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Dataset on characterisation and stability of gingival retraction cord lignocaine–adrenaline nanogel optimised using central composite design

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Abstract

This study aims to characterise and assess the stability of an optimised lignocaine–adrenaline nanogel using central composite design (CCD). Compatibility studies were conducted using Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) and Ultraviolet–visible (UV–vis) spectroscopy. Eighteen lignocaine–adrenaline Nanoemulsion (LANE) formulations derived using CCD were characterised for particle size, polydispersity index (PDI), zeta potential and pH. All LANE formulations were transformed into lignocaine-adrenaline Nanoemulsion-based Gel (NBG) by adding 0.1 % Carbopol 940. Stability studies for LANE and NBG were conducted for 12 months storage at 25 °C. The results of long-term stability assessment of LANEs and NBGs were integrated with CCD predictions to produce the optimised NBG, lignocaine–adrenaline Nanogel. The optimised NBG model was validated in triplicates. The optimised NBG was subjected to 5000 rpm centrifugation for 30 min, repeated heating-cooling cycles (40 °C and 4 °C), and a freeze-thaw cycle (-5 °C and 25 °C). ATR-FTIR and UV–vis results indicated compatibility between lignocaine, adrenaline and the excipients. The viscosity of the nanogel corresponded to that of ferric sulphate solution (24 ± 1 mPa·s at 20 °C). The LANE and NBG formulations showed no drug precipitation or phase separation after the stability study. The optimised NBG had particle size (61.76 ± 0.25 nm), PDI (0.36 ± 0.01), zeta potential (–26.47 ± 0.02 mV) and pH (6.28 ± 0.02). The optimised NBG remained stable in stress-induced environments. CCD enabled optimisation of a stable NBG formulation. © 2024 The Authors

Author keywords

Adrenaline; Central composite design; Characterisation; Haemostasis; Lignocaine; Nanotechnology

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