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# Evaluation of Angiogenic Potential of Baghdadite, Mineral Trioxide Aggregate, and their Combination Using the Yolk Sac Membrane Model

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## Abstract

**Background:** Biomaterials that promote neovascularization are of great value in regenerative endodontics. Mineral Trioxide Aggregate (MTA) is commonly employed for pulp capping, whereas Baghdadite, a bioactive calcium-zirconium-silicate ceramic, has been reported to be useful in inducing angiogenesis. Comparing the efficacy of Baghdadite, MTA, and their combination, however, is not well investigated. This study aims to assess and compare the angiogenic potential of Baghdadite, MTA, and their combination at two concentrations with the chick embryo yolk sac membrane (YSM) model.

**Methods:** 70 fertilized White Leghorn eggs were incubated to promote the yolk sac vasculature. Seven experimental groups were MTA (5 µg and 10 µg), Baghdadite (5 µg and 10 µg), MTA+Baghdadite (5 µg and 10 µg), and a control group. The experimental groups were exposed on the yolk sac membrane and incubated for 48 hours. Angiogenesis was quantitatively evaluated by Wimasis image analysis software for vessel density, total length of vessel network, and branching points.

**Results:** The interaction between MTA and Baghdadite at 5 µg revealed the maximum angiogenic potential with a vessel density of 17.6%, vascular length of 13,515.9 pixels, and 213 branching points. Baghdadite without the addition of MTA performed better than MTA at both the concentrations. MTA at 10 µg revealed relatively lower angiogenic ability, indicating dose-dependent cytotoxicity.

**Conclusion:** Baghdadite markedly promotes angiogenesis, and when used in combination with MTA at lower levels, exhibits a synergistic effect. These results validate its potential for use in regenerative endodontic procedures involving neovascularization, particularly in vital pulp therapy.

**Keywords:** angiogenesis, Baghdadite, Mineral Trioxide Aggregate (MTA), regenerative endodontics, yolk sac membrane model