

7-1-2017

The Effects of Different Extract of *Lepidium Sativum* on Induced Periodontitis in Dexamethasone Immunosuppressed Rats

Hoda ElSayed

(B.D.S 2006) faculty of oral and dental medicine M.U.S.T university in Ministry of Health

Naglaa Elkilani

Professor and Head of Oral Medicine, Periodontology, Radiology, and Diagnosis Faculty of Dental Medicine for Girls, Al-Azhar University-Girls Branch.

Mona Farid

Professor and Head of the Oral and Dental Biology Department and Former Dean of Faculty of Dental Medicine for Girls, Al-Azhar University-Girls Branch.

Follow this and additional works at: <https://azjd.researchcommons.org/journal>



Part of the [Other Dentistry Commons](#)

How to Cite This Article

ElSayed, Hoda; Elkilani, Naglaa; and Farid, Mona (2017) "The Effects of Different Extract of *Lepidium Sativum* on Induced Periodontitis in Dexamethasone Immunosuppressed Rats," *Al-Azhar Journal of Dentistry*. Vol. 4: Iss. 3, Article 8.

DOI: <https://doi.org/10.21608/adjg.2017.5265>

This Original Study is brought to you for free and open access by Al-Azhar Journal of Dentistry. It has been accepted for inclusion in Al-Azhar Journal of Dentistry by an authorized editor of Al-Azhar Journal of Dentistry. For more information, please contact yasmeenmahdy@yahoo.com.



The Effects of Different Extract of *Lepidium Sativum* on Induced Periodontitis in Dexamethasone Immunosuppressed Rats

Hoda Mohammed ElSayed⁽¹⁾, Naglaa Shawki Elkilani⁽²⁾ and Mona Hassan Farid⁽³⁾

Codex : 30/1707

dentaljournal.forgirls@yahoo.com

ABSTRACT

Objective : The present study was designated to evaluate the effect of *lepidiumsativum* extract on structure and density of bone in immunosuppressed rats with induced chronic periodontitis histologically, hostometrically as well as radiodensitometric analysis by digital radiography assessment (vista scan). **Materials and methods:** A total 36 wistar male rats were divided randomly into 6 groups (6 rats/group). The study sample was divided into: I - Control group: in this group rats were fed with a normal diet. II- Control group with ligature: without receiving dexamethasone injection, a sub marginal cotton ligature. III- Vehicle group: in this group rats were received a weekly dose of dexamethasone for 6 weeks and received sub marginal cotton ligature (no treatment). SRP 1 (methanol group): rats were received methanol extract for 30 days, these were subjected to scaling and root planning (SRP). SRP 2 (watery group): in this group rats were subjected to (SRP). SRP 3 group submitted only to SRP and received no further treatment. **Results:** methanol extract has better anabolic effect on bone and regenerative on periodontal ligaments than watery extract. This could be explained by the fact that *lepidiumsativum* possesses anti-inflammatory, immunomodulatory properties and antioxidative activity that may resolve periodontal inflammation.

KEYWORDS

Immunosuppression,
Dexamethasone ,
Chronic periodontitis,
lepidiumsativum, Extract , SRP

Paper was extracted from master thesis entitled as “The Effects of Different Extract of *Lepidium Sativum* on induced periodontitis in Dexamethasone Immunosuppressed Rats”.

1. (B.D.S 2006) faculty of oral and dental medicine M.U.S.T university in Ministry of Health.
2. Professor and Head of Oral Medicine, Periodontology, Radiology, and Diagnosis Faculty of Dental Medicine for Girls, Al-Azhar University-Girls Branch.
3. Professor and Head of the Oral and Dental Biology Department and Former Dean of Faculty of Dental Medicine for Girls, Al-Azhar University-Girls Branch.

INTRODUCTION

Chronic periodontitis is an inflammatory disease of the supporting tissues of the teeth associated with a polymicrobial biofilm (subgingival plaque) accreted to the tooth⁽¹⁾. Although periodontal bacteria are essential for disease initiation, susceptibility, as determined by various genetic, environmental, and risk factors, is also implicated in the etiopathogenesis of periodontitis. Fact, it is the host inflammatory reaction to uncontrolled bacterial challenge that primarily mediates tissue damage⁽²⁾.

