

# Overview of Botanical Therapies for Oral Conditions

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**Abbreviations**

COX-2	Cyclooxygenase-2
EGCG	Epigallocatechin gallate
IL	Interleukin
NF- $\kappa$ $\beta$	Nuclear factor-kappa $\beta$

**Abstract**

Oral disease is a common concern that affects quality of life, particularly in geriatric and end-of-life patients. Treatments including dental cleaning, antibiotic therapy, and pain control are often needed to resolve conditions and to maintain comfort. Botanical therapies may also be useful in the treatment of various oral conditions including infections, inflammation, wounds, ulcerations, and in palliation of oral neoplasms. In animal patients, common administration is via herbal infusions as oral washes, either through supplemental drinking water or syringe application. Topical gel and honey formulations have the advantage of remaining in contact with tissues longer than water-based teas. A brief overview of plants frequently used for oral care traditionally and from the current literature is presented here with the intention of comparing their benefits and translating these into options for animal treatment. Much of the available research on botanicals for oral health is conducted on human patients and laboratory animals often using the antiseptic chlorhexidine as a standard for comparison. Due to the high rate of adverse effects reported with chlorhexidine usage, herbal alternatives may need to be considered, as they may provide similar therapeutic achievements while minimizing negative side effects.

**Introduction**

Oral diseases and conditions are commonly encountered in animal patients and include infections, wounds, ulcerations, and neoplasms. Certain chemotherapy and radiation treatments can also cause the painful side effects of oral mucositis (inflammation, ulceration, edema, and bleeding) and

potential infection. The impact of oral disease on quality of life for animals is historically underestimated by caregivers, and treatments may be delayed. Regular evaluation of dental health and emphasis on preventive care, including brushing and dental prophylaxis, is important, along with the use of antibiotics and pain medications as needed to maintain comfort (1). Consideration of treatment options and ease of administration help to assure compliance and successful outcomes.

Due to the high concentration of microorganisms in the oral cavity, treatment goals for oral conditions must include antiseptic and antimicrobial properties. Chlorhexidine is commonly used as an oral cleanser to reduce bacterial biofilm (dental plaque) and to control potential bacterial, viral, and fungal infections (2). In a 2017 Cochrane review assessing the effectiveness of chlorhexidine mouthwash for control of gingivitis and plaque in people, chlorhexidine reduced gingivitis in those with mild gingivitis and reduced plaque accumulation when used as an adjunct to mechanical oral hygiene procedures. However, there was a significant amount of extrinsic tooth staining, with other reported side effects of oral pain, irritation, mild desquamation, mucosal ulceration and erosions, and a burning sensation of the tongue and oral tissues (2). Prolonged use and higher concentrations have been associated with increased adverse effects (3, 4).

Several herbal alternatives have been found to have antimicrobial effects while additionally enhancing wound healing, reducing inflammation, and decreasing oral pain. Herbal

treatments studied in human and animal patients have been shown to improve oral health through multiple properties including antimicrobial, antioxidant, anti-inflammatory, wound healing, and analgesic. Current research highlights several botanicals. This brief overview includes aloe gel (*Aloe vera*), green tea leaf (*Camellia sinensis*), calendula flower (*Calendula officinalis*), chamomile flower (*Matricaria recutita*), turmeric rhizome (*Curcuma longa*), and plantain leaf (*Plantago major*). Products derived from honey bees (*Apis mellifera*) such as honey, propolis, and royal jelly have also been found to have many benefits to oral mucosal health. Bee products contain several phytochemicals that play a partial role in their effectiveness and are therefore included here as well.

### **Aloe Gel**

Known for its use in the treatment of dermatologic and GI conditions, aloe has antioxidant, anti-inflammatory, analgesic, antimicrobial, antiproliferative, and antineoplastic properties. It has been shown to promote wound healing and increase collagen formation, while inhibiting metalloproteinase and collagenase activity (3,5).

