

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. Current research fails to explain the possible physiological health effects associated with living near the coast. Therefore, my research aims to expand our fundamental mechanistic knowledge on how exposure to coastal environments can contribute 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 inorganic salts, microbiota and bioactive molecules and can be inhaled by coastal populations. My research builds on the hypothesis that inhalation of these low concentrations of marine microbiota and biogenic molecules by exposure to coastal environments potentially interacts with pathways in the human body, leading to positive health effects.

To test this hypothesis, in the summer of 2024, a study was performed with 67 healthy adults between 18 and 50 years old. Three different groups were tested: (1) a group living at the coast for more than 1 year, (2) a group living inland for more than 1 year and (3) a group living inland throughout the year, but spending a lot of time at the coast during the study period.

The total coastal exposome of the participants was 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 was investigated based on climate data from weather stations, GPS data from the participants and samples of sea air (analysed for marine microbiota and bioactive molecules). The specific external coastal exposome was analysed based on questionnaires of the participants. Lastly, the internal coastal exposome was analysed by nose swabs of the participants to characterize the marine microbiota and bioactive molecules inhaled. Additionally, VAMS (volumetric absorptive micro-sampling) methods were used to collect blood samples, in which immune biomarkers will be measured.

This research will help provide 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.

Keywords

Ocean; Air; Human health; Exposome; Sea spray aerosols