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Evaluation of transepithelial stromal riboflavin absorption with enhanced riboflavin solution using spectrophotometry

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Purpose: To assess transepithelial stromal riboflavin absorption with an enhanced riboflavin solution (riboflavin 0.1%, 15% dextran T500 with trometamol (Tris-[hydroxymethyl]aminomethane) and sodium ethylenediaminetetraacetic acid by analyzing light-transmission properties of ex vivo rabbit corneas.

Methods: The enhanced riboflavin drops (Ricrolin TE) were applied every 3 minutes for 1 hour to 12 corneas (4 with intact epithelium, 4 with superficial scratches, 4 with 8.0 mm epithelial debridement). As a comparison, riboflavin drops without the enhancers (riboflavin 0.1%, 20% dextran T500) (normal riboflavin group) were applied to 12 corneas (4 with intact epithelium, 4 with superficial scratches, 4 with central epithelial debridement). A control group of 4 corneas with intact epithelium received balanced saline 0.9%. To assess enhanced riboflavin absorption, light transmission spectra of the corneas were analyzed with a spectrophotometer.

Results: The spectra in corneas with intact epithelium in both riboflavin group and in eyes with superficial scratches treated with normal riboflavin were similar to controls. Those with enhanced riboflavin and superficial scratches showed a homogeneous yellow discoloration of the cornea with a dip in light transmission between 400 and 490 nm, similar to that of the enhanced riboflavin solution. This was also seen, albeit of a greater magnitude, with complete epithelial removal, with eyes receiving enhanced riboflavin having a greater dip in transmission than eyes receiving normal riboflavin.

Conclusions: Administration of enhanced riboflavin and superficial epithelial scratches allowed sufficient riboflavin stromal absorption to homogeneously alter the transmission spectra of rabbit corneas. This did not occur to the same extent with an intact epithelium or normal riboflavin with superficial scratches.

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