The gel of the aloe leaf is soothing, moisturizing, and demulcent, having a high content of mucilaginous polysaccharides (including acemannan, glucose, xylose, arabinose, galactose, and rhamnose). The prominent phytochemical, acemannan, has been found to have antiviral, anti-inflammatory, and wound healing properties. Additionally, it has antineoplastic and immune-modulating properties by enhancing macrophage and T cell functions (3, 6, 7).

Several studies have shown the efficacy of aloe gel in the treatment of gingivitis and periodontitis in humans. The studies used aloe as either a mouthwash diluted in saline or toothpaste formulated with aloe as an ingredient. In combination with good oral hygiene, aloe gel was found to enhance healing and decrease inflammation, bleeding, and pocket depth with similar results to chlorhexidine and significantly better results than distilled water rinse controls (4, 5).

In one single-blind clinical trial in 20 human patients with moderate to severe chronic periodontal disease, a 98% aloe vera gel (2% saline) was injected into periodontal pockets after scaling and root planing. The mouth of each patient was divided with a control side which received only distilled water treatment after the scaling and root planing. Measurements were taken at 30 and 60 days post-procedure by a dentist who was blinded to the original treatments. No changes were seen compared to the control sides in plaque index, but significant changes were seen in both gingival index, which measures inflammation, and probing depth (5).

Aloe gel is clear and gelatinous, found in the inner portion of the sliced leaf, sometimes called the pulp. Polysaccharides in fresh gel degrade within 48 hours, so fresh leaf is recommended. The latex of aloe, high in anthraquinones, is known to be a stimulant laxative and is the yellow/brown liquid produced just under the epidermis of the leaf. Chemical testing for anthraquinones as a marker for latex content is a potential method of quality control for gel products. Due to the laxative effect as well as potential carcinogenesis, hepatotoxicity, and other adverse effects, products containing aloe latex are not recommended (8). Gel alone is considered non-toxic and non-carcinogenic, however due to variation in product quality, caution is recommended if diarrhea, irritation, or hypersensitivity is noted (8). An extrapolated oral dose for gel alone would be 1.5-7.0 ml per kg, divided daily (3, 6, 7).

### **Green Tea Leaf**

Readily available, green tea has antioxidant, anti-inflammatory, antimicrobial, antineoplastic, and other properties. Green tea provides a bitter, warming, and astringent herbal effect. The harvesting and preparation process for green tea gives it the distinct color, taste, and added phytochemical benefits. The young leaves and buds of the tea plant are steamed and quickly dried, as opposed to 2-3 days of oxidation that black leaves go through before drying (9).

Known primarily for its high antioxidant polyphenol content (catechins including epigallocatechin gallate [EGCG], flavonoids, and phenolic acids), green tea has strong anti-inflammatory effects through inhibiting the nuclear factor-kappa  $\beta$  (NF- $\kappa$  $\beta$ ) inflammatory pathway and activating endothelial nitric oxide synthase (3, 4, 6). Antineoplastic activities include interference during tumor initiation, promotion, metastasis, and angiogenesis (10).

Green tea and its components, while having significant antioxidant and anti-inflammatory actions, are particularly effective as an antimicrobial treatment and preventive for periodontal disease (4). In several studies the extracted phytochemical EGCG was shown to have strong broad spectrum antimicrobial action against *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, *Prevotella intermedia*, and *Fusobacterium nucleatum*, common oral bacteria connected with periodontal disease in humans. The EGCG was found to be bactericidal for some organisms at higher doses, while at lower doses it significantly reduced virulence by inhibiting bacterial growth and adhesion to oral cells, preventing biofilm formation and inhibiting bacterial production of toxic metabolites, thereby reducing cytotoxic effects (11).

Studies using green tea as a mouthwash after tooth brushing in human cancer patients undergoing chemotherapy or radiation treatment found a significant reduction in the occurrence of oral mucositis compared to controls using tap water. Improvement of oral health and preservation of oral mucosa was reported (3, 4).

