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# Stinging Nettle

## *A Modern View of An Ancient Healing Plant*

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**T**he aptly named stinging nettle (*Urtica dioica* L.) possesses medicinal properties that have long been used by humans. Similar species of the plant also possess the same properties. Modern research has begun to investigate some of the biochemical bases of these properties. This article presents a thorough review of historical and recent views of the many facets of stinging nettle.

*U. dioica* L. is one member of the Urticaceae family. *U. urens* L., the dog or small nettle, appears to possess similar qualities to *U. dioica*. The German government monograph (Commission E monograph)\* on stinging nettle treats the two species of nettles as equivalents. As many as fifty other species of *Urtica* exist but it is not known to what extent they are also similar to stinging nettle. It is generally believed that these nettles are somewhat interchangeable as medicines. However, *U. dioica* is by far the most commonly encountered species for medical use. Table 1 lists some other species of *Urtica*.

Stinging nettle is called *ortiga* in Spanish, *Brennessel* in German, *ortica* in Italian, and *ortie* (or *ortie dioique*) in French. Nettle is derived from the Anglo-Saxon word *noedl*, which means needle. *Urtica* comes from the Latin word for "to burn," and

*dioica* comes from the Latin word for "two houses," referring to the separate male and female flowers in some varieties of the plant.

### Botanical Features

Stinging or great nettle stands 24–72 inches tall and is a perennial herb. It has large, heart-shaped, serrated green leaves. They are very fleshy, drooping, and heavy. The stems and leaves (particularly the lighter green undersides) are covered with fine hairs. These hairs contain silica and break off when they are touched, injecting irritant chemicals into the skin. Contact with the hairs leads to a painful sting, development of an erythematous macule, and itching or numbness for a period of time after that. One source states that these reactions last only for a few moments but can last for days with repeated exposures in some people.<sup>1</sup> Medicinal extracts of nettles do not cause this reaction as the hairs are destroyed in processing.

Small nettle is usually only a few inches tall and has delicate, smooth, and shiny leaves. However, it, too, possesses stinging hairs. Unlike great nettle, dog nettle produces separate male and female flowers. The flowers of both plants are white and appear in the summer (or spring for plants that grow near coastal areas). Dwarf nettle is an annual, not a perennial.

Often, nettles grow in large groups, in damp shaded soil. However, stinging nettle or similar species of the plant can grow almost anywhere. Great nettle shows a particular fondness for formerly cultivated areas that have since been somewhat neglected. It has been reported that growing nettles with aromatic herbs

such as mint leads to an improvement in the essential oil content of the aromatics.<sup>2</sup> Although indigenous to Eurasia, nettles have since spread to most parts of the world, including North America, particularly in the northern temperate region.

Some plants have evolved a similar appearance to stinging nettles without actually having stinging hairs. The theory is that animals that might eat the mimics will have learned to avoid stinging nettles and, thus, will leave all plants that look like stinging nettles alone. Stinging nettles should be carefully distinguished from *Lamium album* (dead or white nettle) in particular as this plant is used differently.

### Historical Notes

Nettles have a long and colorful history of use as food, cordage, and medicine. The young boiled shoots have been reported as being a food for Europeans and Persians<sup>3</sup> as well as being used in the Himalayas.<sup>4</sup> The stems were once widely used in Europe as cordage for weaving, sailcloth, and fishing line.<sup>2</sup> With proper processing, the fiber was said to be as fine as silk.

In ancient Europe, stinging and dog nettle were considered to be useful for conditions ranging from skin eruptions to kidney disease to arthritis. In the 1600s, Nicholas Culpeper wrote that boiled or juiced roots or leaves helped to relieve wheezing, shortness of breath, and inflammation of the throat.<sup>5</sup> Other leaf extracts were said to help provoke menses, kill worms, stimulate urination, shrink nasal polyps, heal infected sores, and stanch bleeding. The seed was also considered to be diuretic and

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\*For information about the Commission E monograph on stinging nettle, write to the American Botanical Council, Box 201660, Austin, TX 78720-1660.

