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Ex Vivo Penetration of Low-Level Laser Light Through Equine Skin and Flexor Tendons

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Objective: To measure penetration efficiencies of low-level laser light energy through equine skin and to determine the fraction of laser energy absorbed by equine digital flexor tendons (superficial [SDFT] and deep [DDFT]).

Sample: Samples of skin, SDFTs, and DDFTs from 1 metacarpal area of each of 19 equine cadavers.

Procedures: A therapeutic laser with wavelength capabilities of 800 and 970 nm was used. The percentage of energy penetration for each wavelength was determined through skin before and after clipping and then shaving of hair, through shaved skin over SDFTs, and through shaved skin, SDFTs, and DDFTs (positioned in anatomically correct orientation). Influence of hair color; skin preparation, color, and thickness; and wavelength on energy penetration were assessed.

Results: For haired skin, energy penetration was greatest for light-colored hair and least for dark-colored hair. Clipping or shaving of skin improved energy penetration. Light-colored skin allowed greatest energy penetration, followed by medium-colored skin and dark-colored skin. Greatest penetration of light-colored skin occurred with the 800 nm wavelength, whereas greatest penetration of medium and dark-colored skin occurred with the 970 nm wavelength. As skin thickness increased, energy penetration of samples decreased. Only 1% to 20% and 0.1% to 4% of energy were absorbed by SDFTs and DDFTs, respectively, depending on skin color, skin thickness, and applied wavelength.

Conclusions and Clinical Relevance: Results indicated that most laser energy directed through equine skin was absorbed or scattered by the skin. To achieve delivery of energy doses known to positively affect cells in vitro to equine SDFTs and DDFTs, skin preparation, color, and thickness and applied wavelength must be considered.