EVALUATION OF THE THERAPEUTIC POTENTIAL OF KAEMPFEROL-LOADED BIONANOCOMPOSITES IN CORNEAL NEOVASCULARIZATION

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Introduction. The cornea is the transparent anterior structure of the eyeball, characterized by the absence of blood vessels, a condition essential for maintaining its optical function. Among ocular diseases, corneal neovascularization is a major cause of impaired visual acuity and may progress to severe vision loss or blindness.

Aim of study. To analyze recent studies regarding the therapeutic potential of kaempferol-loaded bionanocomposites for the treatment of corneal neovascularization, with particular emphasis on their pharmacokinetic advantages and prospects for clinical application.

Methods and materials. The study is based on the analysis of bibliographic sources indexed in the PubMed and Google Scholar databases published between 2018 and 2025. A total of 40 scientific publications were analyzed.

Results. Kaempferol, a flavonoid-rich plant compound, is known for its antiangiogenic properties and is of interest as a potential therapeutic agent for inhibiting the formation of vascular neoformations at the corneal level. However, the direct administration of kaempferol is considerably limited by anatomical barriers and low bioavailability. In this context, nanomedicine can improve the pharmacological potential of kaempferol and offer minimally invasive therapeutic strategies. The use of bionanocomposites loaded with kaempferol and nanoparticles of ZnO, SiO_2 and Ag can contribute to increasing the bioavailability of hydrophobic kaempferol, significantly reducing abnormal blood vessel formation, inflammation, and angiogenic factors such as VEGF by inhibiting cell migration. The integration of nanoparticles into the composition of bionanocomposites can provide additional therapeutic advantages, including the reduction of oxidative stress and attenuation of the inflammatory response. In addition, ZnO and Ag nanoparticles exhibit antimicrobial properties that may improve the therapeutic potential and support ocular regeneration.

Conclusion. The therapeutic potential of kaempferol-loaded bionanocomposites in corneal regeneration is immense due to the multitude of benefits. However, further investigations are needed to design and optimize kaempferol-functionalized bionanocomposites that allow for controlled release of the compound, protect its chemical stability, and increase its bioavailability at the corneal level, thus maximizing therapeutic efficacy.

Keywords: bionanocomposites, kaempferol, corneal neovascularization, anti-angiogenesis.

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