Green tea is easily prepared for use in syringe washes or drinking water by brewing 1 teaspoon dried tea in 1 cup of boiling water. A dosage of 0.5-1 cup per 10 kg per day is generally safe for small animals (6). Mild stimulation can occur due to the presence of caffeine. Eliminating evening treatment times can help avoid sleep disturbances. To assure adequate fluid intake in animal patients, replacing fresh water sources entirely with teas, even if diluted, is not recommended.

### **Calendula Flower**

Calendula flowers, particularly known for their anti-inflammatory, demulcent, and wound-healing properties, are also used to enhance lymphatic drainage, which can be useful with oral infections that lead to sore throats and lymphadenopathy (6). The flowers are cooling and astringent while also antiseptic, with strong antioxidant activity. They contain a variety of phytochemicals including triterpenoids, flavonoids, coumarins, quinones, volatile oil, carotenoids, and amino acids (4, 6).

In experimental studies of periodontitis induced in laboratory rats, calendula was found to reduce inflammatory bone resorption, possibly by its actions of decreasing neutrophilia and the pro-inflammatory mediators tumor necrosis factor-alpha (TNF- $\alpha$ ), interleukin (IL)-1 $\beta$ , and receptor activator of nuclear factor kappa- $\beta$  ligand, (RANKL), an important therapeutic target in osteoporosis. Additionally, an increase was found in the number of cells that were immunopositive for osteoprotegerin, an antiresorptive molecule (4, 12, 13). Bone loss around tooth roots can be a significant concern in periodontal disease.

Several studies have demonstrated significant wound healing benefits of calendula (14). In one study, topical ethanol and water extracts were shown in vitro and in vivo to increase expression of connective tissue growth factor and  $\alpha$ -smooth muscle actin, proteins involved in the granulation phase of wound healing (15). Along with anti-inflammatory effects, these actions can significantly improve oral injuries and ulceration.

A combination mouthwash including extracts of ginger (*Zingiber officinale*), rosemary (*Rosmarinus officinalis*), and calendula was found to have similar benefits to chlorhexidine

in a randomized double-blind placebo-controlled trial of human patients with gingivitis. Gum inflammation, bleeding, and plaque accumulation were assessed. The additional antimicrobial actions of the other herbs are complementary to the wound healing effects of calendula, and all 3 of the herbs possess antioxidant and anti-inflammatory properties (16).

For small animals, an infusion made with 5-30 g dried calendula herb flowers per cup of boiling water, up to 0.5 cups per 10 kg, can be divided throughout the day, used as drinking water, or applied by syringe. Calendula is considered a safe, non-toxic herb, with caution to avoid in those who have allergies to the Asteraceae or daisy family (6, 7).

### **German Chamomile Flower**

The flowers of chamomile are commonly used as an infusion or "tea" (technically called a tisane if not using the tea plant) for calming anxiety and GI soothing effects. Chamomile is also used topically on skin and mucous membranes for its anti-inflammatory, antioxidant, antimicrobial, and wound healing properties. It has been used in the treatment of GI as well as oral ulcers.

Medicinal phytochemicals including volatile oils (chamazulene, bisabolol, bisabolol oxides, 1,8-cineole) and flavonoids (apigenin, luteolin, quercetin, rutin) contribute to the strong anti-inflammatory and antioxidant properties. In vitro and in vivo studies have shown anti-inflammatory action through the inhibition of cyclooxygenase-2 (COX-2) and IL-6 production (3,6).

In a periodontitis study of laboratory rats, a dry extract of chamomile prevented inflammation and alveolar bone resorption (17). In human patients, studies have shown that chamomile mouthwash improves clinical disease, reduces microbial population, and reduces gingival bleeding, having similar results to chlorhexidine without side effects of tooth staining and taste disruption (18, 19).

Chamomile has been studied in the treatment of oral mucositis induced by chemotherapy and radiation therapy in human patients. As a mouthwash it had similar results to the allopurinol conventional treatment. One study compared the use of ice chips made with chamomile infusion (2.5%) to those made with pure water. Human patients swished the ice in their mouths for 30 minutes starting 5 minutes prior to chemotherapy infusion treatments daily for 5 days. Cold therapy is used to decrease blood circulation to oral tissues which are more sensitive to chemotherapy side effects. The chamomile infused ice resulted in lower pain levels and no ulcerations compared to the control group (3).

