Bacterial colonization of microplastics in beaches of Tenerife (Canary Islands, Spain)

Cintia Hernández-Sánchez*†[1,2], Javier González-Sálamo[3], Francisco Javier Díaz Peña[4], Javier Hernández-Borges[5,6], Cristobalina Rodríguez-Álvarez[7], and Ángeles Arias[7]

[1]Instituto Universitario de Enfermedades Tropicales y Salud Pública de Canarias, Universidad de La Laguna (ULL) – Avda. Astrofísico Fco. Sánchez, s/nº, 38206 San Cristóbal de La Laguna, Spain
[2]Departamento de Obstetricia y Ginecología, Pediatría, Medicina Preventiva y Salud Pública, Toxicología, Medicina Forense y Legal y Parasitología, Área de Medicina Preventiva y Salud Pública – Escuela Politécnica Superior de Ingeniería, Sección de Náutica, Máquinas y Radioelectrónica Naval, Universidad de La Laguna (ULL). Vía Auxiliar Paso Alto, nº 2, 38001 Santa Cruz de Tenerife, Spain
[3]Departament of Chemistry, Sapienza University of Rome – P.le Aldo Moro 5, 00185 Rome, Italy
[4]Departamento de Biología Animal, Edafología y Geología, Facultad de Ciencias, Universidad de La Laguna (ULL) – Avda. Astrofísico Fco. Sánchez s/n. 38206, San Cristóbal de La Laguna, Spain, Spain
[5]Departamento de Química, Unidad Departamental de Química Analítica. – Avda. Astrofísico Fco. Sánchez s/nº, Facultad de Ciencias Universidad de La Laguna, Spain
[6]Instituto Universitario de Enfermedades Tropicales y Salud Pública de Canarias – Universidad de La Laguna (ULL), Avda. Astrofísico Fco. Sánchez, s/nº. 38206 San Cristóbal de La Laguna, Spain., Spain
[7]Departamento de Obstetricia y Ginecología, Pediatría, Medicina Preventiva y Salud Pública, Toxicología, Medicina Forense y Legal y Parasitología, Área de Medicina Preventiva y Salud Pública – C/ Sta. María Soledad, s/n. Facultad de Ciencias de la Salud. Sección de Medicina., Spain

Abstract

Isolated systems like islands, experience important problems related to microplastic debris on their beaches (1,2). This problem is also increased by the formation of microbial biofilms on the surface of the microplastics present in such aquatic environments, which provides potential facilities for microorganisms to survive in the biofilm. Apart from that, microplastics act as a vehicle for the dispersion of pathogenic organisms around coastal waters, constituting a new route of exposure for humans (3).
Although in Europe, the Bathing Water Directive uses Faecal Indicator Organisms (FIO), such as *Escherichia coli* and *Intestinal enterococci*, as key parameters for the monitoring and control of bathing water quality (Directive 2000/7/EC), their presence is not analysed in microplastics deposited on such beaches, despite the fact that they provide a more durable substrate for these and other microorganisms than their natural reservoirs (4).

The objective of this study was to analyze the microbial content (FIO and *Vibrio spp*) of microplastics (fragments and pellets) collected on six beaches (Almáciga, El Socorro, Las Teresitas, Playa Grande, Puertito de Adeje, La Viuda and Punta del Bocinegro) on Tenerife,

*Speaker
†Corresponding author: chernans@ull.edu.es

Canary Islands (Spain). Results show that *Escherichia coli* was present in 57.1% of the fragments and 28.5 % of the pellets studied. In the case of *Intestinal enterococci,* 85.7% of the fragments and 57.1% of the pellets tested positive for this parameter. Finally, 100% of the fragments and 42.8% of the pellets analyzed in the different beaches contained *Vibrio spp.* Results obtained in this study show that microplastics act as reservoirs of microorganisms that can increase the presence of bacteria that indicate faecal and pathogen contamination in bathing areas.

1 *Mar. Pollut. Bull.*, 2019, **146**, 26–32.

2 *Mar. Pollut. Bull.*, 2020, **151**, 110847.

3 *Trends Microbiol.*, 2021, **29**, 107–126.
4 *Nat. Rev. Microbiol.* 2020, **18**, 139–151.

Keywords: microplastics, microorganisms, Canary Islands, public health.