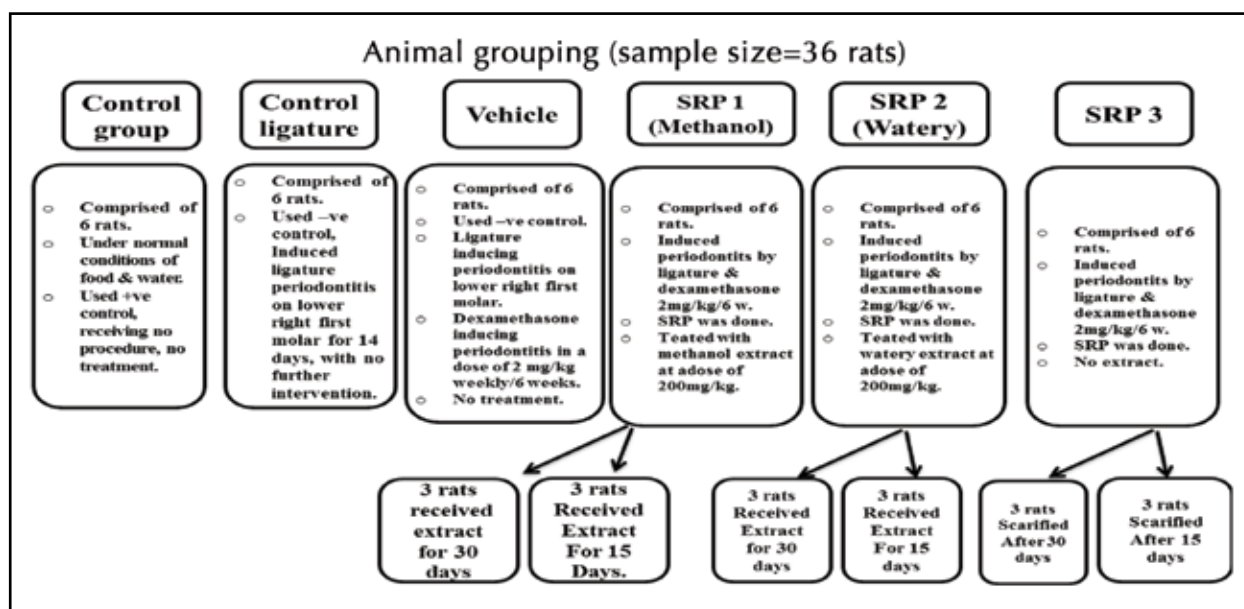
Corticosteroids exert effects on different aspects of metabolism including carbohydrate metabolism, protein catabolism and also on physiological processes like immune response and regulation of inflammation, blood electrolyte levels and behaviour. They influence bone remodelling by influencing osteoblasts, osteoclasts and osteocyte function⁽³⁾. Herbs are used, to reduce inflammation, and calm and soothe irritation. *Lepidiumsativum* is an annual herb, stem finely striate, branched and glabrous (hairless, smooth)⁽⁴⁾. One of the traditional uses of *Lepidiumsativum* is for increasing the speed of

bone fracture healing. Host modulatory therapy is to restore balance between on the one hand, pro inflammatory mediators and destructive enzymes and on the other hand anti-inflammatory mediators and enzyme inhibitors⁽⁵⁾.

Digital radiography has gained popularity in many areas of clinical practice. It is perhaps the most abundant and common technology today with over 10,000 systems in use worldwide. As the technology becomes more widely available and technological issues are resolved, it is expected that systems will go down and clinical utilization will further increase⁽⁶⁾.

Over the last 25 years, digital radiographic developments have led to improved image quality, reduced working time from image capture to display and reduced radiation dose to patients. In contrast to a radiographic film, digital imaging requires either a wired sensor placed in the patient's mouth or a phosphor plate sensor (PPS) to temporarily store the radiographic energy of the latent X-rays. The latter is scanned before the radiographic image can be displayed on-screen⁽⁷⁾.

MATERIALS AND METHODS



Drug treatment: Extract of lepidiumsativum was suspended in 0.5% carboxymethylcellulose. The groups were treated daily with methanol and watery extract (50, 100 or 200 mg/kg) (1/10 of toxicity dose) by gavage for 30 days.

