TITLE: RESPONSE OF THE BACTERIAL COMMUNITY IN OIL-CONTAMINATED MARINE WATER TO THE ADDITION OF CHEMICAL AND BIOLOGICAL DISPERSANTS

AUTHORS: COUTO, C.R.A.[a]; JURELEVICIUS, D.A.[a]; ALVAREZ, V.M.[a]; VAN ELSAS, J.D.[b]; SELDIN, L.[a]

INSTITUTION: [a]INSTITUTO DE MICROBIOLOGIA PAULO DE GOES, UNIVERSIDADE FEDERAL DO RIO DE JANEIRO, RIO DE JANEIRO, BRAZIL, [b]MICROBIAL ECOLOGY DEPARTMENT, UNIVERSITY OF GRONINGEN, GRONINGEN, THE NETHERLANDS

ABSTRACT:
The use of dispersants in different stages of the oil production chain and for the remediation of water and soil is a well established practice. However, the choice for a chemical or biological dispersant is still a controversial subject. Chemical surfactants that persist long in the environment may pose problems of toxicity themselves; therefore, biosurfactants are considered to constitute an environmentally friendly and effective alternative. Nevertheless, the putative effects of such agents on the microbiomes of oil contaminated and uncontaminated marine environments have not been sufficiently evaluated. Here, we studied the effects of the surfactant Ultrasperse II® and the surfactin (biosurfactant) produced by *Bacillus* sp. H2O-1 on the bacterial communities of marine water. Specifically, we used quantitative PCR, genetic fingerprint analyses and high throughput sequencing to study the abundance, structure and composition of the bacterial communities in marine water collected from two regions with contrasting climatic conditions – Grumari beach, Rio de Janeiro, Brazil, and Schiermonnikoog Island, Groningen, The Netherlands. The addition of either chemical surfactant or biosurfactant influenced the structure and abundance of total and oil-degrading bacterial communities of oil-contaminated and uncontaminated marine waters. Remarkably, the bacterial communities responded similarly to the addition of oil and/or either the surfactant or the biosurfactant in both set of microcosms. DNA sequencing (after 30 days of incubation) revealed that the addition of dispersants promoted changes in the diversity of bacterial community. The treatment of water and oil-contaminated water with surfactin promoted an increase in abundance of *Planctomycetes*, and a decrease of *Actinobacteria* phyla in both set of microcosms, compared with the control. The *Proteobacteria* and *Bacteroidetes* phyla were found in all microcosms. After 30 days of incubation, the addition of surfactin enhanced the oil-degrading bacteria more than the chemical surfactant. However, no increase of hydrocarbon biodegradation values was observed, irrespective of the dispersant used. These data contribute to an increased understanding of the impact of novel dispersants on marine bacteriomes before their commercial release into the environment.

Keywords: Biosurfactant, Surfactin, Dispersant, Ultrasperse II, Oil-contaminated marine water, Bacterial community

Development Agency: CNPq, Petrobras