

# Herbal Treatment for Lichen Planus

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## Abstract

The immune disease lichen planus affects primarily mucous membranes, particularly in the mouth. Current drug treatments are palliative only and have significant adverse effects. The disease appears to be related to stress, leaky gut, and allergies, and natural medicine offers ways to treat these underlying problems including diet, supplements, and herbal therapies.

Potentially valuable herbal therapies for symptoms or to treat causes include nervines and adaptogens. These include *Aloe barbadensis* (aloe vera) gel; *Curcuma longa* (turmeric) rhizome; curcumin; *Potentilla tormentilla* (tormentil) herb; *Portulacca oleracea* (purslane) leaf; *Glycyrrhiza glabra* (licorice) root; *Tripterygium wilfordii* (thunder god vine) root; *Althaea officinalis* (marshmallow) leaf or root; *Alcea rosea* (hollyhock) leaf or root; *Symphytum officinale* (comfrey) leaf; *Zingiber officinale* (ginger) rhizome; *Filipendula ulmaria* (meadowsweet) flowering top; *Achillea millefolium* (yarrow) flowering top; *Calendula officinalis* (calendula) flower; *Humulus lupulus* (hops) strobile; *Larrea tridentata* (creosote bush) herb; *Artemisia tridentata* (bigleaf sagebrush) leaf, *Crataegus* spp. (hawthorn) leaf, flower and fruit; *Rubus* spp. (blackberry, raspberry) leaf and root; *Vaccinium* spp. (blueberry, bilberry) leaf and fruit; *Morella cerifera* (bayberry) bark, *Polygonum* spp. (bistort) leaf, *Camellia sinensis* (black tea) steamed leaf; and *Agrimonia eupatoria* (agrimony) herb.

## Introduction

Lichen planus, a chronic, immune-mediated, mucocutaneous disease, primarily affects the buccal mucosa.<sup>1</sup> The condition comes in three major forms: reticular; atrophic; and erosive (see Major Forms of Oral Lichen Planus). Oral lichen planus (OLP) is usually found on both sides of the oral cavity, although a lesion occasionally is limited to one area. The lesion rarely progresses but also rarely regresses spontaneously.

OLP appears to occur more frequently in women than in men; based on the best study available, the age-standardized prevalence in women is 1.57%, compared with 0.96% in men.<sup>2</sup> Other sites that lichen planus can affect include the lips, vaginal mucosa, glans penis, flexor surfaces of the wrists, and other skin sites. Diagnosis can often be made by inspection, but a biopsy is usually confirmatory, given the nearly unique histology of the lesions, particularly early in their course.

Systemic and topical corticosteroids reverse the lesions of lichen planus quickly. However, the disease very frequently recurs after the steroids are discontinued, and so, patients typically end up on long-term topical steroid therapy. Although this decreases the risk of systemic complications, Cushing's syndrome can and does occur in up to 9% of patients using clobetasol, a potent topical steroid frequently recommended for treating OLP.<sup>3,4</sup> In a study, adrenal suppression was seen in 86% of patients with OLP who were treated with clobetasol three times daily as an initial treatment, which fell to 4% with single doses every other day for maintenance.<sup>5</sup>

Oral candidiasis is a frequent result of using topical corticosteroids to treat patients with OLP.<sup>6</sup> To combat this, oral nystatin or miconazole is commonly used along with clobetasol, which increases costs and bother for patients.<sup>7</sup> Drug therapy for lichen planus is therefore palliative and can cause significant adverse effects, and newer treatments that either target symptoms more safely or that treat the cause of the disease are needed.

## Immunopathogenesis

OLP is a chronic inflammatory disease. A predominant TH1 cytokine pattern precedes development of OLP. When interferon- $\gamma$  (IFN- $\gamma$ ) predominates, OLP occurs; when tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) predominates, oral and cutaneous lichen planus occurs.<sup>8</sup> These inflammatory cytokines trigger a cascade of events that lead to apoptosis in epithelial basal cells. The Nf $\kappa$ B pathway is upregulated, and the transforming growth factor- $\beta$  (TGF- $\beta$ ) control pathway is downregulated, resulting in chronic inflammation and keratinocyte hyperproliferation

(the basis of the white lesions in the disease).<sup>9</sup> For a graphic representation of the disease pathogenesis, see Figure 1.

