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Introduction

Afrin® original nasal spray has widespread use in ophthalmology and otolaryngology as an effective, biocompatible hemostatic agent. The active ingredient, 0.05% oxymetazoline (Oxym), is an alpha-adrenergic agonist and imidazoline derivative, distinct from catecholamines such as epinephrine, norepinephrine, and phenylephrine [1]. In addition, Afrin® original is formulated with antimicrobial preservatives, mainly benzalkonium chloride (BKC), which has antimicrobial activity toward Gram positive bacteria [2]. Recent studies have explored the use of Afrin® original an Oxym based nasal spray in dental vital pulp therapy. Review of literature supports its potential to be more effective and biocompatible than existing topical hemostatic agents in pulpal management. To date, no study has explored the antibacterial properties of Children's Afrin®.

Aims

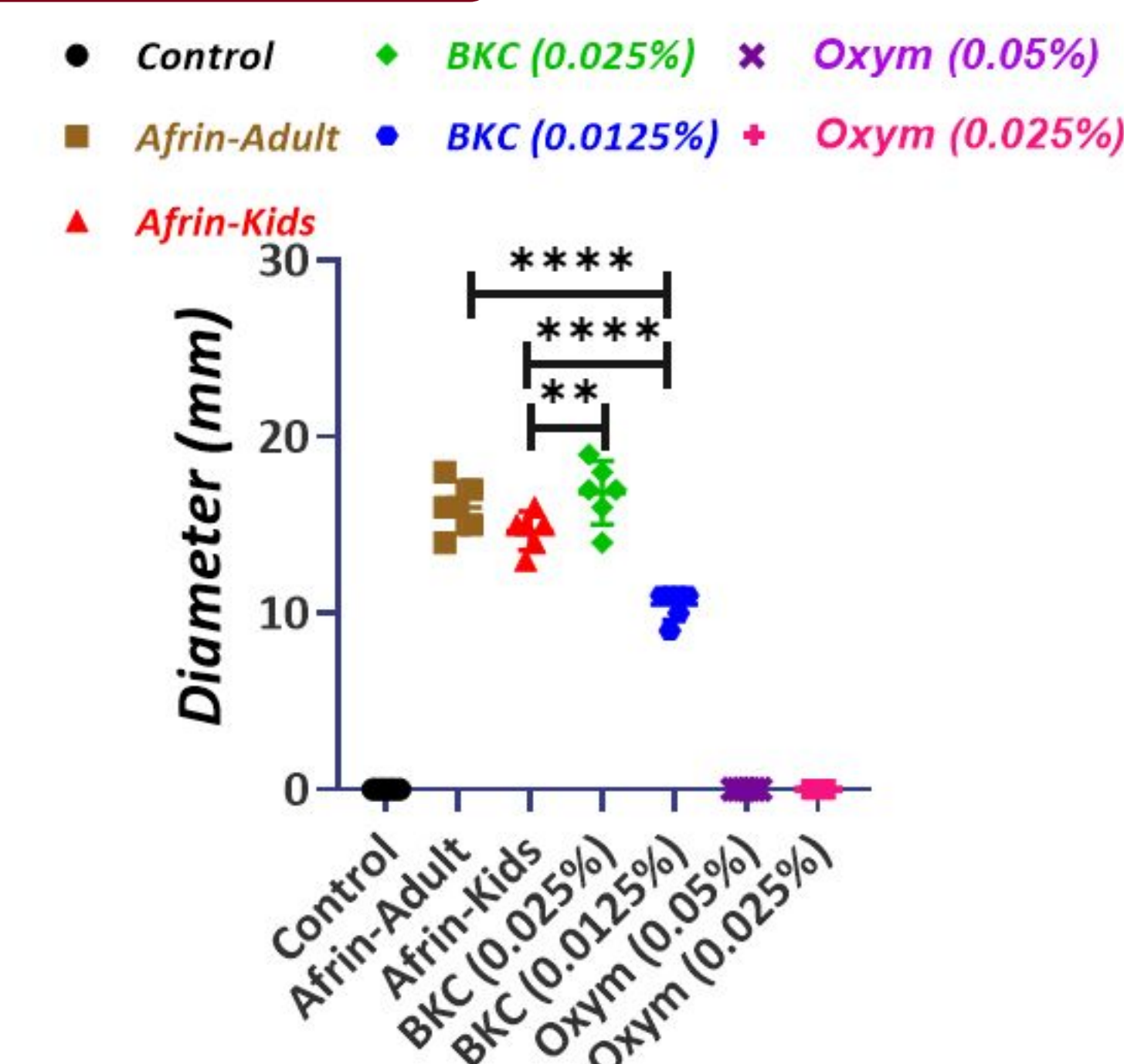
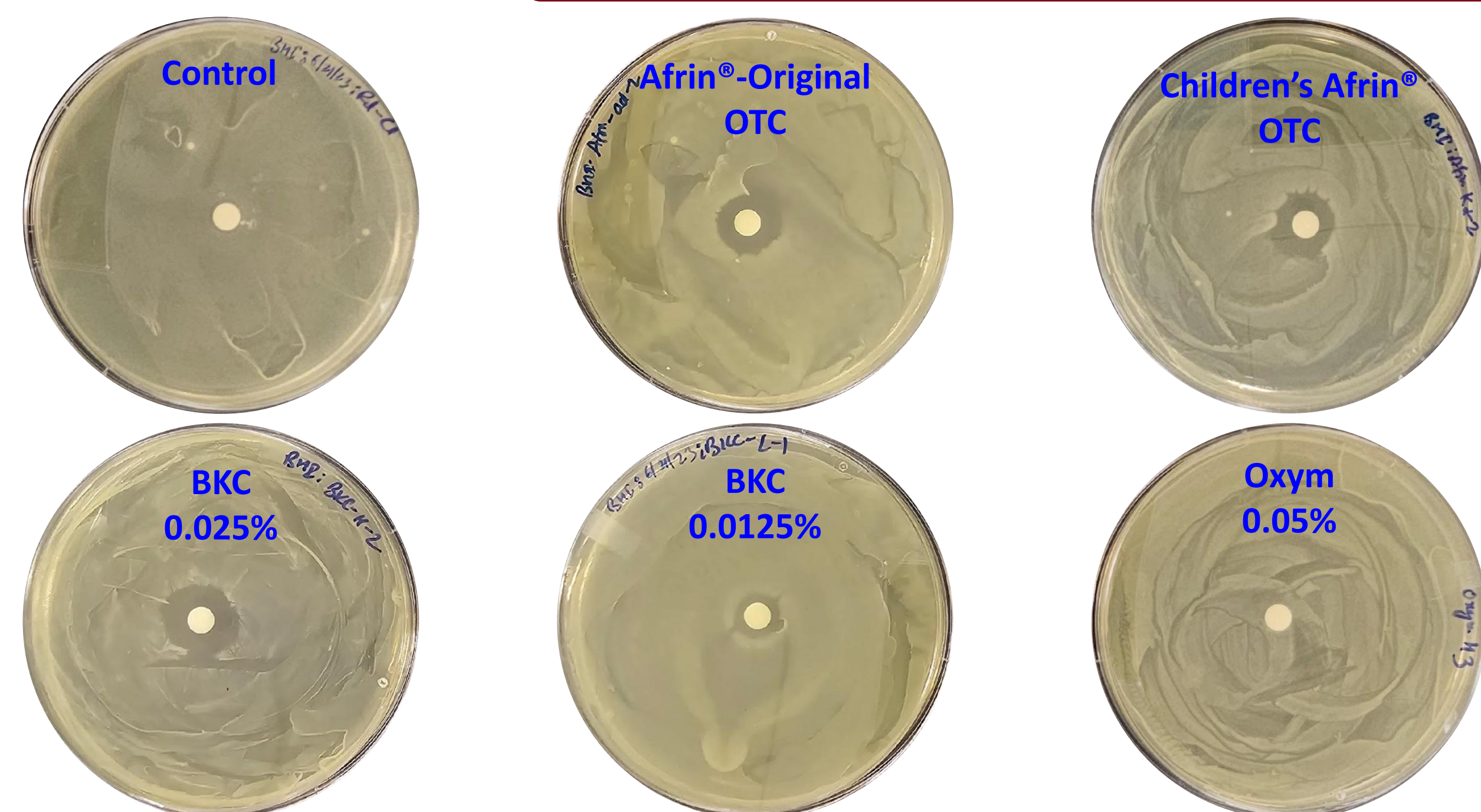
To evaluate and compare the antibacterial property of Children's Afrin®, Afrin® original, and their active (Oxym) and inactive (BKC) ingredients against the dentinal caries model organism *Rothia dentocariosa* (Rd).