## Nettle is reportedly one of the most nutrient-dense herbs in common use.

anthelmintic. Dr. Culpeper also mentioned an ancient practice of applying the fresh mature leaves to the joints for treatment of "gout, sciatic or joint aches."<sup>5</sup>

Eclectic physicians around the turn of the century in the United States employed nettle for the treatment of diarrhea, hemorrhoids, bleeding, nephritis, eczema, chronic colon disease, and urinary gravel.<sup>6</sup>

Flies are said to dislike nettles. Therefore, some nettle bundles were often kept indoors to dissuade house flies from entering there.

### Constituents

Nettle contains a number of compounds and nutrients. The leaf, root, and seed have all been employed in medicine. Therefore, it is important to distinguish as much as possible which compounds are found in which portions of the plant and in what quantities these compounds are found.

Nettle is reportedly one of the most nutrient-dense herbs in common use. Three samples of stinging nettle leaves (each sample taken from a different year's harvest) have been reported to contain, on average, eleven nutrients (see Table 2). Zinc and manganese content is affected by soil conditions but this is not necessarily the case with other minerals.<sup>7</sup> The leaves are apparently most nutritious but the roots may also have some value. This has yet to be investigated rigorously.

The main active constituents in nettle have yet to be identified. A large number of compounds have been isolated and have been suggested as being beneficial but definitive evidence in humans is lack-

ing. Currently, it appears that hydrophilic components, including lectins and polysaccharides, are most important, particularly in prostate disease.<sup>8</sup> However, hydrophobic constituents have not been ruled as being entirely unimportant.<sup>9</sup> Each class of compounds may have separate effects. A number of possible compounds that might contribute significantly to nettle's therapeutic effects are discussed here. Current knowledge argues strongly in favor of using whole plant preparations clinically.

Beta-sitosterol and similar plant sterols are present in stinging nettle. Isolated beta-sitosterol in high doses (20 mg three times per day) has been shown to reduce symptoms in men with benign prostatic hyperplasia (BPH)<sup>10</sup> and, at even higher doses (1 g and above per day), to reduce serum cholesterol levels in humans.<sup>11</sup> It is unlikely that the much smaller amounts (<0.01 percent)<sup>12</sup> of beta-sitosterol in nettles would have similar benefits. Recent studies in animals have suggested paradoxically that the presence of higher levels of sitosterin, a compound that is similar to sitosterol, may actually promote BPH.<sup>13</sup> Total protein, carbohydrate, and *U. dioica* agglutinin (UDA, see below) were all associated with less hyperplasia in this study. The steroidal compounds stigmasterol, stigmast-4-en-3-one, and campesterol have been shown to inhibit the prostatic sodium/potassium pump, which might contribute to nettle's effects in BPH.<sup>9</sup>

A potent lectin known as UDA occurs in stinging nettle, particularly in the root. UDA is considered to be unique among plant lectins because of its structure and its ability to induce a specific pattern of T-



*Urtica dioica.*

lymphocyte activity.<sup>14</sup> This lectin is very acid- and heat-resistant. Although UDA shares characteristics with so-called bacterial superantigens, it is not a pathogenetic constituent. UDA induces cytokine production by a subset of T lymphocytes and appears to increase numbers of certain CD8+ and CD4+ cells while decreasing the numbers of other cells.<sup>15</sup> Mice prone to developing systemic lupus erythematosus do not do so when they are fed UDA.<sup>16</sup> UDA possesses significant in vitro antiviral effects, blocking the lethal effects of HIV (types 1 and 2), cytomegalovirus, respiratory syncytial virus, and influenza A viruses on human cells.<sup>17</sup> UDA also blocks the binding of epidermal growth factor to its receptor in the prostate, which would theoretically prevent or reduce prostate enlargement.<sup>8,12</sup> UDA's effects have not