Some patients with chronic hepatitis C (CHC) develop OLP.<sup>10</sup> We have recently written in detail about herbal treatment of patients with CHC.<sup>11</sup> OLP develops, at least in part, as a result of chronic immune upregulation and inflammation caused by the body's frustrated attempt to destroy the virus in hepatocytes, and so inflammation- and immune-modulating herbs are logical choices for patients who have OLP comorbidly with CHC.

In natural medicine, leaky gut and subsequent food allergies are believed to be a significant inciting factor for lichen planus. This seems to be logical, given the authors' own clinical observation that elimination-challenge diets frequently reduce the condition. In addition, most autoimmune diseases have ultimately been shown to be associated with these problems.<sup>12</sup>

Nonsteroidal anti-inflammatory drug (NSAID) use is a well-established risk factor for lichen planus.<sup>13</sup> Although a direct antigenic role for these drugs cannot be ruled out in causing lichen planus, it is also possible that they are involved because of their well-known role in increasing leaky gut.<sup>14</sup> Definitive proof of a connection among leaky gut, food allergy, and OLP remains to be demonstrated.

Demulcent and inflammation-modulating herbs are the major herbal therapies to correct all these problems. They are discussed below in detail.

## Demulcents

*Aloe barbadensis* (aloe; *Aloe vera*) is native to drier parts of Africa and is now cultivated in other desert regions of the world including, extensively, Texas. This herb is a member of the Liliaceae family. The mucoid gel found in the inner portion of the leaves, free of cathartic laxative anthraquinone glycosides, contains soothing, immunomodulating, inflammation-modulating complex carbohydrates, including glucomannan.<sup>15</sup> The mix of polysaccharides is often referred to as acemannan. A case study has previously reported that 2 oz of aloe-stabilized juice orally each day resulted in elimination of OLP in 1 52-year-old woman.<sup>16</sup>

In a double-blinded study in 54 Thai adults, subjects were randomly assigned to apply either *Aloe vera* gel or vehicle twice a day for 8 weeks.<sup>17</sup> Patients in the aloe group were significantly more likely to have a 50% or greater clearing of lesions and reduction of pain, compared with patients in the placebo group. Two patients went into complete remission, compared with none taking placebo. Nine patients taking aloe had complete remission of all symptoms compared to 1 taking placebo—a significant difference. There were no significant adverse effects. Aloe has also been shown to be effective for topical use in women with vulvar lichen planus in a double-blinded, placebo-controlled clinical trial.<sup>18</sup>

*Portulacca oleracea* (purslane), in the Portulacaceae family, is a humble demulcent weed from Eurasia. This weed has previously been reported to modulate inflammation and decrease

pain.<sup>19</sup> A group of 37 Iranian adults with OLP volunteered for a double-blinded, randomized controlled trial of a purslane extract.<sup>20</sup> The extract was made by dissolving the above-ground, cooked parts in 80% ethanol. This extract was dried

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and encapsulated, and subjects were given 235 mg per day of the extract or placebo for 3 months. There was significantly greater reduction in lesion size and pain levels in patients taking purslane, compared with controls, with results lasting up to 3 months after discontinuation of therapy. No adverse effects were noted.

Although their efficacy is not well-documented, demulcents are a treatment of choice for helping repair leaky gut in the Western herbal world.<sup>21</sup> There is some experimental evidence that the polysaccharide-rich demulcent *Avena sativa* (oats) can prevent leaky gut.<sup>22</sup> Other forms of complex carbohydrates may also be beneficial.<sup>23</sup>

Some other highly sustainable and safe demulcent herbs include *Althaea officinalis* (marshmallow) leaf or root and *Alcea rosea* (hollyhock) leaf or root. *Symphytum officinale* (comfrey) leaf is also an excellent treatment but should only be used internally for 2–4 weeks at a time and should be avoided in patients with concomitant liver or kidney disease, and not used during pregnancy or lactation. A cold infusion is the optimal preparation for these herbs, with 3–5 g of herb per cup of water allowed to sit in room-temperature water for 8–12 hours. One cup should be swished and swallowed at least three times per day.

