“Key insights into the *invitro* toxicity of airborne particulate matter in urban areas – The involvement of residential wood burning”

Constantini Samara

Exposure to ambient particulate matter (PM) has been linked to adverse health effects such as respiratory and cardiovascular diseases or neurological disorders, hospitalization,and premature mortality. In most epidemiological studies, health effects were linked to PM_{10} or $PM_{2.5}$(i.e., particles with aerodynamic diameters <10μm and <2.5 μm, respectively), that are regulated by Directive 2008/50/ECon ambient air quality and cleaner air for Europe. However, ultrafine particles(UFPs, i.e., particles with aerodynamic diameters 0.1 μm), are of utmost significance from a public health viewpoint, since they have higher pulmonary deposition efficiency and greater surface area which increases their capacity to carry toxic chemicals.

Although firm associations between the ambient PMmass concentrations and adverse health effects have been established, there is still gaps in our knowledge of PM toxicity related to which component(s) of PM, and/or which of their physical and chemical characteristic(s), are responsible. Relating PM toxicity to which component(s) of ambient PM, and/or which of their physical and chemical characteristic(s), are responsible we can better explain the health effects, moreover to develop relevant PM management strategies that will be more effective in addressing public health.

Particulate air pollution constitutes a complex mixture of particles, present in the atmosphere as solids or liquids that vary in mass, number, size, shape, surface area, chemical composition as well as reactivity, acidity, solubility and origin.PM size and chemical composition are critical characteristics determining their biological effects, and many studies have shown that the potential to elicit biological effects are stronger for fine and ultrafine particles than for coarse particles. Location (traffic-impacted, industrial, or background) also influences the PM toxicological outcomes in relation to the specific sources and particle composition. Studies revealed that particles collected at traffic sites were the highest inducers of oxidative and genotoxic potential, although it has alsobeen demonstrated that PM from wood smoke causes inflammation, cytotoxicity, genotoxicity, and oxidative stress.

The economic crisisin Greece, started in 2010, forced a significant shift to woodburning for residential heatingbecause the price of fuel oil increased dramatically. In all Greek cities, this resulted to increased wintertime PM levels and severe concerns for the potential impact of wood smoke on PM toxicity.
On the occasion of this situation, a relevant study was carried out in the city of Thessaloniki, northern Greece, with major objectives: (a) to assess the *in vitro*toxicity of PM at traffic and wood burning sites, and (b) to disclose the potential associations between the observed toxic effects and PM’s size, location/sources and chemical composition.