## Polysaccharides may exert a major portion of nettle's immune actions.

**Table 1. Other Species of the Genus *Urtica* besides *Urtica dioica***

<i>U. cannabina</i>	Northeast China	Leaves as food
<i>U. crenulata</i> Roxb	India	Very potent stings
<i>U. laetevirens</i> Maxim	China	Leaves as food
<i>U. parviflora</i> Roxb	India, Himalayas	Shoots as food, treatment for sciatica
<i>U. pilulifera</i> L.	India, Central Asia, Europe	Fruit used as galactagogue, root as a diuretic
<i>U. stimulans</i> L.	India	Very potent stings
<i>U. tuberosa</i> Roxb	India	Roots as food
<i>U. urentissima</i> Blume	India, Indonesia	Very potent stings

**Table 2. Selected Nutrient Content of *Urtica dioica* Leaf**

Nutrient	Content (mg/100 g, 0 moisture)
Calcium	2900
Chromium	3.0
Iron	42
Magnesium	860
Potassium	1750
Riboflavin	0.43
Selenium	2.2
Thiamine	0.54
Vitamin A	15,700 (IU <sup>a</sup> /100 g)
Vitamin C	83
Zinc	4.7

Note: In the fresh plant (i.e., without the moisture removed), these levels would be lower/more dilute. Source: Pedersen, M. *Nutritional Herbiology*. Bountiful, UT: Pedersen Publishing, 1987.; <sup>a</sup>IU, international units.

been confirmed in humans but offer interesting possibilities for explaining the benefits of nettle administration.

### The Anti-Inflammatory Effect

Caffeic malic acid extracted from nettles has been investigated in comparison to whole-leaf extracts. Both showed significant inhibitory action against lipoxygenase.<sup>18</sup> Similar phenolic compounds (caffeic acid, chlorogenic acid) may also exert an anti-inflammatory effect in nettle.

The lignans of nettle present another possibility in the search for major active

constituents. One of the most active constituents appears to be (—)-3,4-divanillyltetrahydrofuran. The proposed mechanism of action of lignans is to block the binding of sex-hormone-binding globulin to testosterone or to the testosterone receptor.<sup>19,20</sup> A water extract of nettle has also been shown to have this effect in one study in which UDA, an alcoholic extract, and stigmast-4-en-3-one were shown to be ineffective.<sup>21</sup> The roots of nettle are the major source of lignans.

Polysaccharides may exert a major portion of nettle's immune actions. Produc-

tion of tumor necrosis factor (TNF) alpha is stimulated by some of these polysaccharides as are T-lymphocyte activity and complement activation.<sup>8</sup> Studies on these activities were conducted in vitro. A study in mice found the crude polysaccharide extract to be an anti-inflammatory as potent as indomethacin.<sup>8</sup> In contrast to these findings were studies conducted in human blood using whole-leaf extracts of nettle.<sup>22</sup> Nettle actually decreased TNF and interleukin-1 beta production by white blood cells. Flavonoids, caffeic malic acid, caffeic acid, and chlorogenic acid isolated from nettles all failed to exert any effect in this assay.

The stinging hairs of nettle contain formic acid, acetic acid, butyric acid, acetylcholine, 5-hydroxytryptamine, histamine, leukotrienes, and a resin. All components are thought to contribute to the sting.<sup>23,24</sup> It is also thought that histamine causes the immediate wheal of the sting and that other constituents lead to the prickly sensation and itching, which can last for hours afterward. It is not known how these constituents might account for the observed antirheumatic, antiarthritic effect of topical application of nettles. An analogy to bee-venom therapy, which has been known anecdotally as being beneficial for arthritis, has been suggested but has not been investigated.<sup>25</sup>

One substance found in nettle, (10-E, 12-Z)-9-hydroxy-10, 12-octadecadienic acid, inhibits aromatase in the prostate.<sup>26</sup> A whole-plant extract combined with *Pygeum africanum* also inhibits aromatase.<sup>27</sup> This enzyme converts testosterone to estradiol and is linked to the pathogenesis of BPH. Other constituents that have been shown to exist in nettle with unknown effects are shown in Table 3. A summary of the major actions of nettle is given in Table 4. All this evidence, taken together, suggests that nettle possesses numerous active constituents that act mildly on a number of different

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pathogenic mechanisms in disease states to bring about healing.