Methods

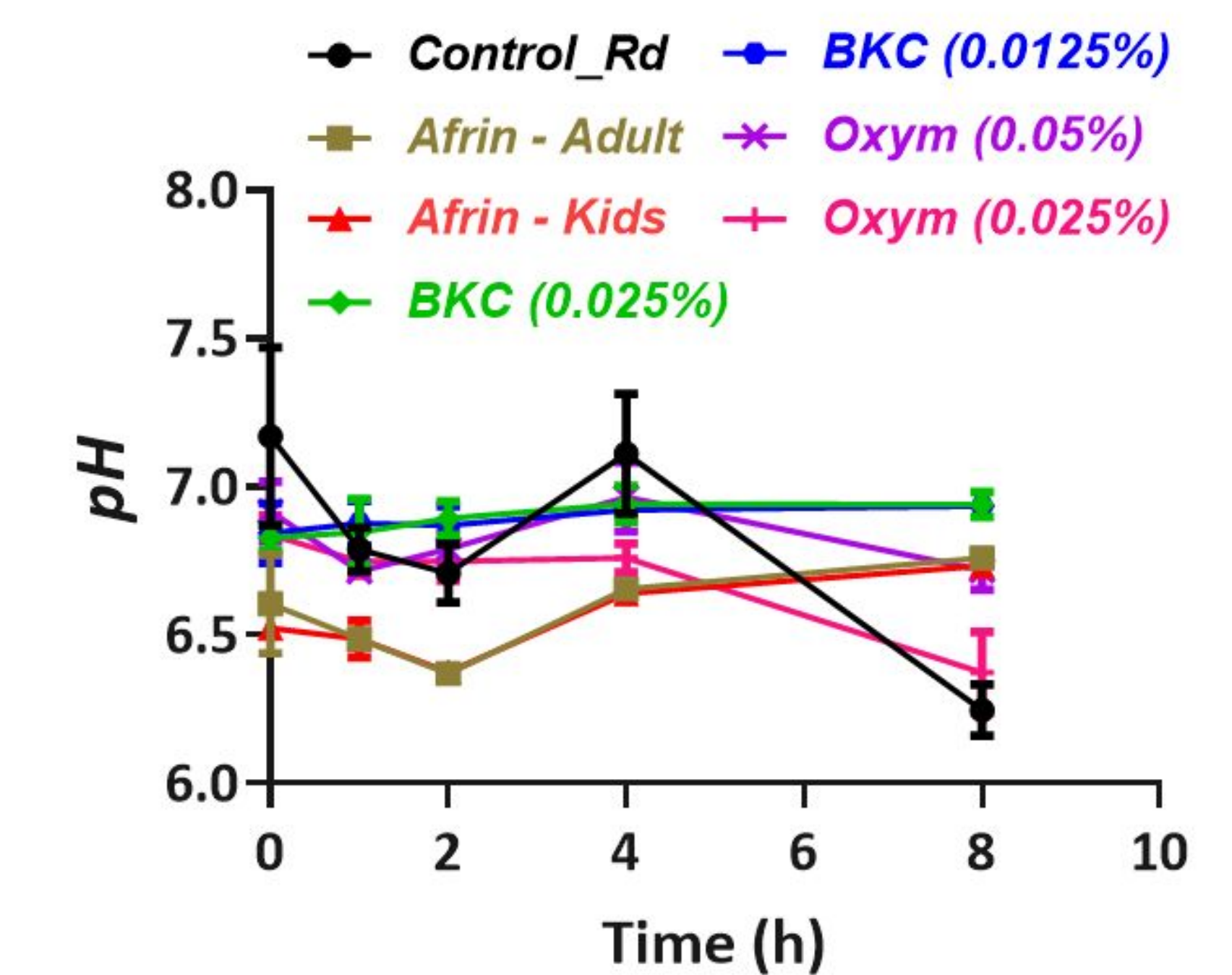
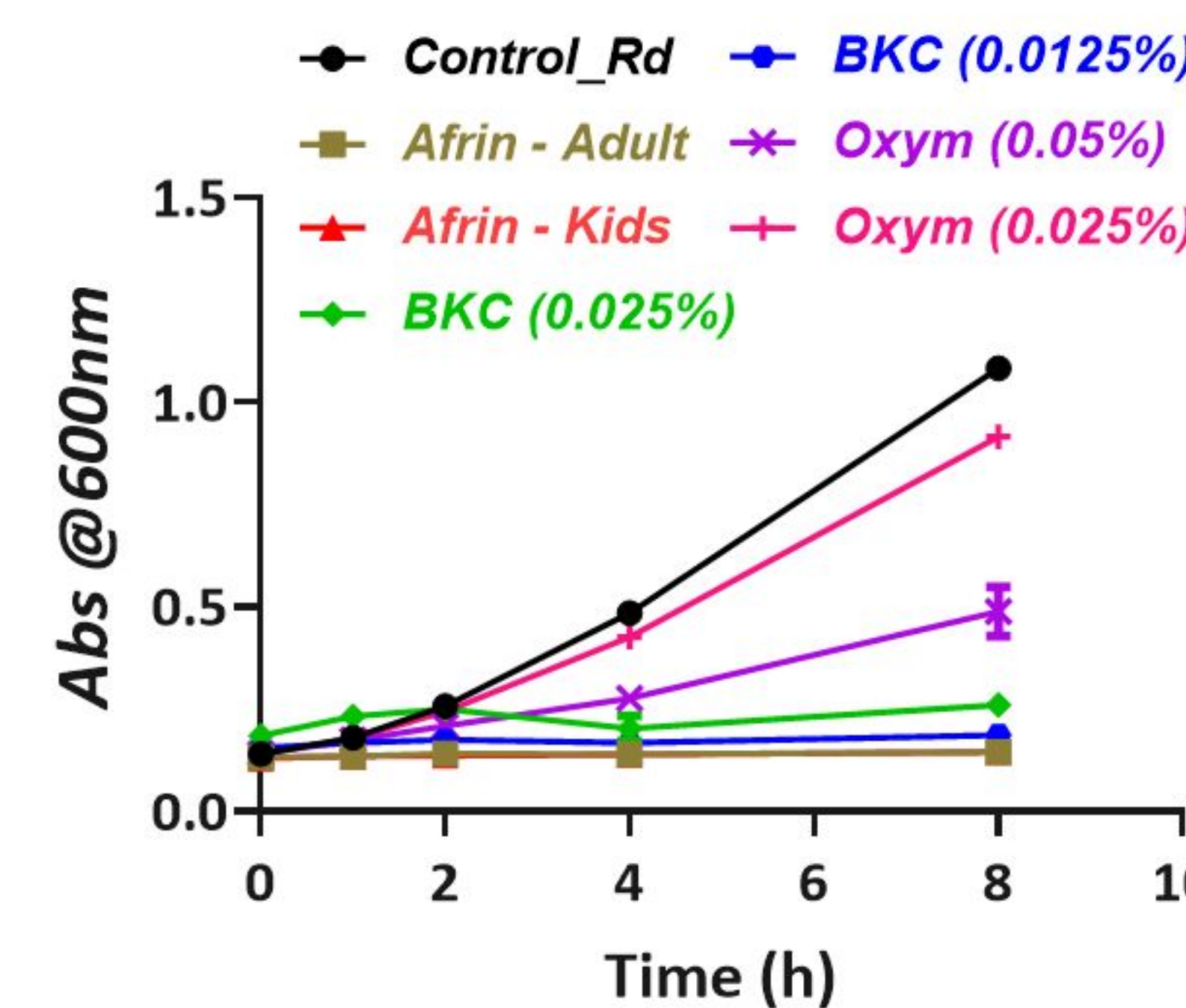
Rothia dentocariosa (Rd) bacterial cells were grown overnight in brain-heart infusion (BHI) broth media. Using the overnight culture, the *Rothia* bacterial cells were diluted to 0.6 OD, followed by 300 µL cell suspension spread over the BHI agar plates to form a uniform cell bed using a L-shaped disposable spreader. Simultaneously, the Whatman Grade AA discs (6mm) were dried with 20 µL of each reagent (n=3), Oxymetazoline (Oxym, 0.05%; 0.025%), Benzalkonium Chloride (BKC, 0.025%; 0.0125%), Afrin® original (Oxym 0.05% and BKC unknown concentration), and Children's Afrin® (Oxym 0.025% and BKC unknown concentration) at room temperature and exposed to the bacterial cell bed to study the antibacterial property using a disc inhibition assay. The exposed agar plates with bacterial cell beds were allowed to grow overnight under ambient conditions. In addition, an antibacterial broth inhibition test was performed by adding the test reagents in BHI broth media containing *Rothia dentocariosa* at 37°C under aerobic conditions. The optical density at 600 nm wavelength and pH for each sample type (n=3) were recorded simultaneously at defined time intervals (0, 1, 2, 4, and 8 hrs). For hemostatic experiments, an *ex vivo* bovine dental caries model was designed.

