Conference Proceedings By
United Research Forum, London, UK

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UNITED RESEARCH FORUM
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6th World Congress on

Dentistry and Oral Health

July 09-10, 2026 | Frankfurt, Germany

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27-Hydroxycholesterol contributes to hypercholesterolemia-associated aggravation of apical periodontitis in ovariectomized rats and raloxifene counteracts its action

The influence of hypercholesterolemia on apical periodontitis (AP) development remains inconclusive. The cholesterol metabolite 27-hydroxycholesterol (27HC) can affect cellular responses to bacterial infections and estrogen status, with raloxifene potentially modulating its action. This study examined 27HC's impact on macrophage-derived inflammatory mediators and raloxifene's regulatory function using murine J774 macrophages and an experimental AP model in ovariectomized (OVX) or control rats receiving high fat/high cholesterol diet (HFHCD) or normal diet. Western blot and enzyme-linked immunosorbent assay assessed iNOS expression and CCL2 and 27HC concentrations. Micro-computed tomography and immunohistochemistry evaluated disease severity. Cholesterol significantly enhanced 27HC production in macrophages, which then induced iNOS and CCL2 synthesis; estradiol suppressed these responses. In HFHCD/OVX rats, serum and lesion 27HC levels were markedly elevated ($p < 0.05$), accompanied by increased lesion size and CD68+/iNOS+ cell infiltration. Raloxifene inhibited 27HC's pro-inflammatory effects on macrophages and suppressed AP progression ($p < 0.05$). Our findings demonstrate that 27HC contributes to AP aggravation in hypercholesterolemia, with estrogen deficiency amplifying both 27HC production and its downstream pro-inflammatory action.

Keywords: 27-hydroxycholesterol; apical periodontitis; hypercholesterolemia; oestrogen deficiency; raloxifene

Biography

Dr. Han-Wei Wang received his DDS, MS, and PhD degrees from the Graduate Institute of Clinical Dentistry at National Taiwan University. He is an attending dentist at National Taiwan University Hospital and a clinical assistant professor specializing in prosthetic dentistry at the School of Dentistry, National Taiwan University. His current research focuses on inflammation-related dental and bone diseases, and he will present his recent work on 27-hydroxycholesterol-mediated aggravation of apical periodontitis published in the International Endodontic Journal.

ISBN: 978-1-917892-41-4