

kissing organelles – new dynamic behaviour of peroxisomes

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Peroxisomes and mitochondria show a much closer interrelationship (the “peroxisome-mitochondria connection”) than previously anticipated, which is of growing medical importance. They cooperate in the metabolism of fatty acids and reactive oxygen species, but also share components of their fission machinery. If peroxisomes – like mitochondria – also fuse in mammalian cells is a matter of debate and was not yet systematically investigated. We examined potential peroxisomal fusion and interactions in mammalian cells in an interdisciplinary approach by developing an in vivo fusion assay based on hybridoma formation by cell fusion. By combining fluorescence microscopy, live cell imaging and computational modeling we discovered that peroxisomes are engaged in transient, but vivid and long term contacts, without exchanging matrix or membrane markers. Computational analysis showed that transient peroxisomal interactions are complex, exhibit power law behavior and can potentially contribute to equilibrate peroxisome pools throughout the cell. Furthermore, we provide first evidence, that although peroxisomes and mitochondria share components of their fission machinery, mitochondrial fusion proteins (mitofusin 1, 2; OPA1) do not contribute to peroxisomal dynamics. We conclude that mammalian peroxisomes do not fuse with each other in a mechanism similar to mitochondrial fusion, but show an extensive degree of a new dynamic interaction.

OC/EC ratio observations in europe: re-thinking the approach for apportionment between primary and secondary organic carbon

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Suspended particles in the atmosphere contain a significant amount of carbonaceous matter which is commonly divided in elemental carbon (EC) and organic carbon (OC). EC is emitted directly into the atmosphere (primary EC) from incomplete burning of fossil fuels and biomass. OC may be emitted directly as particles (primary OC) or formed from gas-to-particle conversion of gaseous precursors in the atmosphere (secondary OC). Primary OC sources include combustion processes or mechanical processes that release into the atmosphere organic materials such as pollen, plant debris and soil. OC has health-relevant properties since its chemical composition includes toxic constituents and climate-relevant properties since fine OC particles are very efficient at scattering light.

The importance of the different OC sources, however, still cannot be estimated accurately because source apportionment methodologies have limitations. A commonly used method for the indirect evaluation of secondary OC in aerosols is based on the minimum values of OC/EC ratios, considering that those represented samples containing exclusively primary carbonaceous aerosol from fossil fuel combustion.

A large set of carbon measurements in aerosols was used to evaluate the capability of the OC/EC minimum ratio to represent the ratio between the OC and EC fractions resulting from fossil fuel combustion. The data set covers a wide area in Europe and includes a great variety of sites. Urban

background sites have shown consistent minimum ratios suggesting that it can be used as an effective tool to derive the ratio between OC and EC from fossil fuel combustion and consequently to differentiate OC from primary and secondary sources. However, our measurements undertaken in a tunnel and two road sites, in Lisbon and Madrid, strongly influenced by fresh vehicle emissions, revealed lower values for the OC/EC minimum ratio than usual measurements taken in less extreme urban environments. These results were indicative of an elevation of the OC/EC minimum ratio with additional OC, presumably secondary, in urban background air. Therefore, the OC/EC ratios derived from the tunnel are probably more representative of road transport emissions than those derived from application of OC/EC minimum ratios taken from open air measurements in urban areas. The findings of this study may have significant implications for the development air pollutant emission inventories and may be used for more accurate simulations of the anthropogenic forcing of aerosol on climate.

