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Influence of packaging and conditions of storage on the stability of milk powder enriched with omega-3

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The polyunsaturated fatty acids, especially the omega-3 group, are important for fetal growth and development, and for the visual and cognitive function in infants, children and adults. The milk powder can be fortified with encapsulated omega-3 to minimize the effects of lipid oxidation and the formation of "off flavors" to which these compounds are subject. The objective of this study was to evaluate the influence of four packaging types: tinsplate and composite can, BOPP/PP and PET metalized/LDPE flexible packaging and storage at $43\pm1^{\circ}\text{C}/50\pm10\%\text{RH}$ and $25\pm1^{\circ}\text{C}/75\pm5\%\text{RH}$, in the quality of milk powder fortified with omega-3 microparticles. The products were analyzed as for: moisture content, water activity, fatty acids content and sensorial quality and the oxygen content in the package's headspace was measured. Due to the high-water vapor permeability of BOPP/PP package, occurred the degradation of lactose by Maillard reaction, caused by increase of moisture content and water activity in the product at $43^{\circ}\text{C}/50\%$ after six weeks and nine months at $25^{\circ}\text{C}/75\%\text{RH}$. The product in the cans, the glass transition temperature of lactose was probably reached and crystallization occurred in the milk after six weeks in metal can and nine weeks in composite can at $43^{\circ}\text{C}/50\%\text{RH}$, even though these packages were impermeable to water vapor. The sensory quality dropped to an unacceptable level at the same time, because the Maillard reaction and lactose crystallization which influence the protein solubility, foam stability, emulsifying capability and color (browning) and flavor characteristics of the milk powder. No changes of odor and flavor were observed in the omega-3 enriched milk powder in metal and composite cans and PET metalized/LDPE flexible packaging after one year of storage at $25^{\circ}\text{C}/75\%\text{RH}$, and these three types of packaging and storage conditions were effective in maintaining the Brazilian label claim of "source of omega-3". Another important conclusion was that the temperature and relative humidity of the storage during the study influenced so much the performance of the packaging in the preservation the milk powder.