### Clinical Applications and Safety

A number of conditions might be amenable to treatment with nettle and its various extracts. Clinical trials have not validated all of these uses. However, the fairly strong agreement between human research and historical uses of nettle suggests that lack of study is more to blame than lack of efficacy in at least some cases. Patient individuality must always be considered for the disease states noted below but nettle does seem to have a very broad range of applications.

One of the most overlooked and un researched aspects of botanical medicine is the nutritional benefit of herbs.<sup>28</sup> There are a few exceptions, particularly *Allium sativum* (garlic) and *Allium cepa* (onion), which are considered to be foods and medicines. Yet, as documented above, nettle leaves and roots have also been used as foods throughout history. In the age of powerful pharmacotherapeutic drugs, such gentle and supportive approaches to medicine have all too often been ignored. Adding nettle to the diet is not exciting and will not yield spectacular results in all but the largest clinical trials because the nutritional benefit will be small (though important) and will accrue only over a relatively long period. This is particularly unfortunate because such supportive measures could help to offset the more negative facets of other treatments. For example, nettle as food might prove to be helpful in protecting patients from the adverse effects of radiation therapy or of surgery. But the current medical system is not set up to investigate such cooperative models for the most part.

Because of the highly nurturing aspect of nettle, it will tend to benefit almost every person's condition. There is not a patient who does not need general nutri-

**Table 3. Miscellaneous Constituents of *Urtica dioica***

Constituents	Notes	Reference
Glucouquinone	Possibly hypoglycemic	—
Glycoprotein	—	a
Terpenes	Found in roots	b
Phenolics		
Homovanillyl alcohol	—	c
Vanillin	—	c
Vanillic acid	—	c
Glycosides	—	d
Scopoletin	—	—
Flavonoids		
Isoquercitrin	—	e
Rutin	—	e
Kaempferol	—	e
Isorhamnetin	Found in flowers	e
Chlorophyll	15.7 mg/100 g in fresh plant	f
Tannic acid	root > leaf	—
Gallic acid	root > leaf	—
Heavy metals	Highly variable depending on where grown	g
Pesticides	Highly variable depending on where grown	h

<sup>a</sup>Anderson, S., et al. Water soluble glycoprotein from *Urtica dioica* leaves. *Phytochemistry* 17:1875–1877, 1978; <sup>b</sup>Kraus, R., Spittler, G. Terpene diols and terpene diol glucosides from roots of *Urtica dioica*. *Phytochemistry* 30:1203–1206, 1991; <sup>c</sup>Kraus, R., et al. Phenolic compounds from roots of *Urtica dioica*. *Liebigs Ann Chemie* 12:1205–1214, 1990 [in German]; <sup>d</sup>Chaurasia, N., Wichtl, M. Sterols and sterol glycosides from *Urtica dioica*. *J Nat Prod* 50:881–885, 1987; <sup>e</sup>Chaurasia, N., Wichtl, M. Flavonol glycosides from *Urtica dioica*. *Planta Med* 53:432–434, 1987; <sup>f</sup>Duke, J.A. *CRC Handbook of Medicinal Herbs*. Boca Raton, FL: CRC Press, 1985; <sup>g</sup>See Ref. 35; <sup>h</sup>Benecke, R. Residues of pesticides in drugs from wild grown medicinal plants. *Pharmazie* 42:869–871, 1987.