Animal sacrifice :Three animals of each group was killed at 15 and 30 days after the periodontal disease treatment by administration of a lethal dose of thiopental. Animals were anesthetized using the dose (0.8 ml/kg body weight, intramuscularly)⁽⁸⁾.

Histological processing:One side of the mandible was used for routine histological processing. The rats was dissected and jaws was placed in neutral formalin for 48 hours⁽⁹⁾.

Radiographic assessment:Standardized radiographs was obtained with the use of digital radiographic images provided by the Vistascan computerized imaging system. Denstiomertic measurement was done using vista scan software⁽¹⁰⁾.

RESULTS

Control group: classical architecture of lamellar bone. Nutrient canals were also evident extending from periodontal ligament (PDL) toward the alveolar bone⁽¹¹⁾.

Control ligature group: The histological results revealed bone trabeculae lack of normal architecture devoid from entrapped osteocytes, focal degeneration of PDL fibers and cells were observed.

Vehicle group:Total degeneration of PDL, resorptive bone area, multiple reversal lines were observed, areas of haemorrhage, blood vessels engorged RBCs .

SRP 3 group (at 15 days):Lack of normal architecture of PDL, focal detachment of PDL , wide osteocytic lacunae , hyalinization of bone .

SRP 3 group (at 30 days):Detached PDL, disorientation of PDL were observed, bone appeared almost hyalinized, lack normal osteocytes.

Watery group (at 15 days):Gradual reorientation of PDL fibers, accompanied by complete attachment to both bone and cementum.

Watery group (at 30 days):Almost complete regeneration of PDL , reversal lines are observed. Sharpeys fibers were obviously observed, appearance of normal bone trabeculae.

Methanol group (at 15 days): Evidence of reorientation of PDL fibers and cells, almost normal architecture of bone trabeculae with multiple variable size of bone marrow spaces.

Methanol group (at 30 days):Best healing is observed (good architecture of PDL, bone trabeculae appeared almost normal), lined by osteoblast cells, multiple reversal lines are observed separating newly formed bone from old bone .

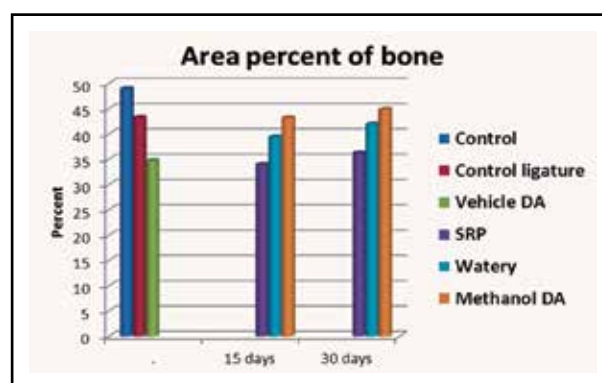


Fig. (1) Percentage of bone in all groups at 30 days and significance of the difference using ANOVA test.

Methanol (at15 days)

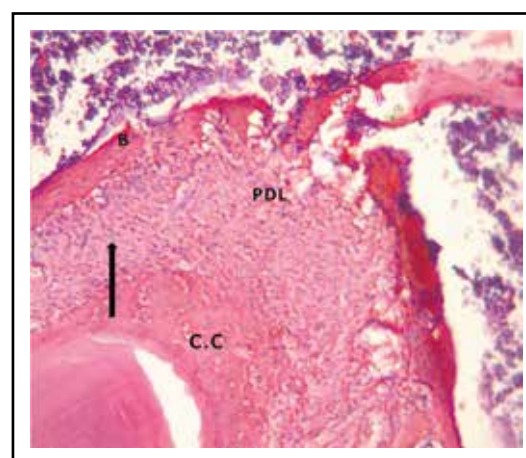


Fig. (2) Photomicrograph showed minimal loss of PDL. Evidence of reorientation of PDL fibers and cells (black arrows), accompanied by complete attachment to the cementum and bone surface.

