ALKYLBENZENE ORIGIN IN RECENT SEDIMENTS FROM THE HYPERSALINE ENVIRONMENT OF MOKNINE SEBKHA. TUNISIA

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Abstract
Organic matter sources in sediments from the north of Moknine hypersaline system were assessed using lipid biomarkers. Alkylbenzenes in the C18-C22 range, with an even carbon number predominance and a maximum at C19, occur in substantial abundance in most sediment samples. High molecular weight alkylbenzenes are only present in low concentration <1%. Total aromatic hydrocarbons are essentially composed of the isomers of C18, C19 and C20 alkylbenzenes. Cyclization and aromatization of linear alkanes was probably the pathway for the formation of most aromatic units upon organic matter diagenesis.
Keywords: Geochemistry, Bacteria, Coastal Systems, Evaporites, Organic Matter

Introduction
Alkylbezens moleculars have been detected in particulars geologicals systems under sulphate reduction conditions [1]. These systems are characterized by evaporitic deposits (carbonates and salt). In the present work we report the result of the study of aromatic fractions in the recent sediments of the hypersaline Moknine system. We identified the origin of aromatic fraction composed by the alkylbenzenes and the dynamic system in the recent.

Geological setting
The Moknine sebkha is an evaporator system from eastern zone of Tunisia and it belongs to group of the Sebkha with lozenge morphology near the Mediterranean sea. Periphery deposit is composed by sand and silty-sand (SM9) and medium zone and central part are composed by clay deposits and covered by Halite.

Methods
Sediments samples were collected from 3 sites (site 9, 10 and 12) of Moknine sebkha using PVC tube (75 mm of diameter). Samples were extracted with chloroform in a soxhlet extractor for 12h. Total extracts were fractionated by column chromatography on silica gel with different solvent sequentially. Aromatic hydrocarbons were obtained by eluting with a mixture of hexane and chloroform (2V/1V) and analysed by gas chromatography/mass spectrometry (GCMS) on Agilent Technologie 6890N connected with Agilent 5973 Network mass spectrometer (operated at 70eV, cycle time 2.24s, and range m/z: 35-600). Ratios of various biomarkers were calculated using peak heights. Compound were quantified by integration of appropriate mass chromatograms of m/z 91 and 105 (alkylbenzene, phytanylbenzene).

Results
Mass chromatography of m/z 91 reveals the presence of homologous series of n-alkylbenzene ranging in most samples from C18 to C22 in different profiles from the north of the Moknine sebkha. Sometimes peaks on C23 to C31 are detected in sediment. This distribution can be explained by the low biological diversity in hypersaline environments [2]. Moknine sebkha, is restrict evaporator environment where only cyanobacteria and algae developed [3].
All samples are dominated by linear alkylbenzenes which thought to be formed by cyclization and aromatization of precursor possessing linear carbon skeletons. They are substituted at different positions (1, 3, 4, 5, 6 and 7) and originate or are diagenetically transformed lipids. Generally, it's accepted that fatty acids derived from biological organisms are likely precursors of alkylbenzene in sediment via well-known sedimentary dehydration and cyclization reactions [4].
Two compound are identified C19 : 1-methyl-4-dodecylbenzene and 1-ethylundecylbezene or 3phenyltridecane and C20 : 1-methyl-4-tridecylbenzene components, characterized by a base peak at 105 and 119 and corresponding molecular ions at m/z 260 and 274. The highest concentrations of isoprenoid benzenes occur in clay sediments of the centre which is associated with high concentration of halite. In this context halophilic archaebacteria have been suggested previously as a source for sedimentary phytanylbenzene [5]. In the Moknine sebkha these component derived from algae or cyanobacteria. In fact, the similar structure of the phytanyl benzenes and natural quinones when the isoprenyl group position is compared with the methyl groups in the aromatic ring [1].The presence of phenylbenzene in the Moknine system could be related to highly reducing palaeoenvironments.

Conclusion
Organic matter constitutes a minor but important fraction of hypersaline Moknine system sediment. Sources of organic matter include primary production within the system; input of terrestrial material and products connected to microbial activity in water and sediment. The distributions of the alkylbenzene compared to the n-alkanes distribution show that the carbon number distributions of these alkylbenzene compounds resembled those of the n-alkanes found in the same sediment with the high odd carbon preference between nC17-nC31. This indicates that the alkylbenzenes may have the same fatty acid precursors as the n-alkanes. The alkybenzene could have been formed by direct cyclization and aromatization, while the n-alkanes could have been formed by decarboxylation of the straight chain fatty acids.

References
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