Disrupting Wnt signaling in the junctional epithelium stem cell niche causes periodontitis, research finds

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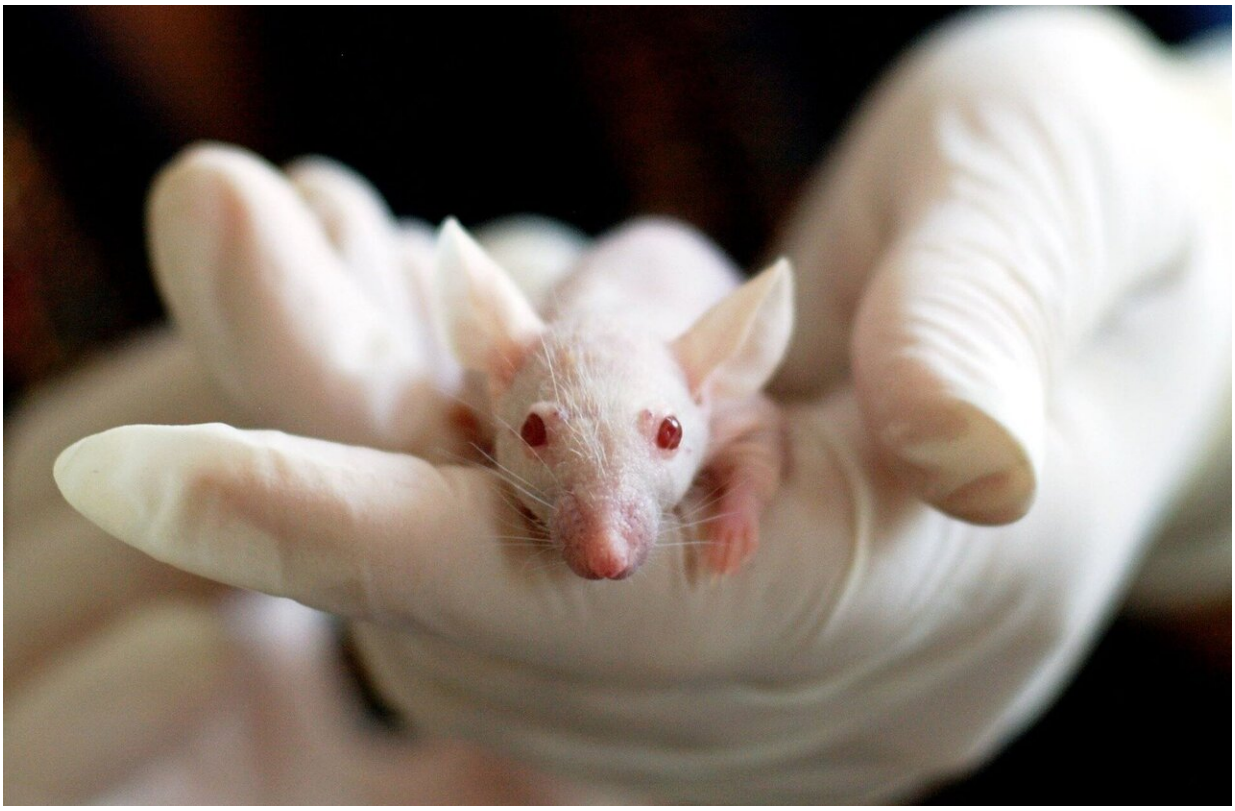

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A study that evaluated how biochemical inhibition of endogenous Wnt signaling affects barrier functions of the junctional epithelium was presented at the 102nd General Session of the IADR, which was held in conjunction with the 53rd Annual Meeting of the American Association for Dental, Oral, and Craniofacial Research and the 48th Annual Meeting of the Canadian Association for Dental Research, on March 13-16, 2024, in New Orleans, LA, U.S..

The abstract, "Disrupting Wnt Signaling in the Junctional Epithelium Stem Cell Niche Causes Periodontitis," was presented during the "Late Breaking Abstracts I" Poster Session on Thursday, March 14, 2024, at 3:45 p.m. Central Standard Time (UTC-6).

The study, by Fabiana Aellos of Stanford University, CA, U.S., used a strain of Wnt reporter mice, Axin2LacZ/+, to demonstrate that endogenous Wnt signaling was reduced by treatment with C59, a membrane-permeable palmitoyltransferase Porcupine (PORCN) inhibitor. The effects of C59 on cell proliferation in the junctional epithelium (JE) were assessed using EdU incorporation to identify mitotically active cells, while the effects of C59 on JE attachment were evaluated using quantitative immunohistochemistry to detect changes in hemidesmosomal protein expression.

Localized inflammation in the JE and underlying periodontium was evaluated using quantitative immunostaining for neutrophils and macrophages. Bone changes were evaluated by micro-CT imaging.

Topical C59 delivery led to a dose-dependent reduction in endogenous Wnt signaling, most significantly in the epithelial component of the JE. In response to reduced Wnt signaling, the JE stem cell niche was abolished, and expression of the hemidesmosomal proteins Laminin5,

Beta4 integrin, and Plectin were significantly reduced.

Accompanying the loss of attachment was a significant increase in macrophages and neutrophils in the connective tissues. Over-expression of the secreted Wnt inhibitor Dkk1 in the JE was employed to inhibit endogenous Wnt signaling, producing a dramatic effect on alveolar bone.

Reducing endogenous Wnt signaling disrupts the stem cell niche, leading to the degradation of JE barrier functions and contributes to periodontal soft tissue breakdown. If continued studies validate these findings, then methods to prevent or potentially treat periodontitis may depend on restoring Wnt pathway activity to maintain the JE stem cell niche.

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