## Inflammation-Modulators

*Curcuma longa* (turmeric) rhizome is a major traditional remedy throughout Asia and is an important modulator of inflammation. The mixture of curcuminoids from this plant, often referred to as curcumin, is well-documented to affect multiple pathways of inflammation.<sup>24</sup>

A double-blinded, randomized trial involving 33 adults with OLP in San Francisco compared 1000 mg curcumin twice a day with placebo for 7 weeks.<sup>25</sup> All subjects received 60 mg of prednisone during the first week of therapy. This was a serious potential flaw in the design of the study, as, actually, this was a trial of whether curcumin could add anything on top of corticosteroid treatment, and also raises the concern that corticosteroids might interfere with curcumin's efficacy. Ultimately, an interim analysis showed very little

## Major Forms of Oral Lichen Planus

**Reticular**—typically causes asymptomatic, weblike white lines on the oral mucosa as a result of keratosis

**Atrophic**—reticular form combined with erythematous patches, also typically asymptomatic

**Erosive**—painful, shallow, irregular ulcers combined with manifestations of reticular and atrophic forms

chance of success and the trial was stopped early because it was futile.

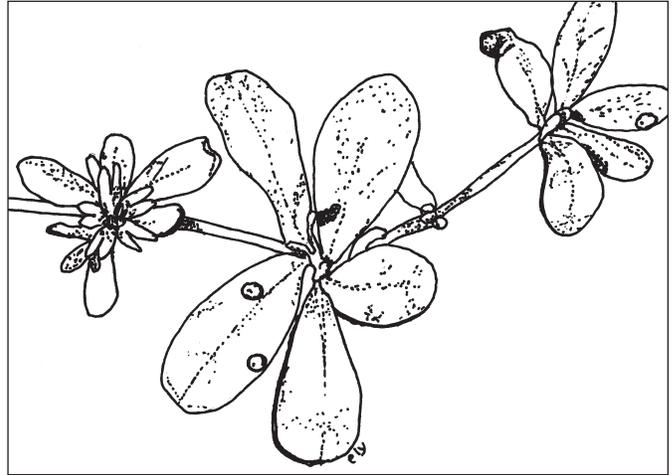
This information suggests that corticosteroids should be withheld unless absolutely necessary for patients with OLP who are considering using natural therapies. In addition, the dose of curcumin that is likely to be effective will be significantly higher than 1000 mg twice per day. Curcumin in capsules is also a suboptimal dosing form, as it does not allow the medicine to reach the lesions by direct contact. A tincture (5 mL, three times per day), decoction (5 g per cup, three cups per day), or nonencapsulated powder of turmeric (3–5 g, two to three times per day) would be much more appropriate. Tincture or powder should be diluted with water.

Other inflammation-modulating herbs to consider that have not been formally studied for patients with OLP include *Zingiber officinale* (ginger) rhizome, *Filipendula ulmaria* (meadowsweet) flowering top, *Achillea millefolium* (yarrow) flowering top, *Calendula officinalis* (calendula) flower, *Humulus lupulus* (hops) strobile, *Larrea tridentata* (creosote bush) herb, and *Artemisia tridentata* (bigleaf sagebrush) leaf. All are recommended as tinctures or teas, again, to allow maximum contact with the lesions topically before being swallowed.

## An Immunosuppressive

*Tripterygium wilfordii* (*lei gong teng*, which translates literally as “thunder god vine”) root bark is a traditional Chinese herbal medicine with potent immunosuppressive effects. It grows as a vine in Eastern Asia and is traditionally recommended for patients with arthritis, fever, chills, and/or swelling. *T. hypoglaucum* is an interchangeable species. Diterpenoids, such as triptolide, are believed to account for much of the therapeutic activity of the plant.<sup>26</sup>

Triterpenoid saponins may also be beneficial for treating inflammation. They are also associated with reversible infertility in men, although triptolides may also play a role in this.<sup>27</sup> Significant bone-marrow suppression is seen with use of the whole plant and extracts free of triterpenoids.<sup>28</sup> A meta-analysis confirmed that extracts of thunder god vine are effective for treating patients with rheumatoid arthritis (RA), but the reviewers stated that the herb's toxicity made it an unacceptable treatment.<sup>29</sup>



*Portulacca oleracea* (purslane). Drawing ©2010, by Eric Yarnell, ND.

