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New developments in cosmetic applications of electromagnetic fields: Client and occupational hazard assessment

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Abstract

Energy-based devices are used to improve features of appearance for aesthetic reasons while avoiding more invasive methods. Examples of treatment targets are the reduction of wrinkles, sagging, unwanted skin lesions, body hair and excess fatty tissue, and the enhancement of muscle tissue. One treatment modality is the use of electromagnetic fields (EMF, 0–300 GHz). The present work aims to give an up-to-date survey of cosmetic applications of EMF for professional use with an assessment of client and worker exposure and possible adverse effects. A systematic search was conducted for peer-reviewed articles (2007-2022), patents, premarket notifications, manufacturer data, and adverse effects reports. Five categories of cosmetic EMF device with increasing frequency were identified: sinusoid low frequency magnetic fields for lipolysis; pulsed low frequency magnetic fields for skin rejuvenation; pulsed low frequency magnetic fields for muscle building; radiofrequency EMF for lipolysis or skin rejuvenation; microwaves for hair removal or hyperhidrosis. In the vicinity of the last four device categories, there is a potential for exceeding the occupational exposure limits in the European Union EMF Directive, which could lead to nerve or muscle stimulation, burns or overheating. There are also potential hazards for clients or workers wearing active or passive medical devices. The severity of reported adverse effects increases with EMF frequency.

Keywords: cosmetic treatment; electromagnetic fields; exposure; hazard assessment; medical devices.

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