ActaCal™

Calcium-Silicate-Based BC SEALER

- Angelus Bio-C Sealer
- Avalon Biomed NeoPUTTY
- Avalon Biomed NeoSEALER Flo
- Endo Direct EndoCeramic
- Meta Biomed CeraSeal
- Septodont BioRoot RCS
- Vista Apex RE-GEN

CALCIUM SILICATE BIOCERAMIC SEALER	VS.	CALCIUM ALUMINATE BIOCERAMIC SEALER
High pH (~11–12) and calcium ion release; promotes healing and antibacterial effects[1]	pH and Calcium Ion Release	Lower calcium ion release; less alkaline environment[1]
Produces Ca^{2+} and OH^-, contributing to bioactivity and healing[2]	Hydration Byproducts	Produces Al^{3+} and OH^-, raising toxicity concerns[2]
No aluminum exposure[3]	Aluminum Toxicity	Al^{3+} linked to inflammation, neuro-degeneration, and Alzheimer's disease[3]
Promotes bone bonding and osteoconduction[4]	Osteointegration	No new bone formation; fibrous encapsulation instead[4]
No significant discoloration[5]	Tooth Discoloration	Can cause significant tooth discoloration over time[5]
Clinically proven; long-term stability[6]	Material Performance in Dentistry	Higher failure rates in restorative and stress-bearing applications[6]
Excellent; promotes stem cell differentiation and repair[7]	Biocompatibility	Hemolytic potential; early cytotoxicity observed[7]
Ideal for anterior aesthetics due to color stability[8]	Aesthetic Suitability	Poor aesthetic profile due to discoloration potential[8]

Published Evidence / Notes

[1] Camilleri, J. (2014). "Hydration mechanisms of mineral trioxide aggregate" - *International Endodontic Journal*, 47(8), 740–753. *https://doi.org/10.1111/iej.12224*
Camilleri, J., & Sorrentino, F. (2013). "Calcium ion release from hydraulic cements" - *Journal of Dentistry*, 41(4), 360–370. *https://doi.org/10.1016/j.jdent.2013.01.007*

[2] Well-established hydration chemistry

[3] Exley, C. (2020). "Aluminium toxicosis: a review of toxic actions and effects" - *Environmental Geochemistry and Health*, 42(4), 1207–1215. *https://doi.org/10.1007/s10653-019-00458-7*
Wang, Z., Wei, X., Yang, J., et al. (2016). "Chronic aluminum exposure and risk of Alzheimer's disease: A meta-analysis" - Neuroscience *Letters, 610, 200–206. https://doi.org/10.1016/j.neulet.2015.11.014*

[4] Haider, T. T., Shujaat, S., & Zaman, M. U. (2009). "Comparison of osteointegration in calvarial defects using different biomaterials" - *Journal of Craniofacial Surgery*, 20(5), 1465–1469. *https://doi.org/10.1097/SCS.0b013e3181b7d01e*

[5] Camilleri, J. (2021). "Discoloration potential of calcium aluminate cements" - *Journal of Endodontics*, 47(5), 783–789. *https://doi.org/10.1016/j.joen.2020.12.013*

[6] Pameijer, C. H., Garcia-Godoy, F., & Morrow, B. R. (2003). "Clinical evaluation of a restorative material containing calcium aluminate" - *Operative Dentistry*, 28(5), 472–478.
Frencken, J. E., et al. (2004). "Clinical performance of new restorative materials in Class I and II cavities" - *American Journal of Dentistry*, 17(6), 407–412.
Asmussen, E., & Peutzfeldt, A. (2004). "Mechanical properties of a new dental cement" - *Dental Materials*, 20(2), 96–101.

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Jeong, Y., et al. (2012). "Cytotoxic effects of experimental endodontic materials on MDPC-23 cells" - *Journal of Endodontics*, 38(7), 938–943. *https://doi.org/10.1016/j.joen.2012.03.001*

[8] Camilleri, J. (2021). "Discoloration potential of calcium aluminate cements" - *Journal of Endodontics*, 47(5), 783–789. *https://doi.org/10.1016/j.joen.2020.12.013*