

The molecular basis for positive health effects of sea spray on human lung cells

Asselman Jana¹, Van Acker Emmanuel¹, De Rijcke Maarten², Tilleman Laurentijn³, Van Nieuwerburgh Filip³, Mees Jan², De Schampelaere Karel¹ and Janssen Colin¹

¹ Laboratory of Environmental Toxicology and Aquatic Ecology, Environmental Toxicology Unit - GhEnToxLab, Ghent University, Campus Coupure, Coupure Links 653, Building F - 2nd Floor, Gent, Belgium

E-mail: jana.asselman@ugent.be

² Flanders Marine Institute (VLIZ), Wandelaarkaai 7, 8400 Oostende, Belgium

³ Laboratory for Pharmaceutical Biotechnology, Faculty of Pharmaceutical Sciences, Ghent University, Campus UZ, Ottergemse Steenweg 460, 9000 Ghent, Belgium

The positive health effects of living in coastal areas have generally been attributed to psychological mechanisms. Recently, it has been suggested that sea spray aerosols cause beneficial health effects through interaction with the mTOR signaling pathway. Here, we provide molecular evidence to support this hypothesis. Using in-vitro experiments, we exposed human epithelial lung cells to extracts of natural sea spray aerosols sampled at the sea shore, sea spray aerosols generated in the laboratory, pure homoyessotoxin and a chemical mTOR inhibitor. We observed significant effects on the mTOR pathway in all exposed samples. Similar to the chemical mTOR inhibitor, we observed a downregulation of genes involved in the mTOR pathway for natural sea spray aerosols. Downregulation and inhibition of the mTOR pathway have been associated with positive health effects in numerous studies. Furthermore, we observed significant regulation of genes and pathways that are closely linked with mTOR most likely caused by the effects on the mTOR pathway. These genes and pathways include the new potential pharmaceutical target PCSK9 and the steroid biosynthesis. For all genes and pathways, the effects of the natural sea spray aerosol and the chemical mTOR pathway were highly similar. This suggests that natural sea spray aerosols contain molecules similar to the chemical mTOR inhibitor, at least in terms of effects, and highlight the potential of sea spray aerosols as new potential pharmaceutical leads. Overall, these results provide a substantial molecular evidence base for positive health effects of sea spray aerosols through the mTOR pathway in human long cell lines.

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