Stabilization of fish oil emulsions rich in ω-3 for topical use.

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Introduction: Currently, the use of fish oils with high content of ω-3 type fatty acids (DHA and EPA) is gaining importance given their important health benefits. This has led to its incorporation in both solid and emulsions systems, which can be used as nutraceuticals or therapeutic adjuvants in atopic skin or even in Psoriasis [1]. Their main drawback is the lipid oxidation of fatty acids and poor organoleptic properties. In our work, the physical and chemical stabilization of emulsions that include fish oils will be addressed by the incorporation of different ingredients: two natural cyclodextrins (CDα and CDβ), that can form inclusion complexes with the fatty acids, and other excipients such as alginate (Alg) and maltodextrin (MD) which can act as natural antioxidants [2-3].

Materials and Methods: A balanced experimental design for 5 variables (fraction O/W, [CDα], [CDβ], [Alg], [MD]) at 3 levels was carried out. The 18 formulations were produced and characterized regarding their texturometric properties and the release of volatile degradation products of the ω-3 at t=0 months and t=1 month at 40°C. An artificial intelligence tool (FormRules®) that combines artificial neural networks and fuzzy logic was used to model the effect of the variables on the properties of the emulsions.

Results: FormRules® succeeded in modelling emulsion parameters at t=0 and t=1 month at 40ºC. The model indicates that the addition of CDα and Cdβ, protect from degradation reducing the emission of volatiles from the aged formulation. Each CD modulates the emission of volatile molecules due to their dissimilarities in size of the hydrophobic cavity that condition the interaction with the diverse types of fatty acids included in the fish oil. Alg contributes to improve the texturometric properties of the emulsions. Moreover, Alg favours the stability of the system due to its ionic character and its antioxidant effect. MD also reduced the formation of volatiles in aged formulations due to its capacity of entrap oxygen.

Conclusions: The emulsification of fish oils with alginate dispersions gives creams with texturometric properties suitable for its use on the skin. Both CDs incorporate the chains of fatty acids in their hydrophobic cavity, reducing their degradation and correcting their organoleptic properties.

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References

[1] P. Mays er, H. Grimm, y F. Grimminger, «n-3 Fatty acids in psoriasis», *Br. J. Nutr.*, vol. 87, n.º S1, p. S77, ene. 2002.

[2] K. Miyashita, M. Uemura, y M. Hosokawa, «Effective Prevention of Oxidative Deterioration of Fish Oil: Focus on Flavor Deterioration», *Annu. Rev. Food Sci. Technol.*, vol. 9, n.º 1, pp. 209-226, mar. 2018.

[3] B. Cheirsilp y J. Rakmai, «Inclusion complex formation of cyclodextrin with its guest and their applications», *Biol. Eng. Med.*, vol. 2, n.º 1, 2017.