

The sea on prescription: investigating the link between sea spray aerosols and human health benefits

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In blue spaces related health research, focus has primarily been on environmental determinants as drivers and contributors to disease onset and negative health effects, while the positive health effects still largely have to be clarified. Most progress on positive effects of marine environmental determinants has been made in the field of psychology where positive associations were established between the presence of blue spaces, and mental health and wellbeing. Current research however fails to explain the possible physiological health effects associated with living near blue spaces. Therefore, the present study aims to expand our fundamental mechanistic knowledge on how exposure to coastal environments, via inhalation of marine microbiota and biologically produced organic molecules (i.e. biogenics), contributes to physiological health benefits.

Oceans produce sea spray aerosols at the air-sea interface by bursting bubbles from breaking waves. These sea spray aerosols contain a mixture of microbiota and biogenics and can be inhaled by coastal populations. This research builds on the hypothesis that inhalation of these low concentrations of marine microbiota and biogenic molecules by acute and/or chronic exposure to coastal environments potentially interacts with cell signaling pathways, leading to positive health effects. To test this hypothesis, this study is currently recruiting healthy adults between 18 and 50 years old. Three different groups will be tested: (1) a group living inland and exposed to a coastal environment during this study, (2) a reference group living at the coast for more than 1 year and (3) a reference group living inland for more than 1 year.

The total coastal exposome of the participants will be taken into account. The exposome concept contains three overlapping domains: a general external exposome, a specific external exposome and an internal exposome. The general external coastal exposome will be investigated based on climate data from weather stations and geographical mapping methods. The specific external coastal exposome will be analyzed based on questionnaires of the participants. Lastly, the internal coastal exposome comprises the imprints of the coastal exposures in the human body and will be analyzed by using innovative minimally invasive microsampling methods and swabs to characterize key biomarkers of coastal exposure.

This research will provide for the first time insights into the role of sea spray aerosols as potential contributors to positive health outcomes of coastal environments. It applies a transdisciplinary approach, combining the strengths of marine ecology and human health, to map the coastal exposome. The results will form a solid base for the next decade of transdisciplinary research within 'Oceans & Human Health' and exposome research. It can furthermore inform future health promotion efforts through exposure to coastal environments.

Keywords

Ocean; Human Health; Exposome; Sea Spray Aerosols