es suficiente para evitar el tabaquismo de segunda y tercera mano?

Exposure to secondhand smoke (SHS) is known to have health consequences for non-smokers when they inhale the same harmful substances as the active smoker; children are particularly vulnerable.[1] The International Agency for Research on Cancer has categorized SHS as a group 1 agent that is carcinogenic to humans(adults).[2] Sufficient evidence is available on the relationship of SHS with diseases in non-smokers, such as cardiovascular diseases, neurological diseases (stroke), low birth weight, and nasal disorders, such as irritation and loss of smell.[3] Associations with chronic obstructive pulmonary disease, asthma and diminished lung function have also been proposed.[3] SHS is the third preventable cause of disease worldwide.[4] SHS is a complex and reactive mixture that is made up of the mainstream smoke exhaled by the smoker and the sidestream emitted from the cigarette, both diluted with ambient air. This mixture contains over 4700 chemicals, including amines, carbonyls, hydrocarbons, and metals, among others.[2,5] SHS is not the only source of non-smokers' exposure to tobacco components, as most of the gases and particles of the SHS are deposited on the surfaces, objects, and dust of indoor environments, and in the atmospheric particles of outside environments, forming third-hand smoke (THS).[5,6] These deposited components can be re-emitted into the gas phase or even react with oxidizers and other atmospheric components to yield secondary contaminants, some of which have increased toxicity, such as nicotine, which reacts with ozone, nitrous acid, and other oxidants producing tobacco-specific nitrosamines.[7]

The choice of the biological matrix or matrices to determine the effect of exposure to SHS and THS will depend on the objective and nature of the study to be performed, the life stage of the target population, the type of exposure, and also the availability of robust analytical methods that allow reliable determination of biomarkers of interest in a particular matrix. Urine, saliva, and blood, and more recently hair, skin, and exhaled air, have been used as test matrices.[5]

Smoking is known to produce a high degree of oxidative stress due to the amount of free radicals and reactive oxygen and nitrogen species originating in tobacco smoke.[8] The increase in oxidative stress generates a significant number of low molecular weight and volatile metabolites called volatile organic compounds (VOCs) that can be exhaled in the breath.[8] In fact, smokers exhale 6–10 times more benzene and styrene than non-smokers, along with nonanal, 1,3-butadiene, acetone, benzene, toluene, xylene, limonene, and 2,5-dimethylfuran. The usefulness of the latter as a biomarker of smoking and identification of exposure to SHS is well recognized.[8–11] Retention in the respiratory tract and subsequent exhalation of particulate phase components of mainstream smoke have also been studied.[12] Invernizzi et al.[13] analyzed the amount of particulate matter [PM (concentrations of PM_{10}, $PM_{2.5}$, and PM_1 expressed in $\mu g/m^3$)] in the ambient air of a closed room. They found exhalation of PM that generates an SHS peak 15 times greater than that found in open environments and 10 times greater than that emitted by diesel engines. Similarly, Sahu et al.[14] demonstrated the contribution to SHS of particles distributed in exhaled air.

We know that smoking in smoke-free spaces is forbidden in order to avoid indoor air pollution by SHS. As a result, smokers congregate to smoke outside public places and workplaces and usually go back inside immediately after their last draw. UETA et al.[11] confirm that VOCs continue to be exhaled after the last puff for approximately 10 min, with significantly higher concentrations during the first 5 min. Invernizzi et al.[15] found a washout time of between 18 and 90 s after the last puff for PM with a particle range between 0.3 and 1 μm, which is the most representative size of tobacco smoke. This residual tobacco smoke is a hidden source of SHS and THS that can contribute substantially to indoor pollution.

Therefore, residual tobacco smoke should be considered as an additional source of pollution, so after the last puff in an open space, smokers would need to wait for at least 10 min before returning to avoid polluting inside spaces with their breath.

Conflict of interests

The authors state that they have no conflict of interests.

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