PREVALENCE OF MAST CELLS WITHIN THE PERIODONTAL LIGAMENT OF THE DEVELOPING RAT MOLAR

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Glossary of Abbreviations

ABC	Avidin-Biotin Complex
CD34+	Human Mast Cell Precursor
CFU-Mast	Mast Cell Precursor (Rodent)
COX	Cyclooxygenase
CTMC	Connective Tissue Mast Cell (Rodent)
EDTA	Ethylene-diamine-tetraacetic Acid
FcεRI	Antigenic Receptor upon Mast cell surface
FITC	Fluorescein thiocyanate
GAG	Glycosaminoglycan
GM-CSF	Granulocyte-Macrophage Colony Stimulating Factor
HRP	Horse Radish Peroxidase
IFFA	Formaldehyde / Acetic acid tissue fixative
IgE	Immunoglobulin-E
IL	Interleukin
LT	Leukotrienes
MC_T	Mucosal Mast Cell (Human)
MC_{TC}	Connective Tissue Mast Cell (Human)
MMC	Mucosal Mast Cell (Rodent)
PAF	Platelet Activating Factor
PG	Prostaglandins
RMCP-I / RMCP-II	Rat Mast Cell Protease I / II
TGF-β	Transforming Growth Factor-beta
TNF-α	Tumour Necrosis Factor-alpha
TRITC	Tetramethylrhodamine

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Summary

Mast cells are commonly associated with tissue inflammation and can expel an array of cytokines and mediators during activation or injury to the cell. Mast cells demonstrate two sub-types in both humans and rodents and are distinguished by their neutral protease composition. These are classified as either mucosal or connective tissue-type. This study aims to assess the location and prevalence of mast cells about the developing first maxillary molar crown and periodontal ligament (PDL) of the developing mesiobuccal root. A relative incidence of mucosal and connective tissue-type mast cells within the PDL population was also investigated.

Twenty four Sprague-Dawley rats were divided into six groups and assessed at 2 days, 1, 2, 3, 4 and 6 weeks. Maxillae were fixed in 10% neutral buffered formalin and sectioned either longitudinally or horizontally. Sections were stained histochemically with Toluidine blue (pH 0.5) or immunohistochemically with Sheep anti-rat mast cell protease-II. The mesiobuccal root was examined at 150 μm levels. The PDL was divided horizontally into thirds (bone, middle or tooth) to determine mast cell position within the PDL. Longitudinal sections provided total mast cell counts.

The unerupted developing crown demonstrated few mast cells randomly distributed about the dental follicle. Development of the root saw mast cell numbers increase within the PDL with increasing age, with the exception of a reduction at four-weeks. This decrease coincided with tooth eruption. Mast cells were distributed evenly along the length of the mesiobuccal root at all ages, however, once in functional occlusion appeared more prevalent in the apical one-half of the root. An even distribution of mast cells about the root circumference was also noted. Within the PDL a shift of the population was noted to occur from the tooth one-third of the periodontal ligament at two-weeks, to the bone one-third of the PDL in the six-week group. Greater counts of mast cells (approximately 20-40%) were identified when labelled with Sheep anti-rat mast cell protease-II antibody than with Toluidine blue (pH 0.5). This difference suggests detection of a non-connective tissue-type of mast cell or an immature mast cell unable to be detected by the histochemical techniques.

Signed Statement

This report contains no material that has been accepted for the award of any other degree or diploma in any other university. To the best of my knowledge and belief, it contains no material previously published except where due reference is made in the text.

I give consent of this copy of my thesis, when deposited in the University Library, being available for loan and photocopying.

Richard J. Salmon

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