Chamomile oral washes can be made by infusing 5-30 g dried flowers per 1 cup boiling water. For small animals, up to 0.5 cups per 10 kg can be given orally divided throughout the day. Use is contraindicated during pregnancy due to potential uterine stimulant effects and with allergies to the Asteraceae, or daisy family (6,7). There are precautions for rare reports of transient epistaxis in cats (6).

### Turmeric Rhizome

Well known for its anti-cancer effects, turmeric has undergone extensive studies for both internal and external use. For topical uses, the antioxidant, anti-inflammatory, antimicrobial, antineoplastic, and radioprotective properties are beneficial. Phytochemicals such as polyphenols, sesquiterpenes, diterpenes, triterpenoids, sterols, and alkaloids have been identified (3,6).

Curcumin, a lipophilic polyphenol often used as an isolated chemical, is the most studied component of turmeric rhizomes. Antineoplastic properties have been identified that regulate many pathways particularly affecting cell proliferation and apoptosis. Curcumin enhances wound healing by increasing transforming growth factor-beta-1 (TGF-β-1) levels to stimulate fibroblast production of fibronectin and collagen, causing increased re-epithelialization and granula-

tion rates. The TGF-β-1 also promotes macrophage activity for immune defense. Antineoplastic, antioxidant, and anti-inflammatory actions occur through inhibition of NF-κβ, COX-2, and by decreasing lipid peroxides, while increasing the activity of superoxide dismutase (SOD), catalase, and glutathione peroxidase (3,20).

Turmeric has been used in humans as a mouthwash with successful results in reducing periodontal disease. In a study of human patients with chronic periodontitis, a 2% whole turmeric gel was applied into periodontal pockets after scaling and root planing, compared to scaling and root planing alone. A periodontal dressing was left in place for 7 days, and patients were evaluated at 30 and 45 days post-procedure. Use of the turmeric gel showed a statistically significant reduction in the mean plaque index, gingival index, sulcus bleeding index, and probing pocket depth, with no adverse effects that might be expected such as burning, dryness, ulceration, or tooth staining (21).

Several reviews of randomized controlled trials have shown that curcumin is useful in prevention and treatment of oral mucositis induced by conventional cancer therapies in humans (20, 22). In a systematic review, curcumin was shown to reduce the severity as well as delay or prevent onset of

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oral mucositis following chemotherapy and radiation therapy. Turmeric and curcumin reduced pain, erythema intensity, ulceration size, and severity (23). Curcumin products were tested, including one combination product with whole turmeric and ginger, on human patients receiving radiation or chemotherapy. A significant reduction of oral mucositis was found, comparable to that in the chlorhexidine treatment group (3).

One concern with the use of turmeric as an oral wash or topical paste in animals is the strong tendency to stain carpet, flooring, countertops, cloth, and all its contacts. This information should be shared with clients along with precautions for use during pregnancy or obstructive gall bladder disease. A wash can be made from a decoction of 5-30 g turmeric root per cup of water using up to 0.5 cups per 10 kg divided through the day. Dried turmeric powder can be made into a paste with water and applied topically up to 600 mg per kg, but palatability may be a limiting factor. Contact allergy and sensitivity have been reported with turmeric, and caution with bleeding disorders or anticoagulant medications is recommended (6, 7).

### Plantain Leaf

Commonly used as a topical wound poultice, plantain has anti-inflammatory, antioxidant, antimicrobial, analgesic, demulcent, and wound healing properties. The leaves are cooling, astringent, and mucilaginous, containing iridoid glycosides (aucubin and catalpol), phenolic acids (ursolic, oleanolic, and linoleic acids), polysaccharides, flavonoids (apigenin, scutellarin, baicalein, nepetin, plantagoside), tannins, and other active phytochemicals (6, 7).

