

**The effect of dietary Omega-3 polyunsaturated
fatty acids on experimental periodontitis lesions in
the mouse**

**A research report submitted to the University of Adelaide in
partial fulfilment of the requirements for the Degree of Doctor
of Clinical Dentistry (Periodontics)**

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THE UNIVERSITY OF ADELAIDE

Faculty of Health Sciences – School of Dentistry

**Statement by Research Supervisor of DClinDent Thesis or
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Department / School: Dentistry

Research Supervisor(s): Professor Mark Bartold

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DECLARATION

I, Andrzej Bendyk, of 25 Royal Avenue, Adelaide, do solemnly and sincerely declare that the work presented in the Research Project is, to the best of my knowledge and belief original; except as acknowledged in the text. It has not been accepted in part or full for another degree.

Although the articles contained are multi-authored and contribution was greatly appreciated, their input was mainly advisory and I carried out all of the laboratory procedures and bulk of the writing.

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ABSTRACT

Periodontitis is an infective disease caused predominantly by gram negative anaerobic bacteria. However it is apparent that alveolar bone loss, which characterises periodontitis, is a result of the host inflammatory response to pathogenic bacteria, not the infectious agents directly. Omega-3 polyunsaturated fatty acids (O-3 PUFAs) are recognised, and used widely, for their anti-inflammatory effects. Evidence is emerging that their oxygenated derivatives are key chemical mediators in the resolution of inflammation. We hypothesised that dietary supplementation with fish oil rich in the O-3 PUFA docosahexaenoic acid would modify inflammatory reactions within the periodontium and thus reduce alveolar bone loss in mice infected with periodontopathic bacteria.

Eighty mice were fed experimental diets containing either 10% tuna oil (40) or a sunola oil (40) which contained no traceable O-3 PUFAs for 57 days. After two weeks each dietary set was split into four groups of ten mice, with these groups being inoculated with either

- a) *Porphyromas gingivalis*
- b) *P. gingivalis* and *Fusobacterium nucleatum* (combined inoculum)
- c) Carboxymethylcellulose (control) or
- d) No inoculations (control).

Of the twenty mice which received no inoculations, half were sacrificed after fifteen days and half at the end of the experiment to enable comparative fatty acid analysis of the oral soft tissues. Results demonstrated that eicosapentoic acid and docosahexaenoic acid were found in significantly higher proportions in the oral soft tissues of mice fed a tuna oil diet, and that animals receiving this diet exhibited an average of 54 - 72% less alveolar bone resorption in response to the different bacterial infections. Irrespective of diet, the combined inoculum resulted in slightly more alveolar resorption than *P. gingivalis* alone. The findings of this study suggest that fish oil dietary supplementation may have potential benefits as a host modulatory agent in the adjunctive management of periodontitis. Given its advantages in terms of safety, cost effectiveness and widespread availability, this dietary supplement warrants further research in human trials to assess its ability to modulate alveolar bone loss in individuals with periodontitis.