A.Sudharsana et al /J. Pharm. Sci. & Res. Vol. 7(9), 2015, 757-758

ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in

Flax Seeds in Periodontal Therapy

A.Sudharsana
CRI, Saveetha Dental College

Dr.Sankari.M.D.S.
Prof, Dept. of Periodontics, Saveetha Dental College

Abstract :
Flax (*Linum usitatisimum* L.) is grown as a fibre crop or oil crop. Flax is a rich source of fatty acids such as polyunsaturated fatty acids, the essential omega-3 fatty acid, and linoleic acid (LA), the essential omega-6 fatty acid. Adequate dietary intake of omega-3 polyunsaturated fatty acids (n-3 PUFAs) increases tissue concentrations of fatty acids that downregulate inflammation. Periodontitis being an inflammatory disease, use of omega -3 fatty acids in periodondontal therapy is a possible treatment option. This article overviews dietary modulation using omega-3 fatty acid as atreatment option for periodontitis.

Key words: Uses of flax, Resolvins, omega-3 fatty acids, periodontal therapy.

INTRODUCTION:

Periodontitis is defined as an inflammatory disease of supporting tissues of teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession or both[1]. Periodontitis occurs as a result of immunoinflammatory response. Inflammation is a normal defense mechanism that protects the host from infection and other noxious challenges. It is a crucial activity to initiate pathogen killing and tissue repair process to restore tissue homeostasis.It is generally well regulated to minimize collateral tissue damage. When there is dysregulation of this well controlled process it leads to pathological inflammation. There are pro inflammatory cells that activate host inflammation, such as IL-1, IL-6 and TNF-α [2]. Similarly, eicosinoids are inflammatory mediators and regulators which are involved in modulating the intensity and the duration of inflammatory response. Eicosinoids include prostaglandin, thromboxanes, leukotrenes [3].

OMEGA -3 FATTY ACIDS:

Omega -3 fatty acids are poly unsaturated fatty acids , there are three types of omega -3 fatty acids derived from food and used by body (i) α-linolenic acid, (ii)eicosapentaenoic acid and (iii) docosahexaenoic acid. The body converts α-linolenic acid to eicosapentaenoic
acid and then to docosahexaenoic acid. Eicosapentaenoic acid and docosahexaenoic acid are the two types of omega-3 fatty acids that serve as important precursors for lipid-derived modulators of cell signaling, gene expression and inflammatory processes. The most
important polyunsaturated fatty acids biologically are eicosapentaenoic acid and docosahexaenoic acid. Although α-linolenic acid can serve as a precursor for eicosapentaenoic acid and docosahexaenoic acid synthesis in humans, this pathway of synthesis will vary across the general population. Therefore, direct dietary intake of n-3 fats rich in eicosapentaenoic acid and docosahexaenoic acid are of most benefit clinically[4].
Sources: Most of the α-linolenic acid consumed in the diet comes from plant sources i.e. Flax seed, walnuts and pecans, with a small percentage in western diets also obtained from chicken and beef. The highest concentrations of eicosapentaenoic acid and docosahexaenoic acid are found in coldwater fish, such as salmon, tuna and herring.

FLAX SEEDS:

Flax (*Linum usitatisimum* L.) is grown as a fibre crop or oil crop. Flax is a rich source of fatty acids such as polyunsaturated fatty acids, the essential omega-3 fatty acid, and linoleic acid (LA), the essential omega-6 fatty acid. For vegetarians the source of omega-3 fatty acid is only through plants. Flax seeds and flax oil has high concentration of omega-3 fatty acid. Hence this can be used as a source of omega-3 fatty acid by vegetarians[4].
Adequate dietary intake of omega-3 polyunsaturated fatty acids (n-3 PUFAs) increases tissue concentrations of fatty acids that down regulate inflammation[5].

