
Plastics, pathogens, and persistence: important clinical *E. coli* strains can survive and retain their virulence on environmental plastic waste

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Abstract

Diarrhoeagenic *Escherichia coli* (DEC) has been identified as a leading cause of diarrhoeal disease globally, with nearly 1.7 billion cases identified each year. There are increasing reports of DEC being found in hospital effluents and in sewerage systems, which are not designed to tackle bio-medical waste. Hospital effluents often harbour antibiotic resistant pathogens, many of which can cause infections that are becoming harder, and sometimes impossible, to treat. Untreated sewage from wastewater treatment works is often discharged directly into receiving waters and can be washed up onto riverbanks and bathing beaches. This waste often includes plastics such as disposable wet wipes, cotton bud sticks and sanitary products, which are regularly colonised by sewage-associated bacterial pathogens. Here, we employed a novel sampling strategy to examine the ability of isolates encompassing the major clinical *E. coli* groups; enterohaemorrhagic *E. coli* (EHEC); enterotoxigenic *E. coli* (ETEC); adherent-invasive *E. coli* (AIEC); and uropathogenic *E. coli* (UPEC), to colonise and persist on environmental plastics. Using luciferase expressing variants of each strain, we have demonstrated that these pathogens are able to survive on plastics under environmental conditions for up to 28 days. Importantly, we have shown that these strains retain their virulence (using a *Galleria mellonella* model as a surrogate for human infection) after 28 days in the plastisphere. This indicates that plastics in the environment can act as a reservoir for dangerous human pathogens and facilitate persistence for extended periods of time. Plastics colonised by pathogens may present a heightened risk to public health particularly in areas where people are exposed to plastic pollution.

Keywords: Human health, plastisphere, pathogenesis, persistence

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