tional support in order to heal, to stay well, or to become optimally healthy. In addition, nettle is essentially without adverse effects when it is used as a medicine, even in relatively high doses (>5 mL of tincture three times per day). Clinical experience shows nettle to be not only safe in pregnancy but also a useful addition to supportive herbal formulae during gestation. This directly contradicts animal research that suggests that nettle might stimulate uterine contractions and shows the relative lack of utility of such studies.<sup>29</sup> Nettle is completely safe for use by lactating women and is historically known to promote the flow of

breast milk. Although nettle is a traditional therapy for diabetes, two animal studies have found nettle to have a slightly hyperglycemic effect.<sup>30,31</sup> No human data (from clinical trials or from empirical sources) support this finding and further research is needed before nettles can be suggested for diabetic patients. A very rare patient may be allergic to nettles, as with any herbal substance. One case of adulterated (with *Atropa belladonna* [deadly nightshade] leaves) commercial nettle tea causing poisoning in a woman in Austria has been reported.<sup>32</sup> Nettle is otherwise completely nontoxic.

## Nettle is believed to counteract acids with its alkalinity and to move toxins out of the body via the urine.

**Table 4. Major Actions of *Urtica* spp.**

Action	Apparent Active Constituents
Diuretic	Unknown
Anti-inflammatory	UDA, <sup>a</sup> polysaccharides, sterols, caffeic malic acid
Antiviral	UDA, polysaccharides
Blocking SHBG <sup>b</sup> activity	Lignans, sterols
Blocking EGF <sup>c</sup> binding to receptors	UDA
Prostatic aromatase inhibition	HOA, <sup>d</sup> others unknown
Nutritive	Vitamins, minerals, protein, chlorophyll

<sup>a</sup>UDA, *Urtica dioica* agglutinin.; <sup>b</sup>SHBG, sex-hormone-binding globulin.; <sup>c</sup>EGF, epidermal growth factor.; <sup>d</sup>HOA, (10-E, 12-Z)-9-hydroxy-10, 12-octadecadienic acid.

**Table 5. Clinical Applications of Stinging Nettles**

### Definite or Very Likely to be Beneficial

Allergic rhinitis  
Benign prostatic hyperplasia  
As a food supplement

### Possibly Beneficial

Osteoarthritis and rheumatoid arthritis  
Edema  
Gout attack (prevention)

Iron deficiency  
Neuralgia, sciatica (topically)  
Urinary tract infection (as a diuretic)

### Theoretically Beneficial

Systemic lupus erythematosus  
Viral infections

### Unsupported Historical Uses

Anaphylactic shock  
Asthma (as burned leaf or as a tincture)  
Diarrhea  
Hair loss  
Hemorrhage  
Insufficient lactation

Note: Definite or very likely indications have been supported either by clinical trials or by extensive empirical reports. Possible benefits have support by animal studies and extensive empirical reports. Theoretical benefits have been suggested by preliminary *in vitro* or animal studies and are not major historical uses. Unsupported historical uses have not been the subjects of any recent investigations.

Nettle-leaf juice has been reported to be diuretic in humans.<sup>33</sup> The preeminent German physician/phytotherapist R.F. Weiss cites old animal research showing that nettle leaf is uricosuric.<sup>34</sup> *Taraxacum officinale* (dandelion) leaf showed a similar effect, and these two extremely safe plants are likely to be a good combination for this reason. The diuretic effect is beneficial for cardiac edema and venous insufficiency.<sup>33,34</sup> Edema after trauma is another indication.<sup>34</sup>

### Detoxifier

Michael Moore, an herbalist and teacher in Bisbee, Arizona, recommends the juice of the leaf for premenstrual water retention and confirms that this juice does

not stimulate uterine contractions in women.<sup>35</sup> He contends that dog nettle is particularly effective for reducing irritative (but not infective) urethritis or cystitis compared to great nettle. He also mentions the belief that toxins (often acids) in the body's system produce chronic inflammatory conditions, such as skin diseases and arthritis, and that nettle is believed to counteract the acids with its alkalinity and to move toxins out of the body via the urine. The concept of endotoxemia causing disease has been discussed more in other literature and is beyond the scope of this article.<sup>36</sup> However, there is clear evidence for this concept in extreme situations, such as major

surgery,<sup>37</sup> and the importance of this concept cannot be discounted. This concept, as well as the role of nettle in the prevention or treatment of endotoxemia, has not been subjected to direct, controlled study.