Plantain has been shown to have strong antioxidant effects and to reduce inflammation by modulating COX-2, NF- $\kappa$ B, nitrous oxide (NO), and leukotriene B4 levels (3, 6). The antimicrobial effect is mild with a moderate ability to reduce bacterial biofilm. Luteolin and apigenin found in plantain work as multiple drug resistant efflux pump inhibitors, improving the effects of other antimicrobials used simultaneously (7).

Traditionally plantain has been used as a direct poultice for toothaches and oral abscesses to draw out infection. The addition of yarrow (*Achillea millefolium*) or chamomile has been found to reduce gum pain (7). In multiple human studies plantain was found to ameliorate signs of oral mucositis induced by radiation and chemotherapy. Reduction of healing time and pain was found to be equivalent to chlorhexidine in randomized controlled studies (3).

Topical poultice or fresh juice from leaves may be used directly on gum tissues. Alternately an infusion made with

5-30 g dried or fresh herb in 1 cup water can be given up to 0.5 cups per 10 kg daily (6). Fresh or frozen juice and/or plant material have more active antimicrobial action, with the phytochemical aucubigenin being destroyed by heat (7). Although broadleaf plantain (*P. major*) was highlighted in studies, narrowleaf or ribwort plantain (*P. lanceolata*) has similar phytochemicals and therapeutic properties. There are no contraindications or concerns of toxicity for these species of plantain (6, 7, 24).

### Honey Bee Products

Honey is familiar, readily available, and potentially easy to administer due to its pleasant taste and thick, sticky texture, allowing it to remain in contact with tissues longer. Known for its use in wound healing, honey has antioxidant, anti-inflammatory, antimicrobial, and anti-neoplastic properties, making it a good candidate for oral treatments. In addition to water, nectar sugars, and glandular secretions of honey bees, honey contains proteins, vitamins, enzymes, and various phytochemicals depending on the plant source nearby (3). Honey can be infused with other herbs for enhanced effects.

In multiple randomized controlled studies, honey mixed with saline used as a mouthwash reduced symptoms of oral mucositis and weight loss in human patients undergoing chemotherapy or radiation therapy, resulting in improved quality of life. Some studies found it to be more effective than chlorhexidine in managing oral mucositis; one study favored it over lignocaine gel for symptom relief and reduced severity of mucositis (3, 25).

Propolis is a bee product composed of plant resins collected by honey bees and used in the construction of their hives. In humans it is used as a health and nutritional supplement. Known for its use in anti-ulcer and antineoplastic treatments, it has strong antioxidant, anti-inflammatory, and antimicrobial properties (3, 26). Propolis is composed of resin (50%), wax (30%), essential oils (10%), and pollen (5%) and includes several phytochemicals including phenolic compounds, esters, flavonoids, terpenes, beta-steroids, aromatic aldehydes, and alcohols, as well as proteins, vitamins, and minerals (27).

Propolis has been studied extensively, especially with regard to antimicrobial activity, for oral health benefits including treatment and prevention of plaque, gingivitis, and periodontal disease. When used in a mouthwash or gel formulation, significant anti-inflammatory and wound healing benefits were demonstrated in several randomized controlled studies of chemotherapy- and radiation-induced oral mucositis (3, 4, 20, 28).

Royal jelly is produced from the glands of worker bees to feed the queen bee and newly hatched larvae. It has a higher water content and contains several nutrients, proteins, hormones, and active phytochemicals. It is also known for its antioxidant, anti-inflammatory, antineoplastic, antimicrobial, and wound healing properties. Several studies have shown anti-inflammatory action through the suppression of pro-inflammatory cytokines (TNF- $\alpha$ , IL-6, IL-1) by Major Royal Jelly Protein 3 (MRJP3). In addition, MRJP2, MRJP3, and MRJP7 were found to stimulate cell migration and proliferation, most likely contributing to wound healing effects (3). Royal jelly has been found to ameliorate oral mucositis in laboratory animals and human cancer patients (3, 26, 27).