In a randomized trial, 94 Chinese patients with erosive OLP were randomly assigned to take either a crude root extract or a glycosides-only extract for 3 months.<sup>30</sup> The glycoside extract was more effective for patients with grade I disease than the crude root extract was, while both extracts were equally effective for patients with grade II disease. The researchers recommended against thunder god vine use in people of childbearing age because of concern about fertility effects. The utility and safety of this controversial, potent, and potentially dangerous herb remain to be seen.

## Stress Relievers

According to many studies, high levels of stress and anxiety increase the risk of OLP substantially.<sup>31–33</sup> Some studies have not found a connection.<sup>34</sup> We have previously written at length about nervine and adaptogen herbs to help combat anxiety and stress.<sup>35–37</sup> Please see these articles for thoughts about specific herbs that might be helpful for an individual patient. Adaptogens are of particular interest because they are also immunomodulating, and thus may help alleviate some of the immunopathogenesis discussed above.

*Glycyrrhiza glabra* (licorice) root is an example of an herb that embodies almost all the actions described as useful above: adaptogenic; immunomodulating; inflammation-modulating; and demulcent.<sup>38</sup> In a study, the triterpenoid saponin glycyrrhizin, which imparts the sweet taste to licorice root, has been given intravenously (IV) for 4 weeks to treat OLP successfully in patients with CHC, compared with just giving oral cleanings to control patients.<sup>39</sup> Because of the well-established use of IV glycyrrhizin for patients with CHC, it was unclear if this therapy was working on the underlying viral hepatitis or on the lichen planus directly.<sup>40</sup>

Oral licorice is preferred for patients with OLP, however, as this way it can act directly on the lesions. A typical dose of fluid extract would be 1–2 mL diluted in water, and for tea, the dose would be 1–2 g per cup of water simmered for 15–20 minutes, with three cups taken per day. In both cases, a swish-

