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Address of correspondence
Dr Albertina Moglioni
Dr. Valeria P. Sülsen
Instituto de la Química y Metabolismo del Fármaco (IQUIMEFA) (UBA- CONICET),
Facultad de Farmacia y Bioquímica, Universidad de Buenos Aires
Junín 956, 1113, Buenos Aires, República Argentina
Phone +54 11 5287-4272 Fax +54 11 4508-3642
iquimefa@ffyb.uba.ar
amoglio@ffyb.uba.ar
vsulsen@ffyb.uba.ar

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High-dose Coenzyme Q10 oleogels designed for orphan therapy

Ehrenhaus Masotta N.[1], Martinefski M .R.[2], Höcht C.[3], Lucangioli S. E.[4,5], Rojas A. M.[1,5], Tripodi V. P.[4,5]
[1]Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Departamento de Industrias y Facultad de Farmacia y Bioquímica.
[2]Universidad de Buenos Aires, Departamento de Química Analítica y Fisicoquímica.
[3]Universidad de Buenos Aires, Departamento de Farmacología.
[4]Universidad de Buenos Aires, Departamento de Tecnología Farmacéutica.
[5]Universidad de Buenos Aires, Consejo Nacional de Investigaciones Científicas y Tecnológicas, CONICET, Buenos Aires, Argentina.
vtripodi@ffyb.uba.ar

Recently, Coenzyme Q10 (CoQ10) was established by the FDA as an orphan drug and its therapeutic recommended dose increased significantly, reaching values up to 50 mg/kg/day. Patients with CoQ10 deficiency usually have swallowing difficulties, whereby the use of solid dosage forms is not the best option because they find them hard to swallow resulting in a lower adherence to the treatment. In order to satisfy the high-level requirements in adult patients and offer them a more comfortable way of treatment, a new oral CoQ10 dosage form was developed and evaluated. As CoQ10 is practically insoluble in aqueous solutions because of its lipophilic nature, oleogels were proposed to dose CoQ10.

CoQ10 oleogels were prepared by its dissolution in medium-chain triglyceride (MCT) oil, using ethylcellulose for gelling and sorbitan monostearate (SMS) as surfactant. Physicochemical stability of oleogels was tested by their rheological properties, colorimetry, lipid oxidation, syneresis and remaining CoQ10 content during 12 months at 25.0°C.

Pharmacokinetic profile was tested by a single-dose bioavailability study after oral intake of an oleogel containing 1g of CoQ10 and compared to the commercial capsule involving 7 healthy subjects.

Thermoreversible oleogels with a maximal amount of 1 g of CoQ10 were developed with proved stability during at least 12 months of storage at 25.0°C. SMS allowed high stability to oxidation of the MCT-oil retained by the gel network, as well as low syneresis. Plastic deformation of oleogels without fracture was determined under compression, emulating the deformation behavior of the material into the oral cavity.

Comparison of main pharmacokinetic parameters showed similar maximal concentration and half-life of CoQ10 after intake of both formulations and a non-significant increase in the area under the curve for the oleogel when compared with the commercial capsule.

The use of these oleogels could promote the adherence to the treatment, ameliorating the discomfort perceived during swallowing by patients and could be a useful alternative for the treatment of adult patients with high CoQ10 requirements.

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Keywords: high-dose coenzyme Q10; dysphagia; oleogel; physicochemical stability; pharmacokinetic profile.