Wound healing and antimicrobial properties have been strongly associated with all honey bee products, and they are considered relatively safe for use and ingestion, though caution is recommended with allergies to bee products (27).


### Additional Considerations

Administering herbs for treatment of oral conditions in animals often requires some innovation. In general, humans can be instructed to swish a mouthwash for a certain amount of time, but in animals, alternative methods are needed. This might include administering an herbal infusion by syringe,



in drinking water, or soaked in a cloth and held in place. Herbal pastes, honey infusions, or aloe gel can be used to increase oral contact time in animals. Herbal treatments can be applied under anesthesia after a dental cleaning as well as used regularly 2 to 3 times daily for home care. Alcohol-based tinctures, while safe and effective when used properly for ingestion, may cause irritation of the oral mucosa with prolonged contact, therefore soothing mucilaginous and anti-inflammatory herbal preparations are preferred for topical treatment of mucous membranes. Multiple herbs can be combined in water or other infusions for enhanced effect. Herbs infused in honey and other honey bee products may provide additional benefits.

As always, species differences must be considered when translating research and experience from human to animal medicine. Disease conditions may have similar presentations such as inflammation, ulceration, pain, and bleeding, while the etiology may vary in animals and include chemical or electric burns, immune-mediated, and viral or bacterial infections.

Many medicinal plants have antioxidant, anti-inflammatory, antimicrobial, and wound healing properties; certainly not all have been studied, and this brief overview touches on just




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a few. Additional plants studied for their use in oral medicine in different ecosystems and cultures include cashew leaf (*Spondias mombin*), olive leaf (*Olea europaea*), licorice root (*Glycyrrhiza glabra*), lemongrass leaf (*Cymbopogon citratus*), tulsi leaf (*Ocimum tenuiflorum* L), meswak stick from the Arak tree (*Salvadora persica*), witch hazel leaf (*Hamamelis virginiana*), marshmallow root (*Althaea officinalis*), myrrh resin (*Commiphora myrrha*), sage leaf (*Salvia officinalis*), and pomegranate juice (*Punica granatum*) (3, 4, 6, 26, 29, 30). Before use, an herbalist should study these plants in more detail to understand any precautions needed for the species and individual being treated.

## Conclusion

Herbal therapies can provide a viable option to replace chlorhexidine and other products that may irritate mucous membranes, providing the essential antimicrobial effects along with anti-inflammatory and wound healing benefits. Regular dental prophylaxis including scaling under anesthesia and toothbrushing in combination with herbal therapies can provide optimal care.

While most high-quality clinical trials on herbs for oral conditions have been conducted in people, the similar pathologies from humans to animals along with the known benefits of herbs indicates the need for controlled clinical trials in animal patients.

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## References

1. Wallis C, Holcombe LJ. A review of the frequency and impact of periodontal disease in dogs. *J Small Anim Pract.* 2020; 61(9):529-540. <https://doi.org/10.1111/jsap.13218>.
2. James P, Worthington HV, Parnell C, et al. Chlorhexidine mouthrinse as an adjunctive treatment for gingival health. *Cochrane Database Syst Rev.* 2017;3(3):CD008676.
3. Ferreira AS, Macedo C, Silva AM, Delerue-Matos C, Costa P, Rodrigues F. Natural products for the prevention and treatment of oral mucositis-a review. *Int J Mol Sci.* 2022;23(8):4385. <https://doi.org/10.3390/ijms23084385>