RESOLVINS:

Resolution of inflammation are essential to restore to heath. Resolution is an active process involving biochemical circuits that actively biosynthesize local mediators within the resolution phase, which is brought about by resolvins[6].
Resolvins and protectins are lipid-derived mediators of inflammation. They possess anti-inflammatory and pro-resolving properties by inhibiting the production of proinflammatory compounds such as TNF- α and reducing the recruitment of immune cells such as neutrophils to sites of inflammation. Mediators derived from fatty acids, such as n-3 polyunsaturated fatty acids, have been investigated for their effects on resolving inflammation. These lipid-derived mediators include resolvins, lipoxins, protectins and maresins and modify the inflammatory response These mediators provide a proactive approach to resolving inflammation and the potential to provide additional tools to improve the host response to periodontitis[7].
Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) give rise to different group of eicosanoids termed as resolvins, that are involved in activities to resolve inflammation.
Resolvins and protectins are lipid-derived mediators of inflammation. They possess anti-inflammatory and pro-resolving properties by inhibiting the production of

proinflammatory compounds such as TNF-a and reducing the recruitment of immune cells such as neutrophils to sites of inflammation [8].There are three types of resolvins, (i) 18R E-series resolvins from EPA (ii)17R and 17S D-series resolvins from DHA (iii) Protectins from DHA.

(i) 18R E-series resolvins from EPA: The exudates collected from murine air pouches in the resolution phase contained 18R-trihydroxyeicosapentaenoic acid (HEPE) as well as several other related bioactive compounds [9]. These novel compounds were generated from EPA. The first bioactive compound, termed resolvin E1 (RvE1), was isolated from exudates and found to reduce inflammation in vivo and blocks human PMN transendothelial migration in vitro. Human recombinant 5-LOX generates resolvin E2 (RvE2) from a common precursor of E-series resolvins, namely 18- HEPE. RvE1 and RvE2, when given together, displayed additive action in controlling PMN infiltration. These results demonstrate that RvE2, together with RvE1, may contribute to the beneficial actions of omega-3 fatty acids in periodontitis by reducing PMN infiltration , stops inflammation-induced tissue and bone loss. Reduces vaso obliteration and neovascularisation[10]. At nanomolar levels in vitro,RvE1 dramatically reduced human PMN transendothelial migration, dendritic cell migration and interleukin (IL)- 12 production[11]. For example, administration of synthetic RvE1 blocks PMN infiltration in periodontal disease in a rabbit model [10].

(ii) 17R and 17S D-series resolvins from DHA: The resolving exudates from mice given aspirin plus DHA also contained novel 17R-hydroxy docosahexaenoic acid(HDHA) and several related bioactive compounds. RvD1 and AT-RvD1 each proved to be potent regulators of both human and murine PMN. They stopped transendothelial migration of human neutrophils[12]. In microglial cells, they block TNF-a-induced IL-1b transcripts[13].

Resolvins Ds are potent regulators of PMN infiltration, RvDs reduced infiltrating leukocytes and blocked Toll-like receptor-mediated activation of macrophages.

(iii) Protectins from DHA: Identification of the resolvins and protectins generated from DHA now opens exploration into the essential roles of these pathways and mediators.

Protectins also reduced PMN infiltration when administered after the initiation of inflammation in vivo as well as acts in an additive fashion with Resolvin E1 to stop PMN infiltration[4].

CONCLUSION:

Endogenous lipid mediators play key roles in local controlling and programming of the acute innate inflammatory response and its resolution as an active biosynthetic process[14]. Omega -3 fatty acid type of poly unsaturated fatty acid which is of three types has animal and plant source. α-linolenic acid has its sources mainly from plants, more specifically from flax seeds and flax oil. Eicosapentaenoic acid and docosahexaenoic acid mainly from animal source. Eicosapentaenoic acid and docosahexaenoic acid are of most benefit clinically, but α-linolenic acid can serve as a precursor. These fatty acids forms resolvins through various metabolic pathways, that are involved in activities to resolve inflammation. As periodontitis is a form of inflammatory disease, dietary modulation using fatty acids in the form of flax seeds aid in reduction of periodontal inflammation. Animal source of omega-3 fatty acids for periodontal therapy has been extensively studied. But omega-3 fatty acid as plant source for periodontal therapy is still at its nascent stage and is of future interest.