Disc Inhibition



Disc inhibition assay showed Afrin® original, Children's Afrin®, and Benzalkonium Chloride (BKC, 0.025%) had the largest zone of inhibition compared to control, BKC (0.0125%), and Oxym (0.025% and 0.05%). The observed discs inhibition assay reported a statistically significant larger zone of inhibition thereby confirming the stronger antibacterial properties. The active component of formulation - Oxymetazoline (Oxym, 0.05%; 0.025%) supported the Rd growth with no zone of inhibition same as control, suggesting no antibacterial property.

Optical Density and pH Level



Antibacterial property against *Rothia dentocariosa* was also confirmed based on growth inhibition assay suggested by a decrease in OD of broth exposed to Afrin® original (Oxy-0.05% with BKC), Children's Afrin® (Oxy-0.025% with BKC), and BKC (0.025%; 0.0125%) for up to 8 hours compared to the control. In addition, again Oxym (0.025% and 0.05%) showed no antibacterial property.

Summary

- Children's Afrin® shares the same antibacterial properties as Afrin® original against *Rothia dentocariosa*.
- This could be suggestive of the same concentration of benzalkonium chloride (BKC), an inactive component in both formulations.
- The active component oxymetazoline (Oxym) did not show any antibacterial property, however as per literature is known for its hemostatic property via alpha receptor mediated vasoconstriction.
- The study highlighted the potential application of Children's Afrin® as an effective pulpal management agent for primary teeth in children.

References

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2. Isaacson G., Buttaro B.A., Mazeffa V., Li G., Frenz D.A. Oxymetazoline Solutions Inhibit Middle Ear Pathogens and Are Not Ototoxic. Ann. Otol. Rhinol. Laryngol. 2005;114:645–651. doi: 10.1177/000348940511400811.

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