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The detection of extracellular DNA as a structural component in the EPS of bacterial strains

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It is generally assumed that nucleic acids are localized inside of living cells and that their priority function is the storage of information. In contrast to this, extracellular DNA is mainly considered as remnant of lysed cells. Studies on the degradation and turnover of extracellular DNA in marine sediments suggest their role in the P cycle of marine ecosystems (1). In native soil systems, extracellular DNA can persist for a long time and it has been demonstrated that extracellular DNA can be transported by water (2). In most natural environments bacteria live in association with surfaces in structures known as biofilms, which is the prevailing microbial lifestyle. Extracellular polymeric substances (EPS) act as multifunctional elements in these biofilms. They form the matrix and stabilize the spatial structure (3). The major components of EPS are not only polysaccharides but also proteins, lipids, and nucleic acids (4), which are the focus of the present study (5). Environmental bacterial isolates were cultivated on oligotrophic media. Phylogenetic affiliation revealed the strains as members of the alpha-, beta-, and gamma-*Proteobacteria* as well as the Cytophaga/Flavobacteria group. The eDNA of all strains was organised as a filamentous network and closely bound to the cell surface as seen with epifluorescence and electron microscopy. The isolated eDNA gave a distinct band on a 0.7% agarose gel in the size range of the genomic DNA. Digestion with DNAse eliminated the band, whereas Proteinase K and RNAse A had no effect. Restriction analysis with various restriction endonucleases and RAPD fingerprint-PCR resulted in a high amount of sequence similarities but revealed also differences between the eDNA and genomic DNA of the strains. Moreover we were able to amplify the 16S rRNA-genes with universal primers from the eDNA

of all three strains. Our results indicate a new function of extracellular DNA possibly as a structural component.

References:

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