New papers on microbiology of the built environment, March 22, 2016

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Microbes and humans

Review: The Anthropocene: a conspicuous stratigraphical signal of anthropogenic changes in production and consumption across the biosphere – Mark Williams – Earth’s Future (OA)

Biospheric relationships between production and consumption of biomass have been resilient to changes in the Earth system over billions of years. This relationship has increased in its complexity, from localized ecosystems predicated on anaerobic microbial production and consumption to a global biosphere founded on primary production from oxygenic photoautotrophs, through the evolution of Eukarya, metazoans, and the complexly networked ecosystems of microbes, animals, fungi, and plants that characterize the Phanerozoic Eon (the last ½4541 million years of Earth history). At present, one species, Homo sapiens, is refashioning this relationship between consumption and production in the biosphere with unknown consequences. This has left a distinctive stratigraphy of the production and consumption of biomass, of natural resources, and of produced goods. (…)

Microbes in homes

Qualitative and Quantitative Analysis of Microbial Communities in Household Dishwashers in Germany — Britta Brands — Tenside Surfactants Detergents ($31.50, sponsored by Miele, but not enough to provide open access, apparently)

The proper cleaning of used dishes provides an essential means to maintain a sufficient hygiene level on food contact surfaces. However, little is known on the microbiological quality
of domestic dishwashers themselves, especially in relation to consumer habits. This study investigated dishwashers in German households to analyse the number and composition of microbial colonisers and their putative impact on dishwashing hygiene. Although the microbiological status of dishwashers appeared to depend on multiple factors, data suggest that a trend towards lower temperatures might effect in a decreased hygiene.

Microbes in hospitals

Assessment of contamination using an ATP bioluminescence assay on doorknobs in a university-affiliated hospital in Japan – Naoko Kajigaya – BMC Research Notes (OA)

(…) We monitored doorknob contamination in a university hospital using an ATP bioluminescence assay and stamp agar method. (…) When comparing ATP values on the same type of doorknobs, significant differences in contamination were demonstrated among several clinical rooms and several rooms in wards during all three seasons. No correlation was observed between ATP values on clinical-examination-room doorknobs and outpatient numbers, or between ATP values at any monitoring point and microbial colony-forming units. ATP values on clinical-examination-room doorknobs were reduced after cleaning according to instructions. (…) Our findings confirm the need to improve routine decontamination in clinical departments. We need to analyze further the relationship between hospital-acquired infections and doorknob contamination, as assessed by ATP assay in clinics.

Microbes and food


(…) This study was aimed at identifying some microbial communities of fresh produce by analyzing 105 samples of imported fresh fruits and vegetables originated from different countries in the world including local samples (Oman) for aerobic plate count and the counts of Enterobacteriaceae, Enterococcus, and Staphylococcus aureus. The isolated bacteria were identified by molecular (PCR) and biochemical methods (VITEK 2). Enterobacteriaceae occurred in 60% of fruits and 91% of vegetables. Enterococcus was isolated from 20% of fruits and 42% of vegetables. (…) Phylogenetic trees showed no relationship between clustering of the isolates based on the 16S rRNA gene and the original countries of fresh produce. Intercountry passage of opportunistic pathogens in fresh produce cannot be ruled out, which requires better management.

Helicobacter pylori in bottled mineral water: genotyping and antimicrobial resistance properties — Reza Ranjbar — BMC Microbiology (OA)
Genotyping using virulence markers of H. pylori is one of the best approaches to study the correlations between H. pylori isolates from different samples. The present research was carried out to study the vacA, cagA, cagE, oipA, iceA and babA2 genotyping and antimicrobial resistance properties of H. pylori isolated from the bottled mineral water samples of Iran. Of 450 samples studied, 8 samples (1.77 %) were contaminated with H. pylori. Brand C of bottled mineral water had the highest prevalence of H. pylori (3.63 %). (…) Contaminated bottled mineral water maybe the sources of virulent and resistant strains H. pylori. Careful monitoring of bottled mineral water production may reduce the risk of H. pylori transmission into the human population.

**Microbes, soil, and waste**

Managing microbial risks from indirect wastewater reuse for irrigation in urbanizing watersheds– Matthew Eric Verbyla – Environmental Science & Technology ($40.00 for 48 hours of access!!!!)

Limited clean water supplies in urbanizing watersheds create challenges for safely sustaining irrigated agriculture and global food security. On-farm interventions, such as riverbank filtration (RBF), are used in developing countries to treat irrigation water from rivers with extensive fecal contamination. Using a Bayesian approach incorporating ethnographic data and pathogen measurements, quantitative microbial risk assessment (QMRA) methods were employed to assess the impact of RBF on consumer health burdens for Giardia, Cryptosporidium, rotavirus, norovirus, and adenovirus infections resulting from indirect wastewater reuse, with lettuce irrigation in Bolivia as a model system.(…) Variability and uncertainty associated with environmental and cultural factors affecting exposure correlated more with QMRA-predicted health outcomes than factors related to disease vulnerability. Policies governing simple on-farm interventions like RBF can be intermediary solutions for communities in urbanizing watersheds that currently lack wastewater treatment.

