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The quality changes in different food fatty acids during storage assessed with the NMR technique

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The aim of the work was to verify the hypothesis that external factors such as elevated temperature and UV irradiation can change the chemical structure of fatty acids and how these possible changes affect their molecular dynamics. Cocoa butter and cocoa paste as rich sources of fatty acids have been studied. Cocoa butter and cocoa paste contains saturated and unsaturated acids mixture (palmitic acid, stearic acid, oleic acid, linoleic acid). The samples were exposed to elevated temperatures of 40°C and the influence of UV irradiation with the dose of 300W/m² for 1000h. The analysis of the chemical structure of fatty acids was carried out using an NMR spectrometer. NMR spectra were recorded at room temperature using a Bruker Ascend 600 spectrometer (Bruker, Billerica, MS, USA). Molecular dynamics were analyzed using NMR relaxometry. NMR relaxometry is a unique experimental method probing mechanisms and characteristic time constants of dynamical processes in condensed matter on the atomistic level. In contrary to NMR spectroscopy which it is focused on molecular structure, NMR relaxometry probes molecular dynamics. This summarizes the concept of the research: as it has turned out those structure-oriented methods may be not sufficient for discriminating between fatty acids storage at the different conditions (temperature, UV irradiation). Furthermore, the next try is to attempt to reveal characteristic dynamical features of these materials. Standard NMR relaxation experiments are performed at a single frequency to determine the structure of the matter. Here, the experiments are carried out in a wide frequency range from about 5kHz to 40MHz (for ¹H). By NMR relaxometry, it is possible to detect motional processes across a huge range of time scales (from MS tons) by single experiment. Obtained results indicate the importance of storage conditions for products rich in fatty acids. Even small changes of chemical structure of the fatty acids can influence on their molecular dynamic.

Biography

Stolecka-Warzecha A has completed her PhD from Academy of Physical Education in Poland and Postdoctoral Studies Healthy Lifestyle Trainer. She is the Assistant Professor in the Department of Basic Biomedical Sciences, Faculty of Pharmacy and Laboratory Medicine at the Medical University of Silesia in Poland. She is a Member of the Scientific Council of the Journal *World of Medicine and Pharmacy*. She is an author of many scientific publications and also a Sports and Clinical Dietitian.

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