4. Figueiredo LC, Freitas Figueiredo N, da Cruz DF, et al. Propolis, aloe vera, green tea, cranberry, calendula, myrrha and salvia properties against periodontal microorganisms. *Microorganisms.* 2022;10(11):2172. <https://doi.org/10.3390/microorganisms10112172>
5. Ashouri Moghaddam A, Radafshar G, Jahandideh Y, Kakaei N. Clinical evaluation of effects of local application of aloe vera gel as an adjunct to scaling and root planing in patients with chronic periodontitis. *J Dent (Shiraz).* 2017;18(3):165-172.
6. Wynn S, Fougere B. *Veterinary Herbal Medicine.* Missouri: Mosby; 2007:283-288, 599-603.
7. Sinadinos C. *The Essential Guide to Western Botanical Medicine.* California: Fieldbrook; 2020.
8. Guo X, Mei N. Aloe vera: A review of toxicity and adverse clinical effects. *J Environ Sci Health Part C Environ Carcinog Ecotoxicol Rev.* 2016;34(2):77-96. <https://doi.org/10.1080/10590501.2016.1166826>
9. Chin JM, Merves ML, Goldberger BA, Sampson-Cone A, Cone EJ. Caffeine content of brewed teas. *J Anal Toxicol.* 2008;32(8):702-704. <https://doi.org/10.1093/jat/32.8.702>
10. Butt MS, Ahmad RS, Sultan MT, Qayyum MMN, Naz A. Green tea and anticancer perspectives: updates from last decade. *Crit Rev Food Sci Nutr.* 2015;55(6):792-805. <https://doi.org/10.1080/10408398.2012.680205>
11. Kong C, Zhang H, Li L, Liu Z. Effects of green tea extract epigallocatechin-3-gallate (EGCG) on oral disease-associated microbes: a review. *J Oral Microbiol.* 2022;14(1):2131117. <https://doi.org/10.1080/20002297.2022.2131117>
12. Lima MDR, Lopes AP, Martins C, Brito GAC, Carneiro VC, Goes P. The Effect of *Calendula officinalis* on oxidative stress and bone loss in experimental periodontitis. *Front Physiol.* 2017;8:440. <https://doi.org/10.3389/fphys.2017.00440>
13. Tanideh N, Ghafari V, Ebrahimi R, Habibagahi R, Koohi-Hosseiniabadi O, Iraj A. Effects of *Calendula officinalis* and *Hypericum perforatum* on antioxidant, anti-inflammatory, and histopathology indices of induced periodontitis in male rats. *J Dent (Shiraz).* 2020;21(4):314-321. <https://doi.org/10.30476/DENTJODS.2020.83660.1056>

