The minimum prerequisite of the primordial membrane- The function of liposome made from the C-20 isoprenoidal lipids

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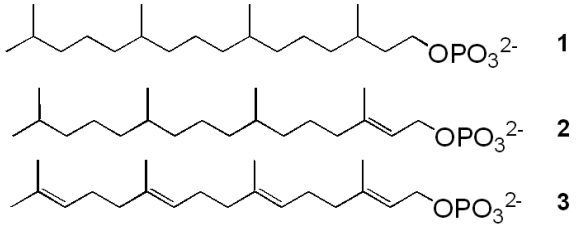
In order to verify the Ourisson and Nakatani's unique and captivating hypothesis [1] about "the terpenoid theory of the origin of cellular life," the properties of the liposomes from the simplest C-20 terpenoid monophosphates (1,2, and 3) were investigated.



At first, the pH dependence of the leakage of fluorescent dye (calcein) from the inside of MLV made by 2 was observed. The MLV made by 2 could keep the inner molecule longer than the MLV made by phosphatidylcholine in low pH (acidic) region. This result is caused by the nature of polar head group.

Next, the temperature dependence of the leakage of the inner molecule from MLV made by 1,2 and 3 was evaluated. The MLV made by 2 could keep the inner molecule longest at the all of the experimental condition (10 ~ 60 °C). This result was quite interesting for the design of the "primordial" lipid molecule. Compound 2 has the trisubstituted double bond from the β,γ-position of phosphate. Thus, a conformationally strained factor at the β,γ-position from the polar head group seems to be important. And the MLV made by 2 had almost the same degree about the leakage of the inner molecule compared with the MLV made by phosphatidylcholine. The result indicates the liposome constituted from a quite simple terpenoid phosphate has a similar potential compared with the liposome constituted from the "sophisticated" present lipid molecule.

References

[1] Ourisson, G and Nakatani, Y. (1994) *Chemistry & Biology, 1*, 11-23.

Correlation of $\delta^{13}C$ and molecular compositions of polycyclic aromatic hydrocarbons in New York/ New Jersey Harbor Complex

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Numerous sub-basins within the New York/New Jersey (NY/NJ) Harbor host variable amounts and sources of polycyclic aromatic hydrocarbons (PAHs). Analysis of the fallout radionuclide ^{137}Cs was used to assign approximate dates to individual depth sections of sediment cores collected from four sub-basins in the Harbor. Sites ranged from heavily contaminated (Newark Bay (NB) and Passaic River (PR)) to slightly polluted (Raritan Bay (RB)) and included a sewage-discharge site (Jamaica Bay (JB)). Sediments analysed represented deposition from about the 1930s to the 1990s. Parent and alkyl-substituted PAHs were detected and quantified by GC-MS and GC. GC-IRMS was applied to determine the $\delta^{13}C$ values of pyrene ($\delta^{13}CPy$). Using an the isotope mass balance equation, petroleum associated PAHs (PA-PAH) were calculated assuming that the $\delta^{13}C$ of the petroleum related Py is -29 ‰, and the combustion derived Py is -24 ‰. The temporal trend of PA-PAH in each of the sediment cores was similar to the trend in total saturated hydrocarbon (TS). Among all samples, the two parameters were positively correlated (r = 0.67). Calculated PA-PAH levels were also positively correlated with the amount of unresolved complex mixture (UCM) (r = 0.68), a suggested indicator of petroleum biodegradation. Various molecular criteria have been applied previously in the attempt to distinguish between combustion and petroleum-derived PAH sources. These criteria are based on the ratios of the principal mass 178, 202, 228, and 276 parent PAHs, and the phenanthrene/anthracene and fluoranthene/pyrene alkyl PAH series. For those ratios in our samples, the Fl/Fl+Py (mass 202) showed the strongest correlation with $\delta^{13}CPy$ (r = 0.66 for mass 202, 0.2 for mass 178, -0.2 for mass 228, 0.19 for mass 276; 0.01, and 0.49 for the two alkyl PAH series). This correlation was strongest for Raritan Bay (0.83) and Jamaica Bay (0.63), but poor at the highly contaminated sites (0.38 in Newark Bay, and -0.48 in Passaic River). When total alkyl substituted PAH were considered, a negative correlation with isotope composition (r = - 0.59) was found for Talky/Parent (the ratio of all alkyl PAH related to mass 178, 202, 202, and 228 with their parents) with comparable correlation at each of the four sites (-0.52 in JB, -0.66 in NB, -0.48 in PR, -0.72 in RB). The significance of the relation between PAH molecular and $\delta^{13}C$ indicators will be explored in this paper.