# LIPIDS OF THE PLACOZOA: A KEY TO EARLY ANIMAL EVOLUTION?

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## Abstract

'Complex' life in the form of multicellular motile eukaryotes capable of cellular differentiation during early development (i.e. animals or metazoa) have dwelled on this planet for more than half a billion years, as testified by molecular clock studies (Peterson et al., 2008) and biomarkers that are thought indicative of demosponges (Love et al., 2009). The latter are largely considered to be the most basal representatives of the metazoa and hence, a proto-demosponge is often inferred as the first complex life form on Earth. An origin of ca. 800 Ma as suggested on the basis of comparative genome data however raises survival questions, since sessile benthic and aerobiotic demosponges would have struggled to survive a 50 Ma long lasting global glaciation (Rooney et al., 2015) as envisaged under the 'hard' Snowball Earth scenario (Hoffman et al.,1998). Placozoa are very simple metazoa of uncertain taxonomic position (Schierwater et al., 2009; Philippe et al., 2009), that, based on morphological and behavioural similarities, have been suggested as candidate organisms for the remnants of the Ediacara biota (Sperling and Vinther, 2010). They consist of only a few cell types and rarely extend over more than 2 mm in diameter (Smith et al., 2014). This morphological simplicity suggests a basal placement of these organisms within the animal tree of life and supports the hypothesis of a placozoan origin of animals, the so-called "placula"–hypothesis (Schierwater et al., 2009), based on a wide array of molecular data. Yet, other studies have often placed the placozoa near (Philippe et al., 2011) or amongst (Cavalier-Smith et al., 1996) the clade of the coelenterata.

To shed more light onto the taxonomic relationship of basal animals and their early evolution, we studied the lipid inventory of placozoa and compared these to the biosynthetically expressed lipids in neighboring clades: ctenophora, cnidaria, and porifera (demospongia and calcarea). Additionally, genome databases were searched for genes coding enzymes involved in various processes of steroid biosynthesis. Hierarchical clustering analysis on the basis of chemotaxonomy reveals the relationships between these specimens and indicates a close proximity of placozoa to demosponges (porifera), while a second group is formed by calcarea (porifera), cnidaria and ctenophora. To date, demosponges are considered the first animals, as derived from the fossil record (Prave et al., 2012) and geochemical evidence (Love et al., 2009). Based on the observed lipid profiles and the subsequent hierarchical analysis, placozoa maintain their ground among the earliest branching metazoa on Earth. This presentation will discuss the resulting taxonomic relationships in the context of Neoproterozoic environmental conditions that prevailed when complex life first emerged.

## References


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