Proteoglycans
of the
Human Periodontium

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This collection of 27 published journal articles represents work carried out between 1983 and 1995. The major thrust of these works is an extension of my PhD studies, and centres on detailed investigations into the nature of proteoglycans in various periodontal compartments and what factors might influence their structure and synthesis. To help this thesis read in a logical fashion the selected papers have been arranged, not in chronological order, but in a thematic form which covers the four main areas of research in this field that I have pursued over the past 13 years. These fields, together with the major sources of the subject matter used for the studies, are described below.

1. Identification of the cellular source of the proteoglycans in gingival connective tissues.
   While my PhD studies had determined the presence of proteoglycans in human gingival tissues, their precise cellular source had not been determined. To do this, cell cultures were established from human gingival fibroblasts, lymphocytes and polymorphonuclear leukocytes. The tissues for these cell isolation studies were obtained from patients attending the Graduate Periodontics Clinic in Seattle, and the candidate's private practice in Adelaide. All of these cultures were established by the candidate. Healthy human volunteers, who were working in the Department of Pathology at The University of Adelaide with the candidate, provided the blood samples for isolation of the lymphocytes and polymorphonuclear leukocytes.

2. Isolation, identification and characterization of the proteoglycans found in the hard connective tissues of the periodontium.
   Not only were proteoglycans identified in the soft connective tissues of the periodontium, but they were presumed to be present in the two hard tissues of the periodontium, namely cementum and alveolar bone. Thus, studies were undertaken to isolate, identify and characterize the proteoglycan content of these tissues. The human alveolar bone specimens were obtained from the Oral Surgery Clinic at the University of Adelaide following routine third molar surgical extractions. The cementum samples were provided by Dr Sampath Narayanan, University of Washington, Seattle, USA as part of a collaborative project investigating the biochemical composition of cementum.

3. Determination of the pathological changes which occur to the proteoglycans in human gingiva.
   Once the proteoglycan composition of the "normal" periodontium had been established, it became necessary to investigate the changes which occurred during the development of inflammatory human periodontitis. The approaches used in these studies included studies on whole gingival biopsies as well as using cell culture. For these studies, inflamed human gingivae were obtained from the Graduate Periodontics Clinic at the University of Washington, Seattle, USA, and in subsequent years from the candidate's own specialist periodontal practice in Adelaide. The gingival fibroblast cultures derived from inflamed gingival biopsies were established by the candidate during his postdoctoral fellowship in Seattle.
4. Studying the effects of selected inflammatory and wound healing agents on proteoglycan synthesis.

Investigations into the molecular factors which might influence proteoglycan structure and synthesis were all carried out using cell culture. The gingival fibroblasts used in these studies included those derived from donors of a variety of ages, as well as those from normal and inflamed gingivae. All of the cultures were established by the candidate either in Seattle, Adelaide or Brisbane. The interleukin-1β was a generous gift from Dr Stephen Dower from Immunex Corporation, Seattle, Washington, USA; the lipopolysaccharide preparations from Porphyromonas gingivalis and Actinobacillus actinomycetemcomitans were a gift from Dr Stephen Miller, State University at Buffalo, New York, USA; the culture supernatants from Fusobacterium nucleatum were provided by Dr Tony Rogers, The University of Adelaide; the platelet derived growth factor used was recombinant human of the BB isoform and was purchased from Genzyme Corporation, Boston, USA.

A more detailed description of the significance of these findings is provided at the commencement of each of the four sections. A statement regarding the candidate's contribution to any jointly authored papers is also detailed at the commencement of each section.