Role of architecture of N-oxide surfactants in the design of nanoemulsions for *Candida* skin infection.

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Streszczenie

In this work we present comprehensive research on the formation, stability and structural properties of oil-in-water (o/w) nanoemulsions with the ability for topical administration, penetration of the skin and acting as antifungal agents against *C. albicans*. The studied nanoemulsions were composed of different ratios of double-head – single-tail surfactants {1-bis{[3-(N,N-dimethylamino)ethyl]amido}alkane-di-N-oxides (C_n-MEDA), N,N-bis[3,3'-(dimethyl-amino)propyl]alkyl-amide di-N-oxides ($C_n(DAPANO)_2$} and single-head – single-tail surfactants {2-(alkanoylamino)-ethyldimethyl-amine-N-oxides (C_n-EDA), and 3-(alkanoylamino) propyldimethylamine-N-oxides, (C_n-PDA)} added to the oil {isooctane IO, isopropyl myristate IPM or glyceryl monocaprylate GM as (O)} and to the water phase (W). The phase behavior of the systems was examined by a titration method. Morphology of the resulting colloids was characterized by scanning and transmission electron microscopy, the particle size and size distributions determined by dynamic light scattering, and kinetic stability by multiple light scattering. While both surfactant types resulted in quite stable nanoemulsions, the systems formed using a single-headed one-tail surfactant were slightly more stable with GM or IPM. The microenvironmental properties of the nanoemulsions were studied by an electron paramagnetic resonance technique to distinguish the molecular dynamics of the different spin probes localized in the particular regions of the surfactant layers, depending on the surfactant structure and the system preparation. Skin permeation studies were performed to monitor transport through the skin, and changes in skin structure were followed using differential scanning calorimetry. Moreover, the activities of curcumin-loaded nanoemulsions stabilized by N-oxide surfactants against *Candida albicans* fungus were evaluated. To estimate *in vitro* efficacy, the suitability of an N-oxide nanoemulsion dressing against wound infection with biofilm *C. albicans* was assessed according to the Antibiofilm Dressing's Activity Measurement. We expect that the nanoemulsion formulations tested in this study will have potential for application as topical delivery systems for pharmaceutically active compounds in skin-related conditions.

Słowa kluczowe

Surfactants, Nanoemulsion, Spin probe, Stability, Topical delivery, Ultradeformable vesicles, Candida, Fungal infection

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