Combustion-generated carbonaceous urban ultrafine atmospheric UFPs: Waterborneflora traps

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The New Yorker [1] saw London as the cradle of air pollution and there is an element of truth in this. We know that there is a myriad of particulates in the atmosphere and some threaten human health [2]. These include primary (formed at source) or secondary (formed in the atmosphere) particles, such as dust, smoke, ash, carbon black and liquid droplets and can cause haze or fog if their size is 100nm-80[m. PM₁₀ and PM_{2.5} have particulate matter with average sizes \leq 10[m and 2.5 m respectively. EPA defines UFPs as d<100 nm (100 x smaller than PM_{10}). In an urban environment, most UFPs come from vehicle exhausts; they contribute little to mass concentrations but rather contribute to particle number concentrations. It is this number concentration of 20nm NPs that is lowered by roadside vegetation. Thus the air we breathe [3] (averaging 13.6kg [4] or 10,000 litres of air per day for the average adult) potentially contains 0.1-10 trillion particles [4] that target people [5]/animals/plants [6]. Some of these may be ultrafine combustion- and trafficgenerated particles (UFPs) smaller than 100nm [7]. It has been known for many years [8,9] that such airborne particulate pollutants can be biomonitored [10] and attenuated/arrested [11] by terrestrial plants, urban forests [12] and green facades [13]. Figure 1 shows moss on which combustion-generated carbonaceous urban ultrafine particles (UFPs) have been sequestered. Here we explore with temporal and spatial resolution [14] the use of wetland/waterborne with portobello mushroom spores (PMS), chlorella vulgaris (CV) and rotala rotundifolio (RR) to control dieselengine emitted carbonaceous ultrafine particles and the mechanism by which that occurs. In future we need such green technology in improved cities that will protect us from this pollution as we transition to zero-carbon economies.



Figure 1. Diesel-emitted UFPs sitting on the surface of roadside moss (scale 2mm).

References: [1] The New Yorker (April 13, 1968); [2] O.Velentza Exronika 21,233,(2016); [3] N.Pham-Thi Rev.Franc.d'Allerg. 59,524,(2019); [4] A.Tsuda Compr.Physiol. 3,1437-1471 (2013); [5] Sermon and Rust ETH 2021; [6] M.W.Holgate Philo.Trans.Roy.Soc.London 290A,591,(1979); [7] H.S.Kwon Expert.Molec.Med. DI 10.1038/s12276-020-0405-1 (2020); [8] L.H.Gindon The Manchester Flora William White, London (1859); [9] Atmospheric pollution in Leicester HMSO, London (1945); [10] M.A.Urosevic Ecological Indicat. 109,105828,(2020); [11] S.K.Shailendra Sust.Environ.Res. 29,37,(2019); [12] M.J.Kwak Forests 10,960,(2019); [13] A.M.Hunter Ecol.Engin. 63,102,(2014) [14] F.A.Y.Gailey Sci.Tot.Environ. 133,201,(1993)