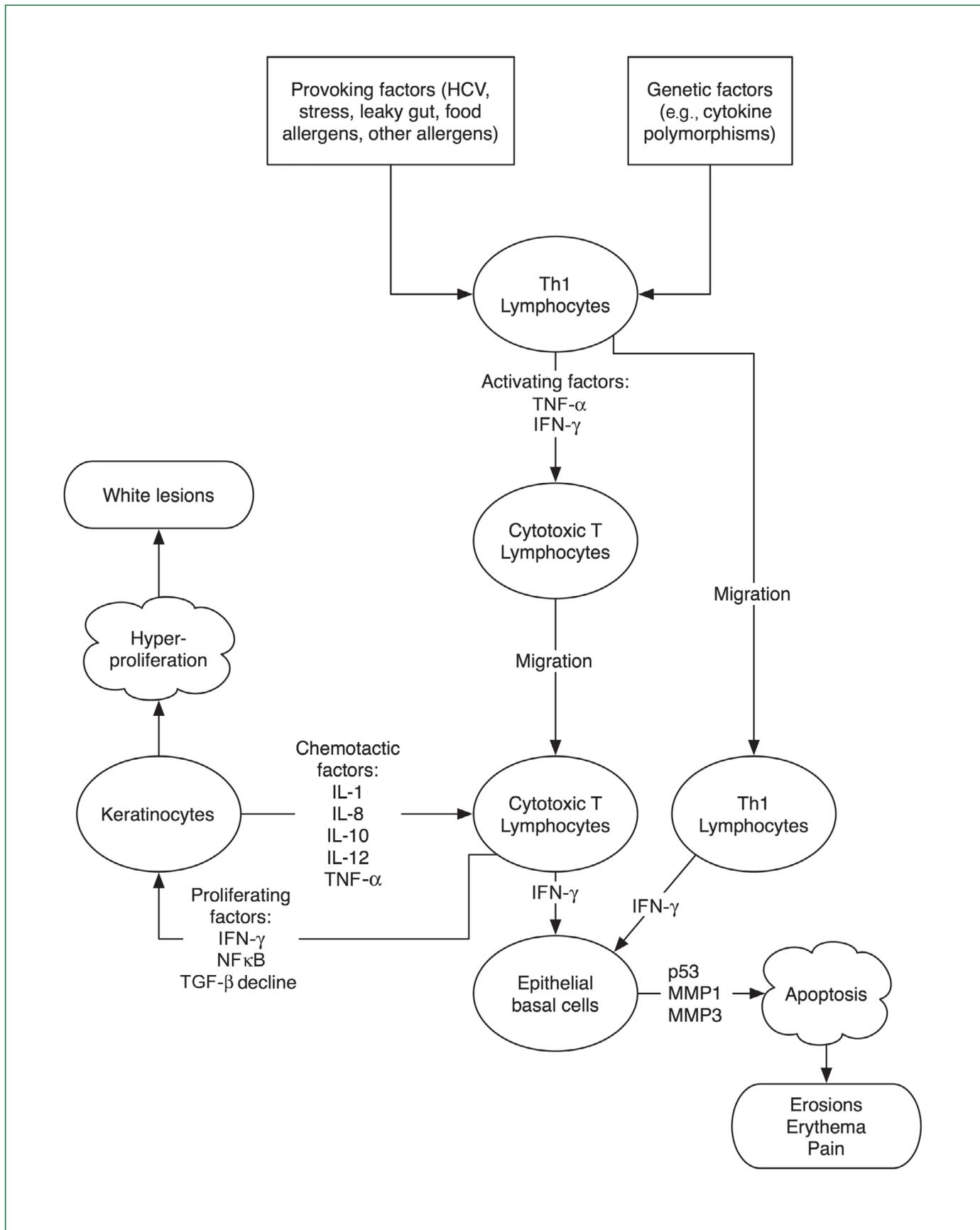


Figure 1. Lichen planus pathogenesis. HCV, hepatitis C virus; TNF, tumor necrosis factor; IFN, interferon; IL, interleukin; TGF, transforming growth factor.

and-swallow approach is recommended for achieving optimal benefits. Patients taking licorice or receiving IV glycyrrhizin should have their serum potassium and blood pressure (BP)

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monitored regularly to avoid potential adverse effects. Licorice should not be used by patients who have uncontrolled hypertension or who are taking corticosteroids or other drugs that can also deplete potassium.<sup>41</sup>

### Astringents

*Potentilla tormentilla* (tormentil) herb is a Rosaceae-family, Eurasian-native rich in tannins and traditionally classed as an astringent.<sup>42</sup> Related species are found across Asia and North America, including *P. arguta* = *Drymocallis arguta* (prairie cinquefoil) in the latter. Astringents are believed to help patients with OLP by coating the lesions and protecting them from irritation by food or compounds in the saliva. Astringents also have vulnerary and inflammation-modulating effects.<sup>43</sup>

In a report from Russia, 53 patients with OLP were treated with cod liver oil and some other immune and detoxifying natural therapies, although details of these were not available.<sup>44</sup> While this treatment was effective for obtaining remission of nonerosive OLP, with effects durable for 1 year, gargling a tincture of tormentil and cod liver oil was much more effective for treating erosive OLP. Most patients will find gargling cod liver oil objectionable, to put it mildly, but tormentil is quite tolerable.

Many other astringents can be considered as part of a program to heal OLP, including *Crataegus* spp. (hawthorn) leaf, flower and fruit; *Rubus* spp. (blackberry, raspberry) leaf and root; *Vaccinium* spp. (blueberry, bilberry) leaf and fruit; *Morella cerifera* (bayberry) bark; *Polygonum* spp. (bistort) leaf; *Camellia sinensis* (black tea) steamed leaf; and *Agrimonia eupatoria* (agrimony) herb. All are best taken as teas or tinctures so they can coat the lesions directly.

### Conclusion

There are many kinds of herbs that can help heal the lesions of OLP effectively and safely, as well as helping keep them from returning. Inflammation-modulators, demulcents, astringents, adaptogens, immunomodulators, and nervines are all relevant. Substantial clinical trials have

verified the efficacy of *Aloe vera* and purslane. This supports performing clinical trials on other herbs mentioned here for treating OLP. In severe cases not responding to other therapies, there is support for short-term use of thunder god vine as an immunosuppressant. ■

