Constraining the timing of basal metazoan radiation using molecular biomarkers and U-Pb isotope dating

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Abundant and well-preserved molecular biomarkers are prevalent in sediments and oils of Neoproterozoic-Cambrian age from the Huqf Supergroup, South Oman Salt Basin. Amongst the diverse compound classes present, distinctive free (extractable) and kerogen-bound C_{26} and C_{30} steranes [1] produced by marine demosponges provide evidence for the first appearance of multicellular animals (metazoa) in the geological record sometime between the Sturtian (711 Myr) and Marinoan (635 Myr) glaciations. The timing of the sponge biomarker appearance corresponds remarkably well to divergence ages for *Demospongiae* based on the most recent molecular clocks (minimum evolution estimates) using protein sequences [2].

These demosponge steranes are potentially the first evidence for the appearance of animals in the fossil record since they predate, by at least 50 Myr, the fossil fauna from the Doushantuo Fm. [3, 4] now considered younger than 580 Myr [5]. The sterane biomarkers are found in all formations of the Nafun and Ara Groups and constitute an apparently continuous 100 Myr record of demosponges through the Terminal Neoproterozoic and into the Early Cambrian.

The application of lipid biomarkers for constraining the divergence ages of basal metazoa circumvents problems associated with uneven preservation of soft-bodied metazoa and their poor capcity for leaving trace or body fossils.

References

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