CONTROL GROUP:

Fig. (3) Photomicrograph showed alveolar bone of dissected mandible with classical architecture of lamellar bone. Periodontal ligament (PDL).Dentin (D). Alveolar bone (B).

DISCUSSION

Periodontal diseases are a group of inflammatory diseases of the gingival and supporting structure of the periodontium. They are the most common of the oral inflammatory diseases and are described as the bacterially initiated conversion of a healthy gingival region to one characterized by inflammation (gingivitis) and the destruction of the supporting structure of the teeth⁽¹²⁾.

Corticosteroids have a range of effects on the skeleton. They affect sex steroids, interfere with calcium turnover, affect collagen, and perhaps alter bone biomechanical competence. Thus, corticosteroids increase osteoclastic bone resorption and lead to negative calcium balance⁽¹³⁾. In periodontitis, host Modulatory treatment can improve therapeutic outcomes, slow the progression of disease, allow for more predictable management of patients, possibly even work as preventive agents against the development of periodontitis⁽¹⁴⁾. *Lepidium sativum* possesses strong pharmacological properties which resemble those of the non-steroidal anti-inflammatory drugs. LS seeds have been used in traditional folk medicine to heal fractured bones⁽¹⁵⁾.

The period for induction of periodontitis was seven days. Some studies demonstrated that loss of attachment and bone occurs in a 7 day period.⁽¹⁶⁾ Other investigators have conducted experiments over much longer periods of time.⁽¹⁷⁾

Fernandes et al.⁽¹⁸⁾ compared the histometric and morphometric methods and found that both are capable of detecting alveolar bone loss in rats. **Li and Amar**⁽¹⁹⁾ likewise compared the different methods-morphometric isolated, histometric and morphometric associated and micro-computed tomography-in 100 male rats, and their findings showed that all the methods are accurate for quantification of alveolar bone loss⁽²⁰⁾. The histological results of the present study revealed that in control ligature group lack of normal architecture of periodontal ligament (PDL), resorptive bays on bone detachment associated with PDL detachment in certain areas, In vehicle group, total degeneration of PDL, lack of normal architecture of PDL and resorptive bone area, Using watery extract of *lepidium sativum*, at 15 days there were gradual healing of PDL with marked reduction in marrow spaces numbers, complete bone attachment, while in 30 days, almost complete regeneration of PDL and reversal lines are observed. Normal bone trabeculae, In methanol 15 group there were minimal loss of PDL, periodontal fibers showed some degree of well orientation, while in 30 days best healing was seen (good architecture of PDL) and PDL fibers are well arranged. Bone trabeculae almost appeared normal, lined by osteoblast cells. Osteocytes lacunae with normal size & shape⁽²¹⁾. By comparing the area percent of bone using histomorphometric analysis of the test groups. At 15 days, the greatest mean value was recorded by methanol, followed by watery extract, while least was recorded in the vehicle group, while at 30 days, same results were observed⁽²²⁾.

CONCLUSION

- Dexamethasone has detrimental effect on bone and periodontal ligament.
- *Lepidium sativum* represent a promising herbal drug that may have potential anabolic effect on

bone and regenerative effect on periodontal ligament.

- Methanolic extract of *lepidiumsativum* has higher anabolic effect on bone and regenerative effect on periodontal ligament than watery extract.