### References

- Chainani-Wu N, Silverman S, Lozada-Nur F, et al. Oral lichen planus: Patient profile, disease progression and treatment responses. *J Am Dent Assoc* 2001;132:901–909.
- McCartan BE, Healy CM. The reported prevalence of oral lichen planus: A review and critique. *J Oral Pathol Med* 2008;37:447–453.
- Pramick M, Whitmore SE. Cushing's syndrome caused by mucosal corticosteroid therapy. *Int J Dermatol* 2009;48:100–101.
- Gonzales-Moles MA, Morales P, Rodriguez-Archilla A, et al. Treatment of severe chronic oral erosive lesions with clobetasol propionate in aqueous solution. *Oral Surg Oral Med Oral Path Oral Radiol Endod* 2002;93:264–270.
- Gonzalez-Moles M, Scully C. HPA-suppressive effects of aqueous clobetasol propionate in the treatment of patients with oral lichen planus. *J Eur Acad Dermatol Venereol* 2010;February 10:e-pub ahead of print.
- Thongprasom K, Dhanuthai K. Steroids in the treatment of lichen planus: A review. *J Oral Sci* 2008;50:377–385.
- Lodi G, Tarozzi M, Sardella A, et al. Miconazole as adjuvant therapy for oral lichen planus: A double-blind randomized controlled trial. *Br J Dermatol* 2007;156:1336–1341.
- Carrozzo M, Ubaldi de Capei M, Dametto E, et al. Tumor necrosis factor-alpha and interferon-gamma polymorphisms contribute to susceptibility to oral lichen planus. *J Invest Dermatol* 2004;122:87–94.
- Scully C, Carrozzo M. Oral mucosal disease: Lichen planus. *Br J Oral Maxillofacial Surg* 2008;46:15–21.
- Carrozzo M, Gandolfo S. Oral diseases possibly associated with hepatitis C virus. *Crit Rev Oral Biol Med* 2003;14:115–127.
- Yarnell E, Abascal K. Herbal medicine for viral hepatitis. *Altern Complement Ther* 2010;16:151–157.
- Vasquez A. *Integrative Rheumatology*, 2nd ed. Austin, TX: Integrative and Biological Medicine Research and Consulting, LLC, 2007.
- Clayton R, Chaudhry S, Ali I, et al. Mucosal (oral and vulval) lichen planus in women: Are angiotensin-converting enzyme inhibitors protective, and beta-blockers and non-steroidal anti-inflammatory drugs associated with the condition? *Clin Exp Dermatol* 2009;35:384–387.
- Davies NM. Review article: Non-steroidal anti-inflammatory drug-induced gastrointestinal permeability. *Aliment Pharmacol Ther* 1998;12:303–320.
- Sujushe A, Vasani R, Saple DG. *Aloe vera*: A short review. *Indian J Dermatol* 2008;53:163–166.
- Hayes SM. Lichen planus—report of successful treatment with *Aloe vera*. *Gen Dent* 1999;47:268–272.
- Choonhakarn C, Busaracome P, Sripanidkulchai B, Sarakarn P. The efficacy of *Aloe vera* gel in the treatment of oral lichen planus: A randomized controlled trial. *Br J Dermatol* 2008;158:573–577.
- Rajar UD, Majeed R, Parveen N, et al. Efficacy of *Aloe vera* gel in the treatment of vulval lichen planus. *J Coll Physicians Surg Pak* 2008;18:612–614.
- Chan K, Islam MW, Kamil M, et al. The analgesic and anti-inflammatory effects of *Portulacca oleracea* L. ssp. *sativa* (Haw) Celak. *J Ethnopharmacol* 2000;73:445–451.
- Agha-Hosseini F, Borhan-Mojabi K, Monsef-Esfahani HR, et al. Efficacy of purslane in the treatment of oral lichen planus. *Phytother Res* 2010;24:240–244.

