THE GENESIS AND PRESERVATION OF BIOMARKERS IN THE SEDIMENTARY RECORD: AN EXPERIMENTAL STUDY OF THE ALGA *EMILIANIA HUXLEYI*

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The distribution of molecular markers in sediments provides a reservoir of unique information concerning biogeochemical processes in the geological past, and how these processes respond to environmental change. However, sedimentary systems themselves are biologically dynamic and these markers, and their precursors, have been subjected to bacterial degradation and modification. Recent research indicates that key changes in sedimented organic matter take place during the earliest stages of sediment burial and diagenesis where bacterial activity is also intense. Hence, effective interpretation of the distribution of biomarkers from deep sediment layers and sedimentary rocks requires knowledge of the rates and processes of bacterial decomposition under a range of environmental conditions.

Algae are important primary producers in the marine environment. The prymnesiophyte alga *Emiliania huxleyi* was selected as a subject for study as it is a source of long chain ketones which are geochemically important biomarkers. The ratio of the ketones C37:2 to C37:3 is temperature sensitive and has been used as a palaeotemperature indicator (UK_{37}).

Preliminary sediment slurry incubations were carried out to optimize experimental design (concentration of decay organism, concentration of sediment in slurry, ability to obtain defined microbial environments over long term incubations, aerobic and anaerobic), and quantitative analytical scheme (extraction and separation technique, type and concentration of internal standards). Subsequent experiments on aerobic bacterial degradation of *E. huxleyi* demonstrated rapid increase in bacterial activity and biomass. This was accompanied by major changes in lipid classes. The dominant aliphatic hydrocarbons, three isomers of nC31:2, were rapidly degraded and completely removed by 78 days. In contrast, in preliminary anaerobic incubations, the same compounds remained unchanged. By 78 days a significant reduction in the total algal sterols was accompanied by a small increase in total stanols; hence the cholestanol/cholesterol ratio increased markedly. The abundance of the long chain unsaturated ketone C37:3 decreased relative to C37:2 resulting in an increase in the UK_{37} ratio. The reasons for these changes are unclear. However, they indicate that bacterial degradation may have to be taken into account in the interpretation of UK_{37} ratios in terms of paleotemperatures.

Further experiments are in progress to clarify the interpretation of these results and provide information on the more recalcitrant biomarkers.