Accumulation of Faecal Indicator Bacteria in River Biofilms

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Aim of the study
- Surface waters are contaminated with faecally derived bacteria from sewage effluents and agricultural run-off.
- *Escherichia coli* and intestinal enterococci serve as microbiological parameters indicating faecal pollution and the possible presence of pathogenic organisms.
- Total coliforms, which are either of faecal or environmental origin, provide basic information on surface water quality.
- Can these bacteria accumulate in river biofilms, indicating their function as potential reservoirs for pathogens of faecal origin?

Methods
- Ten samplings of water and biofilms were performed at different sites of surface waters:
  - River Ruhr (Mülheim a. d. Ruhr)
  - Moersbach (Moers)
  - Anrathskanal (Moers)
- Sample collection:
  - River water, epilithic biofilms and sediment biofilms
- Detachment and dispersal of biofilms:
  - 10 g wet weight of epilithic biofilms were dispersed in 90 ml water for 20 min by Stomacher treatment.
  - 10 g wet weight of sediment biofilms were dispersed in 90 ml water for 10 - 20 min with by sonication in an ultrasonic bath.
- Microbiological analysis:
  - Total cell counts (TCC) of water varied between 1x10^6 and 1x10^7 cells/ml.
  - Biofilms displayed cell counts between 2x10^3 and 5x10^6 cells/ml.
  - HPC percentages of TCC were 0.2 to 17 % in water and 0.04 to 8.2 % in biofilms.
  - *E. coli* and enterococci were detected in all water and biofilm samples.
  - The concentration of *E. coli* ranged from 4x10^1 to 1x10^5 MPN/ml in water and from 1x10^1 to 2x10^3 MPN/100g wet weight in biofilms.
  - Enterococci varied between 4x10^3 and 5x10^5 cfu/100ml in water and 3x10^4 to 3x10^5 CFU/100g wet weight in biofilms.

Conclusions
- Faecal indicator bacteria accumulate in river biofilms at levels approximately one to three log units higher than in the bulk water phase.
- Biofilms in polluted surface waters may be reservoirs for pathogenic microorganisms and contribute to the deterioration of water quality by releasing faecally derived pathogens.
- Such processes have to be considered in risk assessments for surface waters which are used as source water for drinking water production or for recreational purposes.

Results
- Levels of all microbiological parameters were always higher in biofilms than in the water phase.
  - Total cell counts (TCC) of water and biofilms were dispersed in 90 ml water for 20 min by Stomacher treatment.
- Detachment and dispersal of biofilms:
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![Graphs and tables showing accumulation of faecal indicator bacteria in river biofilms](image-url)