Pathogenic *Vibrio* spp. in coastal sediments

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Introduction: Availability of waterways and marine facilities are essential for navigation. Erosion and deposition of sediments are driven by currents and are permanently influencing navigable inland and coastal waters. According to this, sediment management is an integral part of the maintenance and construction of waterways.
Due to the complexity of the water-soil-sediment-groundwater system and the diverse interactions between water quantity, quality and economic activities an integrated sediment management approach is highly complex and challenging. Thereby uncertain consequences of climate change and its impacts have to be considered.
One aspect of water and sediment quality to be addressed within sediment management should consider natural microbial organisms and their possibility to cause severe human diseases. Since 1994 for example, outbreaks of *Vibrio*-related wound infections have frequently been reported for the Baltic Sea coast following heat waves (e.g. Andersson & Ekdahl 2006, Hoyer et al. 1995, Lukinmaa et al. 2006). For the more saline waters of the North Sea, only single cases of *Vibrio*-related wound infections have been reported so far (e.g. Schets et al. 2006).
In this project we investigate pathogenic *Vibrio* spp. in North Sea sediments, their role in sediment dynamics and their potential health hazard. Our findings will result in developing adaptation options for the sustainable and safe use of waterways for shipping, fishing and recreation purposes.

Methods: Water and sediment samples were taken monthly at 11 bathing sites along the North Sea coast and within the estuaries of the rivers Ems and Weser in the federal state of Lower Saxony (Germany). Water and sediment samples were tested for *V. vulnificus*, *V. alginolyticus*, *V. parahaemolyticus* and *V. cholerae* using the most probable number series (MPN) approach. For sediment MPNs, declining volumes of sediment were directly weighed into tubes containing peptone water and incubated overnight at 36°C. MPN tube contents were inoculated onto TCBS and ChromeAgar plates and incubated again.

Results: A total of 70 sediment and 72 water samples were retrieved between September 2009 and May 2010. *V. vulnificus* was not detected at any of the sampling sites during the investigation period (-2°C and 18°C water temperature). *V. cholerae* (non-O1, non-O139-serovars) was detected only thrice. *V. alginolyticus* was the predominant *Vibrio* species and detected at all sampling sites with 71% of water and 91% of sediment samples being positively tested. *V. parahaemolyticus* occurred at all sampling sites, however was only the second most dominant species with 39% of water and 64% of sediment samples being positively tested for this organism. Sediments were more often positively tested for these two species than water samples and germ concentrations were approximately one order of magnitude higher in sediments than in the water, a phenomenon observed before (Vezzulli et al. 2009). Detection of *V. parahaemolyticus* and *V. alginolyticus* was strongly related to water temperature. While 100 % of water samples were positively tested in September (~18°C), only 25% of water samples were positively tested in January (~0°C). The temperature effect was less pronounced in the sediments, particularly for *V. alginolyticus*.

Discussion: Sediment *Vibrios* were consistently more abundant than those in the water and more resistant towards cold temperatures. Thus, sediments seem to serve as a potential hideaway and reservoir for these organisms in winter, especially for *V. alginolyticus*. When handling sediment, this aspect should be considered.
The monitoring program will be continued (at least) until winter 2010 which will allow us to pinpoint more clearly possible trends in terms of *Vibrio* spp. ecology in the North Sea already during the conference.

References: [1] Andersson & Ekdahl (2006) *Eurosurveillance* **11**(31):3013pp; [2] Hoyer et al. (1995) *European Journal of Clinical Microbiology & Infectious Diseases* **14**(11):1016-1018; [3] Lukinmaa et al. (2006) *Diagnostic Microbiology and Infectious Disease* **54**(1):1-6; [4] Schets et al. (2006) *Eurosurveillance 11*(45):3077 pp; [5] Vezzulli et al. (2009) *Microbial Ecology* **58**(4):808-818.