Molecular characterization of preserved tissues in a Cretaceous ankylosaur

ROGER E. SUMMONS[1], JORSUA HERRERA[1], AINARA SISTIAGA[1], CALEB M. BROWN[2], DONALD M. HENDERSON[2], JAKOB VINTHER[3]

[1] EAPS Department, MIT, Cambridge, MA, USA rsummons@mit.edu, herreraj@mit.edu sistiaga@mit.edu,

[2] Royal Tyrrell Museum of Palaeontology, Drumheller, Alberta, PO Box 7500, T0J 0Y0, Canada caleb.brown@gov.ab.ca, don.henderson@gov.ab.ca

[3] School of Biological Sciences, University of Bristol, Bristol BS8 1TQ, UK - jakob.vinther@bristol.ac.uk

Pyrolysis-gas chromatography-mass spectroscopy (py-GC-MS) was conducted on a range of tissues from an exceptionally preserved nodosaurid ankylosaur, *Borealopelta markmitchelli* from the Early Cretaceous of Alberta. These experiments afforded pyrolysates dominated by *n*-alkane/alkene couplets with up to 32 carbon atoms. These couplets result from the breakdown of aliphatic biopolymers that are the dominant component of kerogens and have been formed when lipids polymerize and replace protein and other poorly-recalcitrant biopolymers[1,2]. Notably, the *n*-alkane/alkene couplets are absent from the concretion and the sediment surrounding the ankylosaur. Epidermis and horn tissues also contain assemblages of small nitrogen-, oxygen- and sulfur-containing heterocyclic and aromatic molecules characteristic of eumelanin (e.g. pyrrole, indole, N-methylpyrrole and methylphenol). Of special note, is the presence of significant amounts of benzothiazole which is diagnostic for pheomelanin. Sulfur may be incorporated into melanin during diagenesis to yield thiophenes, alkylthiophenes and benzothiophenes, which are also observed and could similarly be derived from phaeomelanin. As far as is known, however, diagenetic sulfurization is not known to give rise to benzothiazoles. Gastroliths and stomach contents each had characteristic pyrograms. The former contained an abundance of small aromatic components including alkyl benzenes and phenols with low contents of heterocyclics and n-alkane/alkene couplets. The stomach contents had a strong signal for aliphatic biopolymer in addition to a distinctive pattern of C_{27} and C_{29} steranes.

[1]Gupta et al. (2008) Molecular taphonomy of macrofossils from the Cretaceous Las Hoyas Formation, Spain. Cretaceous Research 29, 1-8.

[2]Stankiewicz et al. (2000) Alternative origin of aliphatic polymer in kerogen. Geology 28, 559-562.