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Early diagenetic degradation products of bacteriohopanepolyols produced by Rhodopseudomonas palustris strain TIE-1

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The anoxygenic purple non-sulphur bacterium Rhodopseudomonas palustris strain TIE-1 has emerged as an excellent model organism to study hopanoid biosynthesis and function. It produces several C30 hopanoids, tetrahymanol, as well as various bacteriohopanepolyols (BHPs). In addition, TIE-1 is capable of methylating various hopanoids and the non-hopanoid pentacyclic terpenoid tetrahymanol at C-2, which is rare among hopanoid producers. Here, the lipid inventory of TIE-1 under anoxic photoautotrophic growth conditions using either H2 or Fe(II) as electron donor was studied. Adenosylhopane, aminotriol and bacteriohopanetetrol (BHT) were abundant when TIE-1 was grown on H2, but aminotriol and BHT were only found in traces when grown with Fe(II). Only during growth on Fe(II), BHT was found with and without C-2 methylation (25% of both BHT homologues), whereas the other BHPs were not C-2 methylated independent of growth mode. In C30 hopanoids and tetrahymanol, C-2 methylated compounds accounted for as much as 59% of the respective C-2 methylated/non-methylated homologues during growth with Fe(II), but only up to 24% during growth with H2. This observation reveals that C-2 methylated hopanoids may have a specific function in TIE-1 and are preferably synthesized in response to elevated Fe(II) concentrations. Further, we exposed the bacterial cells of strain TIE-1 to elevated temperatures and pressure aiming to produce early degradation products of bacteriohopanepolyols (BHPs). While so far, only few BHPs such as 32,35-anhydrobacteriohopanetetrol (anhydroBHT) have been identified as early diagenetic degradation products, in our experiments bacteriohopanetetrol (BHT) and possibly adenosylhopane were degraded to various anhydroBHT isomers, and new N-containing degradation products were discovered and tentatively assigned as anhydroaminotriols.