Cry1Ac Transgenic Sugarcane Does Not Affect the Diversity of Microbial Communities and Has No Significant Effect on Enzyme Activities in Rhizosphere Soil within One Crop Season – Dinggang Zhou – Frontiers in Plant Science (OA)

Cry1Ac transgenic sugarcane provides a promising way to control stem-borer pests. Biosafety assessment of soil ecosystem for cry1Ac transgenic sugarcane is urgently needed because of the important role of soil microorganisms in nutrient transformations and element cycling, however little is known. This study aimed to explore the potential impact of cry1Ac transgenic sugarcane on rhizosphere soil enzyme activities and microbial community diversity, and also to investigate whether the gene flow occurs through horizontal gene transfer. We found no horizontal
gene flow from cry1Ac sugarcane to soil. No significant difference in the population of culturable microorganisms between the non-GM and cry1Ac transgenic sugarcane was observed, and there were no significant interactions between the sugarcane lines and the growth stages. (...) We conclude, based on one crop season, that the cry1Ac sugarcane lines may not affect the microbial community structure and functional diversity of the rhizosphere soil and have few negative effects on soil enzymes.

Effect of copper and zinc on microbial tolerance to triclosan in two soil types – Gerty J. H. P. Gielen – Journal of Soils and Sediments (OA)

(...) In this study, the tolerance to triclosan was examined for soil microbial communities chronically pre-exposed to one of two heavy metals (Cu or Zn) and the antimicrobial triclosan. This was investigated in two different soil types. (...) Exposure to mixtures of both triclosan and copper in the Horotiu sandy loam reduced microbial biomass, increased metabolic activity and reduced microbial tolerance to triclosan. (...) Mixture effects could become a cause for concern when soil microbial communities are exposed to triclosan in fertile soils with copper concentrations in excess of 50 mg kg⁻¹ and could be especially important in the more coarsely textured soils. Current regulations for soil contaminants only consider the risk and effects of single contaminants. Greater protection of soil resources could result from considering mixture effects and soil types.

Microbial enzymes as an early warning management tool for monitoring mining site soils – Mohammad Wahsha – CATENA ($41.95)

Soil contamination may influence negatively soil health, which often limits and sometimes disqualifies soil biodiversity and decreases plant growth. However, the increased concentration and distribution of potentially toxic elements (PTEs) in soils by mismanagement of industrial activities, overuse of agrochemicals, and waste disposal are causing worldwide concern. This study focused at developing an early warning tool, based on a consortium of different microbial enzymes, for the assessment and monitoring of soil health in response to heavy metal pollution. Soils were collected from an abandoned mine area in northeast Italy, and the concentration of different heavy metals (...) were measured and analyzed. (...) This study clearly highlights in situ interactions between different patterns of PTEs, represented by different combinations of heavy metals, and enzymatic activity of soil microbial communities, and demonstrate the type of interactions taking place between heavy metals, soil properties, and enzymatic activities. (...) 

Succession of soil microbial communities and enzyme activities in artificial soils – Franziska Ditteric – Pedobiologia ($35.95)
The use of artificial soils that differ only in their mineral composition (illite, montmorillonite, ferrihydrite, boehmite) and the presence of charcoal, but not in soil texture and organic composition, offered a unique opportunity to study composition, function and succession of soil microorganisms colonizing newly exposed organo-mineral surfaces. Artificial soils were incubated with a microbial inoculum from an arable topsoil at constant temperature (20 °C) and moisture conditions for up to 18 months. Discriminant analyses of principal components of PLFAs showed that microbial community structure changed over a period of 18 months toward similar communities for all artificial soils at the end of incubation. The artificial soils experiment clearly showed that changes in substrate availability as well as mineral properties are important drivers for the development of microbial communities.

Metagenomic and functional analyses of the consequences of reduction of bacterial diversity on soil functions and bioremediation in diesel-contaminated microcosms – Jaejoon Jung – Scientific Reports (OA)

Here, we assess the role of microbial diversity in ecological function and remediation strategies in diesel-contaminated soils. Soil microbial diversity was manipulated using a removal by dilution approach and microbial functions were determined using both metagenomic analyses and enzymatic assays. A shift from Proteobacteria- to Actinobacteria-dominant communities was observed when species diversity was reduced. Metagenomic analysis showed that a large proportion of functional gene categories were significantly altered by the reduction in biodiversity. Our results suggest that the relationship between microbial diversity and ecological function involves trade-offs among ecological processes, and should not be generalized as a positive, neutral, or negative relationship.

Microbes and pipes

Fracture Sealing with Microbially-Induced Calcium Carbonate Precipitation: A Field Study – Adrienne J. Phillips – Environmental Science & Technology ($40.00 for 48 hours of access!)

A primary environmental risk from unconventional oil and gas development or carbon sequestration is subsurface fluid leakage in the near wellbore environment. A potential solution to remediate leakage pathways is to promote microbially induced calcium carbonate precipitation (MICP) to plug fractures and reduce permeability in porous materials. In this study, MICP was promoted in a fractured sandstone layer within the Fayette Sandstone Formation 340.8 m below ground surface using conventional oil field subsurface fluid delivery technologies. After 24
urea/calcium solution and 6 microbial (Sporosarcina pasteurii) suspension injections, the injectivity was decreased (…) and a reduction in the in-well pressure falloff (…) was observed. (…) This study suggests MICP is a promising tool for sealing subsurface fractures in the near wellbore environment.