REFERENCE

1. Nakajima T, Ueki-Maruyama K, Oda T, Ohsawa Y, Ito H, Seymour GJ, et al. Regulatory T-cells infiltrate periodontal disease tissues. *J Dent Res*. 2005; 84:639–643.
2. Nannuru KC, Futakuchi M, Varney ML, Vincent TM, Marcusson EG, Singh RK. Matrix metalloproteinase (MMP)-13 regulates mammary tumor-induced osteolysis by activating MMP9 and transforming growth factor-beta signaling at the tumor-bone interface. *Cancer Res*. 2010; 70:3494–3504.
3. Axelrod L. Glucocorticoid therapy. In DeGroot LJ, Jemson JL, de Kretser D, Grossman AB, Marshall JC, Melmed S, et al. eds. *Endocrinology*, 5th ed. Philadelphia: Elsevier Saunders, 2006; 2329-2342.
4. Schimmer BP and Parker KL. Adrenocorticotrophic hormone; Adrenocortical steroids and their synthetic analogs; inhibitors of the synthesis and actions of Adrenocortical
5. Goodman C and Gilman S. Hormones. In Brunton LL, Silazo J, Parker KL, eds. *The Pharmacological basis of Therapeutics*, 11th ed. USA; The McGraw-Hill Companies, 2006; 1587-1612.
6. Holzhausen M, Rossa Junior C, Marcantonio Junior E, Nassar PO, Spolidorio DM, Spolidorio LC. Effect of selective cyclooxygenase-2 inhibition on the development of ligature-induced periodontitis in rats. *J Periodontol* 2002;73:1030–1036.
7. Loo WTY, Fan C-b, BaiLj, Yue Y, Dou Y-d, Wang M, Liang H, Cheung MNB, Chow LWC, Li J, Tian Y, Qing L. Gene polymorphism and protein of human pro- and anti-inflammatory cytokines in Chinese healthy subjects and chronic periodontitis patients. *J Transl Med* 2012, 10(Suppl 1):S8
8. Burgess AW and Metcalf D. The nature and action of granulocyte-macrophage colony stimulating factors. *Blood* 1980; 56: 947–958.
9. Metcalf D. The molecular control of cell division, differentiation commitment and maturation in haemopoietic cells. *Nature* 1989; 339: 27.
10. Nicola NA. *Guidebook to Cytokines and their Receptors*. Oxford University Press:Oxford, UK. 1994.
11. Barreda DR. Regulation of myeloid development and function by colony stimulating factors. *Dev Comp Immunol* 2004; 28: 509.
12. Naik SH, Metcalf D, van Nieuwenhuijze A, Wicks I, Wu L, O’Keeffe M et al. Intrasplenic steady-state dendritic cell precursors that are distinct from monocytes. *Nat Immunol* 2006; 7: 663–671.
13. Fleetwood AJ. Granulocyte-macrophage colony-stimulating factor (CSF) and macrophage CSF-dependent macrophage phenotypes display differences in cytokine profiles and transcription factor activities: implications for CSF blockade in inflammation. *J Immunol* 2007; 178: 5245.
14. Heasman PA, Offenbacher S, Collins JG, Edwards G and Seymour RA. Flurbiprofen in the prevention and treatment of experimental gingivitis. *J Clin Periodontol* 1993; 20: 732-738.
15. Heasman PA and Seymour RA. An association between long-term nonsteroidal anti-inflammatory drug therapy and severity of periodontal disease. *J Clin Periodontol* 1990; 17: 654-658.
16. His-Ming Lee, Sebastian G, Ciancio, Tuter G, Maria E, Ryan, Golub LM. Subantimicrobial dose doxycycline efficacy as a matrix metalloproteinase inhibitor in chronic periodontitis patients is enhanced when combined with NSAID. *J Periodontol* 2004; 75: 453-463.
17. Holzhausen M, Spoldori DMP, Muscara MN, Hebling J. Protective effects of etoricoxib, a selective inhibitor of cyclooxygenase-2, in experimental periodontitis in rats. *J Periodont Res* 2005; 40: 208-211.
18. Howell TH, Fiorellini J, Weber HP, Williams RC. Effect of the NSAID piroxicam, topically administered, on the development of gingivitis in beagle dogs. *J Periodont Res* 1991; 26: 180-183.
19. Information Paper. The pathogenesis of periodontal diseases. *J Periodontol* 1999; 70: 457-470.
20. Ishihara Y, Nishihara T, Maki E, Noguchi T, Koga T. Role of interleukin- 1 and prostaglandin in in-vitro bone resorption induced by *actinobacillus actinomycetemcomitans* lipopolysaccharide. *J. Periodont Res* 1991; 26: 155-160.
21. Kornman KS. Host modulation as a therapeutic strategy in the treatment of periodontal disease. *Clin Infect Dis* 1999; 28: 520-526.
22. Kubota T, Matsuki Y, Nomura T, Hara K. In situ hybridization study on tissue inhibitors of metalloproteinases (TIMP’s) mRNA expressing cells in human inflamed gingival tissue. *J Periodont Res* 1997; 32: 467-472.