Occurrence and Distribution of Antibiotic Resistance in Arctic Bacteria related to Environmental Antibiotic Exposure and Human Fecal Contamination

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ABSTRACT

Approximately 10000 tones of antibiotics are administered to humans and animals each year in Europe, and 30-90% is excreted in feces and urine as intact substances. Sewage treatment plants are lacking in Sisimiut (Greenland), and municipal wastewater is discharged directly into the sea. Thus, untreated wastewater containing active antibiotics from Sisimiut´s hospital is discharged into the bay *Ulkebugten*. The presence of antibiotics in marine environment might promote bacterial antibiotic resistance which represents a problem for both the marine ecosystem and human health, as well as a threat for the consumers of Greenlandic fish and, therefore, for the Greenlandic economy.

This project investigates the occurrence of antibiotic resistance in bacteria in relation to environmental antibiotic exposure and human fecal contamination, as well as the presence of mammalian enterobacteria in mussels and stationary fish in relation to waste water exposure. Mussels and sculpins were collected from a contaminated site (bay *Ulkebugten,* by the hospital) and a reference site (uninhabited island *Frederik VII´s Ø*). Bacteria from mussel´s hepatopancreas and sculpin´s gut were extracted and tested for antibiotic resistance by plate culturing on antibiotic substrates. Bacteria resistant to ciprofloxacin were only found in the contaminated site, suggesting that resistance towards this antibiotic has been acquired there. Resistance towards ampicillin and amoxicillin may also have been acquired at the contaminated site. *E. coli* was found in the contaminated site, which suggests the existence of fecal contamination. *Aeromonas hydrophila* or *Vibrio fluvialis,* both potential human pathogens, resistant to ampicillin was also found in the contaminated site. Different composition between the bacterial communities from the contaminated and reference sites was also observed, and this may be due to the selective pressure exerted by antibiotics in the contaminated site.