Ancient polysaccharides in chalk

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The coccolithophores are unicellular phytoplankton that form an elaborate coccosphere arround their cell. The sphere consists of interlocked calcite platelets, called coccoliths, which are formed inside the cell and are subsequently extruded. Acidic polysaccharides help control the formation of the coccolith elements and these polysaccharides are preserved on the biomineral surfaces after the coccoliths leave the cell. When the algae die, the coccoliths settle on the seabed. Over time, this can lead to huge calcium carbonate deposits such as the late Cretaceous chalk of Northwestern Europe [1,2].

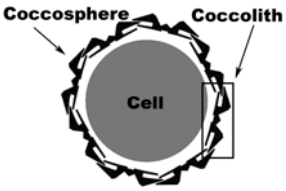

Figure 1: Schematic drawing of a coccolithosphere

We have shown that polysaccharides are still present in the chalk, even after sedimentation and burial for more than 60 million year. We isolated polysaccharides from North Sea samples, by dissolving them in dialysis bags and we analysed the soluble fraction using several methods, including gel electrophoresis and high-performance anion-exchange chromatography. Then, using a constant composition set-up for careful control of solution concentration during precipitation, we investigated how the soluble fraction influenced the crystallisation behaviour of calcium carbonate.

[1] Young & Henriksen (2003) *Min. Soc. Am.* **54**, 189-215. [2] Marsh *et al.* (2002) *J. Struct. Biol.* **139**, 39-45.

Soil and the transmission of prion diseases

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Transmission of scrapie and chronic wasting disease, prion diseases of sheep and goats or deer, elk and moose, respectively, can be mediated by an environmental reservoir of infectivity. Soil is the most plausible candidate for preserving prion infectivity in the environment. The disease-associated isoform of the prion protein (designated PrP^{TSE}) appears to be the primary, if not sole, component of the infectious agent. We have investigated PrP^{TSE} attachment to and detachment from inorganic and organic soil particle surfaces and examined the effect of sorption to specific soil constituents on disease transmission. Natural organic matter appears to diminish PrP^{TSE} attachment to soil particle surfaces. Interaction of PrP^{TSE} with specific soil particle surfaces is remarkably strong. Interestingly, rather than diminishing bioavailability, attachment to such soil particles enhances disease transmission. This finding suggests an explanation for environmental disease transmission despite the presumably low levels of prions shed by infected animals. Our results to date suggest that prions released into many soil environments are preserved near the surface in a bioavailable form, likely perpetuating prion disease epizootics and exposing other species to the infectious agent.