REFRENCES:

(1) Newman, M. G., Carranza, F. A., Takei, H., Klokkevold, P. R. *Carranzas clinical Periodontology*. 10th ed. Elsevier health sciences; 2006.

(2) Birkedal-Hansen H. Role of cytokines and inflammatory mediators in tissue destruction. *J Periodontal Res* 1993, 28, 500–510.

(3) Calder, P. C., Albers, R., Antoine, J. M., Blum, S., Bourdet-Sicard, R., Ferns, G. A., et. al. Inflammatory disease processes and interactions with nutrition. *Br J Nutr* 2009, 101(Suppl. 1): S1–S45.

(4) Dolphus, R., Dawson III, Grishondra Branch-Mays, Octavio, A., Gonzalez, Jeffrey Ebersole, L. Dietary modulation of the inflammatory cascade. *Periodontology 2000*, 2014, 64, 161–197.

(5) Ziboh, V. A. (2000) Nutritional modulation of inflammation by polyunsaturated fatty acids/eicosanoids. In: Gershwin, M. E., German, B. J. & Keen, C. L. (eds). Nutrition and Immunology: Principles and Practice, pp. 157–167. Totowa, NJ: Humana.

(6) Serhan, C. N., Chiang, N. Endogenous pro-resolving and anti-inflammatory lipid mediators: a new pharmacologic genus. *British journal of pharmacology* 2008, 153, S200-S215.

(7) Herrera, B. S., Ohira, T., Gao, L., Omori, K., Yang, R., Zhu, M., Muscara, M. N., Serhan, C. N., Van Dyke, T. E., Gyurko R. An endogenous regulator of inflammation, resolvin E1, modulates osteoclast differentiation and bone resorption. *Br J Pharmacol* 2008, 155, 1214–1223.

(8) Serhan, C. N., Hong, S., Gronert K et al. Resolvins: a family of bioactive products of omega-3 fatty acid transformation circuits initiated by aspirin treatment that counter proinflammation signals. *J Exp Med* 2002;196:1025–1037.

(9) Serhan CN, Clish CB, Brannon J, Colgan SP, Chiang N, Gronert K (2000). Novel functional sets of lipid-derived mediators with antiinflammatory actions generated from omega-3 fatty acids via cyclooxygenase 2-nonsteroidal antiinflammatory drugs and transcellular processing. J Exp Med 192: 1197–1204.

(10) Hasturk H, Kantarci A, Ohira T, Arita M, Ebrahimi N, Chiang N et al. (2006). RvE1 protects from local inflammation and osteoclast mediated bone destruction in periodontitis. FASEB J 20: 401–403.

(11) Serhan, C. N., Hong, S., Gronert, K., Colgan, S. P., Devchand, P. R., Mirick G et al. Resolvins: a family of bioactive products of omega-3 fatty acid transformation circuits initiated by aspirin treatment that counter pro-inflammation signals. *J Exp Med*. 2002, 196, 1025–1037.

(12) Serhan, C. N. Lipoxins and aspirin-triggered 15-epi-lipoxin biosynthesis: an update and role in anti-inflammation and proresolution. *Prostaglandins Other Lipid Mediat* 2002, 68-69, 433–455.

(13) Hong, S., Gronert, K., Devchand, P., Moussignac, R. L., Serhan, C. N. Novel docosatrienes and 17S-resolvins generated from docosahexaenoic acid in murine brain, human blood and glial cells: autacoids in anti-inflammation. *J Biol Chem*. 2003, 278: 14677–14687.

(14) Serhan, C. N. Lipoxin biosynthesis and its impact in inflammatory and vascular events. *Biochim Biophys Acta*.1994, 1212, 1–25.