BIOMARKER TAPHONOMY IN HOLOCENE-AGE CONCRETIONS

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Introduction

While the role of thermal diagenetic alteration of organic matter is well understood, far fewer studies have focused on the diversity of early diagenetic processes which dictate organic matter preservation depending on environmental setting. In order to better understand the relationship between depositional (e.g., local geochemistry, lithology) and biological processes, we have analyzed a suite of Holocene-age fish concretions, and their modern analog (capelin - *Mallotus villosus*), via lipid extraction which have partially decomposed and contain a wide range of lipids from eukaryotes, bacteria and archaea. Here, we focus on two depositional environments which have produced highly contrasting fossil end-members. 1) Kangerlussuaq (Søndre Strømmfjord), Greenland: Is a marine environment with recently exposed sediments due to isostatic rebound which contain an abundance of fish concretions with soft tissue preservation[1] (Figure 1a). 2) Ottawa, Canada: Represents the sedimentary remnants from the Champlain Sea freshwater estuary that resulted from the retreat of the Laurentide ice sheet during the last glacial maximum[2]. In contrast to Greenland, concretions from Canada appear to be fully decomposed (Figure 1b).

Results & Conclusion

Our preliminary results (Figure 1c & 1d) indicate that prevailing photic zone euxinia[3] due to sulfate reducing bacteria at Kangerlussuaq may have enhanced soft-tissue preservation due to efficient reduction by H_2S[4] (e.g., hydrogenation) and sulfurization[5] of lipids. For instance, and most notably, samples from Greenland contain functional fish (and plant) steroids and their products (Figure 1c) while samples from Canada contain neither (Figure 1d). We believe these fossils end-members, among others to be analyzed, will provide a unique opportunity to probe the diagenetic continuum or the "window" into the biological-biological and biological-geological transition and preservation of body fossils and lipid biomarkers[6].

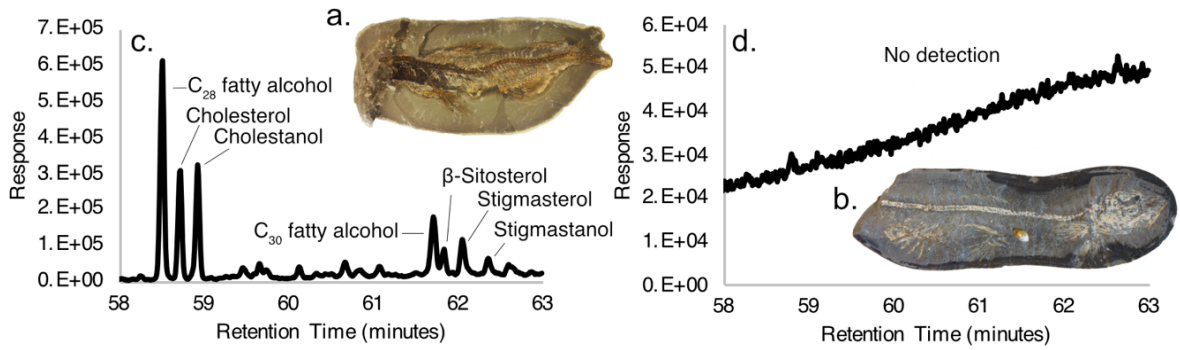

Figure 1 *a) Sample from Kangerlussuaq, Greenland with exceptional soft-tissue preservation. b) Fully decomposed sample from Ottawa, Canada. c-d) Trimethylsilyl (TMS) derivatives of the total lipid extract (TLE) alcohol fractions. c) Detection of functional steroids and their degradation products (e.g., cholesterol to cholestanol). d) no detection.*

References

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