

Effects of marine bacteria and their endotoxin in sea spray aerosols on pro-inflammatory gene expression in human cells

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Many epidemiological studies have shown that people living at the coast (< 5 km) usually have better health including fewer mental problems, a lower BMI, fewer chronic diseases and increased longevity. Sea spray aerosols (SSAs), respirable particles ranging in size from 0.1 to 10 µm, are widely distributed in the air over the coast. Composed of many marine-originated bioactive molecules (e.g., antibiotics, toxins and antitoxins, antitumor and antimicrobial agents and bioactive enzymes), airborne exposure to SSAs has been suggested as a contributing mechanism for coastal health benefits. Current studies about the effects of SSAs and their compounds (e.g., phytotoxins) on human health have shown both benefits and risks, and the underlying mechanisms including the functional substances and dose-response relationships are still unclear and need further study. Gram-negative (G⁻) bacteria are ubiquitous in marine environments. Endotoxin or lipopolysaccharides (LPS), a major component of the outer membrane of G⁻ bacteria, can activate immune cells and stimulate the production of pro-inflammatory cytokines. Endotoxin of G⁻ marine bacteria often show low virulence, presenting potential in the development of drugs for the therapy and/or prevention of asthma, septic shock and other diseases. We hypothesized that marine bacteria and their endotoxin contribute to SSAs' health benefits. In this study, we will expose human cells to a series of SSAs samples with different concentrations. The bacterial count and endotoxin concentration in SSAs, and the expression of pro-inflammatory genes in human cells will be determined. We expect that our results will provide useful information for further marine and coastal health effects research.

Keywords

Sea Spray Aerosols; Marine Bacteria; Bacterial Endotoxin; Pro-Inflammatory Genes; Human Cells