14. Givol O, Kornhaber R, Visentin D, Cleary M, Haik J, Harats M. A systematic review of *Calendula officinalis* extract for wound healing. *Wound Repair and Regen*. 2019;27(5):548–561. <https://doi.org/10.1111/wrr.12737>
15. Dinda M, Mazumdar S, Das S, et al. The water fraction of *Calendula officinalis* hydroethanol extract stimulates in vitro and in vivo proliferation of dermal fibroblasts in wound healing. *Phytother Res*. 2016;30(10):1696-1707. <https://doi.org/10.1002/ptr.5678>
16. Mahyari S, Mahyari B, Emami SA, et al. Evaluation of the efficacy of a polyherbal mouthwash containing *Zingiber officinale*, *Rosmarinus officinalis* and *Calendula officinalis* extracts in patients with gingivitis: A randomized double-blind placebo-controlled trial. *Complement Ther Clin Pract*. 2016;22:93-98. <https://doi.org/10.1016/j.ctcp.2015.12.001>
17. Guimarães MV, Melo IM, Adriano Araújo VM, et al. Dry extract of *Matricaria recutita* L. (chamomile) prevents ligature-induced alveolar bone resorption in rats via inhibition of tumor necrosis factor- $\alpha$  and interleukin-1 $\beta$ . *J Periodontol*. 2016;87(6):706-715. <https://doi.org/10.1902/jop.2016.150411>
18. Gościński A, Paczkowska-Walendowska M, Skotnicka A, Ruchała MA, Cielecka-Piontek J. Can plant materials be valuable in the treatment of periodontal diseases? Practical review. *Pharmaceutics*. 2021;13(12):2185. <https://doi.org/10.3390/pharmaceutics13122185>
19. Agarwal A, Chaudhary B. Clinical and microbiological effects of 1% *Matricaria chamomilla* mouth rinse on chronic periodontitis: a double-blind randomized placebo controlled trial. *J Indian Soc Periodontol*. 2020;24(4):354-361. [https://doi.org/10.4103/jisp.jisp\\_441\\_19](https://doi.org/10.4103/jisp.jisp_441_19)
20. Safarzadeh S, Shirban F, Bagherniya M, Sathyapalan T, Sahebkar A. The effects of herbal medicines on cancer therapy-induced oral mucositis: a literature review. *Phytother Res*. 2022;36(1):243-265. <https://doi.org/10.1002/ptr.7308>
21. Behal R, Mali AM, Gilda SS, Paradkar AR. Evaluation of local drug-delivery system containing 2% whole turmeric gel used as an adjunct to scaling and root planing in chronic periodontitis: a clinical and microbiological study. *J Indian Soc Periodontol*. 2011;15(1):35-38. <https://doi.org/10.4103/0972-124X.82264>
22. Zhang L, Tang G, Wei Z. Prophylactic and therapeutic effects of curcumin on treatment-induced oral mucositis in patients with head and neck cancer: a meta-analysis of randomized controlled trials. *Nutr Cancer*. 2020;73(5):740-749. <https://doi.org/10.1080/01635581.2020.1776884>
23. Normando AGC, de Meneses AG, de Toledo IP, et al. Effects of turmeric and curcumin on oral mucositis: a systematic review. *Phytother Res*. 2019;33(5):1318-1329. <https://doi.org/10.1002/ptr.6326>
24. Mansoor K, Qadan F, Schmidt M, Mallah E, Abudayyih W, Matalaka K. Stability study and a 14-day oral dose toxicity in rats of plantain leaf extract (*Plantago lanceolata* L.) syrup. *Sci Pharm*. 2017;85(1):15. <https://doi.org/10.3390/scipharm85010015>
25. Amanat A, Ahmed A, Kazmi A, Aziz B. The effect of honey on radiation-induced oral mucositis in head and neck cancer patients. *Indian J Palliat Care*. 2017;23(3):317-320. [https://doi.org/10.4103/IJPC.IJPC\\_146\\_16](https://doi.org/10.4103/IJPC.IJPC_146_16)
26. Shavakhi M, Sahebkar A, Shirban F, Bagherniya M. The efficacy of herbal medicine in the treatment of recurrent aphthous stomatitis: a systematic review of randomized clinical trials. *Phytother Res*. 2022;36(2):672-685. <https://doi.org/10.1002/ptr.7332>
27. Pasupuleti VR, Sammugam L, Ramesh N, Gan SH. Honey, propolis, and royal jelly: a comprehensive review of their biological actions and health benefits. *Oxid Med Cell Longev*. 2017;2017:1259510. <https://doi.org/10.1155/2017/1259510>
28. Pereira EMR, da Silva JLDC, Silva FF, et al. Clinical evidence of the efficacy of a mouthwash containing propolis for the control of plaque and gingivitis: a phase II study. *Evid Based Complement Alternat Med*. 2011;2011:750249. <https://doi.org/10.1155/2011/750249>
29. Iauk L, Lo Bue AM, Milazzo I, Rapisarda A, Blandino G. Antibacterial activity of medicinal plant extracts against periodontopathic bacteria. *Phytother Res*. 2003;17(6):599-604. <https://doi.org/10.1002/ptr.1188>
30. Eid Abdelmagyd HA, Ram Shetty DS, Musa Musleh Al-Ahmari DM. Herbal medicine as adjunct in periodontal therapies — a review of clinical trials in past decade. *J Oral Biol Craniofac Res*. 2019;9(3):212-217. <https://doi.org/10.1016/j.jobcr.2019.05.001>
31. Court MH. Feline drug metabolism and disposition: pharmacokinetic evidence for species differences and molecular mechanisms. *Vet Clin North Am Small Anim Pract*. 2013;43(5):1039-1054. <https://doi.org/10.1016/j.cvsm.2013.05.002>