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Microbial degradation on glacier surface is the missing piece of environmental fate of pesticides in cold areas

Roberto Ambrosini (1), Claudia Ferrario (1), Francesca Pittino (1), Ilario Tagliaferri (1), Isabella Gandolfi (1), Giuseppina Bestetti (1), Roberto S. Azzoni (2), Guglielmina A. Diolaiuti (2), Claudio Smiraglia (2), Andrea Franzetti (1), and Sara Villa (1)

(1) Department of Earth and Environmental Sciences, University of Milano-Bicocca, Milan, Italy, (2) Department of Earth Sciences "Ardito Desio", University of Milano, Milan, Italy

Organic contaminants deposited on glacier surfaces undergo different partition and degradation processes which determine their environmental fate and accumulation into the trophic chains. Among these processes, biodegradation by supraglacial bacteria has been neglected so far.
To assess the relevance of biodegradative processes, in situ microcosm experiments were conducted simulating cryoconite hole systems on an Alpine glacier exposed to the organophosphorus insecticide chlorpyrifos (CPF) as model of xenobiotic molecule which accumulate on glaciers after medium range transports.
Results showed that biodegradation is the most efficient process contributing to the removal of CPF on the glacier surface. The high concentrations of CPF in cryoconite and its half-life in the range of 35 – 69 days indicated that biodegradation process can significantly contrast the release of CPF transported on glaciers. Moreover, the metabolic versatility of cryoconite bacteria suggest that these habitats might contribute to the degradation of a wide class of pollutants with different physical–chemical properties.
Metagenomics data indicated that photoheterotrophic bacteria might be involved in the biodegradation of CPF by using light to supplement their metabolic demands, thus contributing to the biological removal of CPF without the constrain of using this pesticide as sole energy source.
In conclusion. cryoconite might act as a "biofilter" for organic pollutants on glaciers by accumulating them and promoting their biodegradation. Owing to its relevance, the contribution of cryoconite to the removal of organic pollutants should be included in the models predicting the environmental fate of these compounds in cold areas.