21. Yarnell E. Natural Approach to Gastroenterology, 2nd ed. Wenatchee, WA: Healing Mountain Publishing, 2010;in press.
22. Keshavarzian A, Choudhary S, Holmes EW, et al. Preventing gut leakiness by oats supplementation ameliorates alcohol-induced liver damage in rats. *J Pharmacol Exp Ther* 2001;299:442–448.
23. Gyory CP, Chang GW. Effects of bran, lignin and deoxycholic acid on the permeability of the rat cecum and colon. *J Nutr* 1983;113:2300–2307.
24. Aggarwal BB, Harikumar KB. Potential therapeutic effects of curcumin, the anti-inflammatory agent, against neurodegenerative, cardiovascular, pulmonary, metabolic, autoimmune and neoplastic diseases. *Int J Biochem Cell Biol* 2009;41:49–59.
25. Chainani-Wu N, Silverman S Jr, Reingold A, et al. A randomized, placebo-controlled, double-blind clinical trial of curcuminoids in oral lichen planus. *Phytomedicine* 2007;14:437–446.
26. Brinker AM, Ma J, Lipsky PE, Raskin I. Medicinal chemistry and pharmacology of genus *Tripterygium* (Celastraceae). *Phytochemistry* 2007;68:732–766.
27. Chen BJ. Triptolide, a novel immunosuppressive and anti-inflammatory agent purified from a Chinese herb *Tripterygium wilfordii* Hook F. *Leuk Lymphoma* 2001;42:253–265.
28. Pyatt DW, Yang YZ, Mehos B, et al. Hematotoxicity of the Chinese herbal medicine *Tripterygium wilfordii* Hook f in CD34-positive human bone marrow cells. *Molec Pharmacol* 2000;57:512–528.
29. Cantera CH, Leeb HS, Ernst E. A systematic review of randomised clinical trials of *Tripterygium wilfordii* for rheumatoid arthritis. *Phytomedicine* 2006;13:371–377.
30. Lin LM, Qi XM. Comparative observation on the effects of radix *Tripterygium hypoglaucum* tablet and *Tripterygium glycosides* tablet in treating erosive oral lichen planus. *Chin J Integr Med* 2005;11:149–150.
31. Chiappelli F, Cajulis OS. Psychobiologic views on stress-related oral ulcers. *Quintessence Int* 2004;35:223–227.
32. Koray M, Dülger O, Ak G, et al. The evaluation of anxiety and salivary cortisol levels in patients with oral lichen planus. *Oral Dis* 2003;9:298–301.
33. Shah B, Ashok L, Sujatha GP. Evaluation of salivary cortisol and psychological factors in patients with oral lichen planus. *Indian J Dent Res* 2009;20:288–292.
34. Rödström PO, Jontell M, Hakeberg M, et al. Erosive oral lichen planus and salivary cortisol. *J Oral Pathol Med* 2001;30:257–263.
35. Abascal K, Yarnell E. Nervine herbs for treating anxiety. *Altern Complement Ther* 2004;10:309–315.
36. Abascal K, Yarnell E. Increasing vitality with adaptogens: Multifaceted herbs for treating physical and mental stress. *Altern Complement Ther* 2003;9:54–60.
37. Yarnell E, Abascal K, Rountree R. *Clinical Botanical Medicine*, rev ed. New Rochelle, NY: Mary Ann Liebert, 2008.
38. Shibata S. A drug over the millennia: Pharmacognosy, chemistry, and pharmacology of licorice. *Yakugaku Zasshi* 2000;120:849–862.
39. Da Nagao Y, Sata M, Suzuki H, et al. Effectiveness of glycyrrhizin for oral lichen planus in patients with chronic HCV infection. *J Gastroenterol* 1996;31:691–695.
40. Arase Y, Ikeda K, Murashima N. The long term efficacy of glycyrrhizin in chronic hepatitis C patients. *Cancer* 1997;79:1494–1500.
41. Isbrucker RA, Burdock GA. Risk and safety assessment on the consumption of licorice root (*Glycyrrhiza* spp.), its extract and powder as a food ingredient, with emphasis on the pharmacology and toxicology of glycyrrhizin. *Reg Toxicol Pharmacol* 2006;46:167–192.
42. Tomczyk M, Latté KP. Potentilla—a review of its phytochemical and pharmacological profile. *J Ethnopharmacol* 2009;122:184–204.
43. Tunon H, Olavsdotter C, Bohlin L. Evaluation of anti-inflammatory activity of some Swedish medicinal plants: Inhibition of prostaglandin biosynthesis and PAF-induced exocytosis. *J Ethnopharmacol* 1995;48:61–76.
44. Volodina EV, Maksimovskii IuM, Lebedev KA. The combined treatment of lichen ruber planus of the mouth mucosa [in Russian]. *Stomatologiya (Mosk)* 1997;76:28–32.

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