The treatment of allergic conditions by nettle remains as an area of interest. One weak, double-blind, placebo-controlled trial showed symptomatic improvement using 300-mg capsules of freeze-dried extracts at the onset of symptoms.<sup>38</sup> Generally, nettles have only a moderate effect on allergic reactions. Nettle is therefore probably best combined with other botanicals, including *Ephedra sinica* (ma huang), *Sambucus nigra* (elderberry), *Euphrasia officinalis* (eyebright), and/or *Ambrosia ambrosioides* (ragweed).

### BPH and Nettle Root

A modern finding, apparently dating from the observations of a German physician named Rückle in 1950, has been that stinging nettle is beneficial for men with BPH.<sup>8</sup> The roots—not the leaves—have been used in this regard. Extensive research has been directed toward determining which constituents exert which actions in the prostate, as documented above.

At least four double-blind human studies have also been conducted. One study compared two doses of nettle in combination with *P. africanum*, another well-researched plant medicine for BPH.<sup>39</sup> One group of 72 men took two capsules twice a day of 300 mg of a 5:1 extract of nettle root and 25 mg of a 200:1 *P. africanum* bark extract. A second group of 72 men took half as much of these preparations. Both doses led to significant symptomatic improvement after 28 and 56 days. There were no adverse effects that were sufficient to cause discontinuation of treatment in this study population. Another controlled study found that nettle was beneficial in combination with alpha-blockers.<sup>40</sup> A third study showed

## The topical application of fresh nettles as a counterirritant for patients with arthritis has a long history.

a benefit of root extract over placebo.<sup>41</sup> The fourth study was a double-blind comparison of a combination of *Sereona repens* and *U. dioica* roots with finasteride (Proscar,<sup>®</sup> Merck & Co., West Point, Pennsylvania) in 543 men over 48 weeks.<sup>42</sup> Both treatment groups in the study showed a similar degree of symptomatic improvement. There were more serious adverse effects in the finasteride group compared to the phytotherapy group, including erectile dysfunction and headache.

A number of open studies have also been performed and have been uniformly positive for treatment of patients with BPH.<sup>43–49</sup> One study involving 67 men used a tincture of a combination of roots of *U. dioica* and *U. urens* at a dose of 5 mL three times per day.<sup>50</sup> Men who had fewer than four episodes of nocturnal urination at the outset of this study improved the most during the 3-week trial period. Taken together with the controlled trials, these results strongly support nettle as a safe and effective therapy for men with mild-to-moderate BPH.

### Topical Nettles and Dosing

The topical application of fresh nettles as a counterirritant for patients with arthritis has a long history. Weiss mentions this approach for lower back pain, sciatica, chronic tendinitis, and sprains as well.<sup>34</sup> This should be attempted only after it has been determined that the patient is not highly reactive to nettle stings (usually patients are not highly reactive to nettle stings). The stings will tend to become less painful over time, although some sources have stated that the stings can become more painful.<sup>1</sup> While topical nettles have not been rigorously investigated, two case studies have been reported.<sup>51</sup> The first was of an 81-year-old man who greatly reduced the pain from his hip osteoarthritis by applying stinging nettle. The other case involved a woman

who treated her arthritic fingers in a similar manner.

Patients with a number of other conditions are said to be benefitted by nettle administration; again, these reports are without scientific investigation. These applications are summarized, along with the indications already mentioned, in Table 5.

The typical dose of nettle juice is 1 tbs (15 mL) in 4–6 oz of water three times per day, particularly for the diuretic effect. Dried leaves can be shaken onto food as seasoning. Steamed (for 10–15 minutes), leaves can be eaten or added to soup. They taste better and the minerals may be absorbed better if the leaves are taken with some vinegar or lemon juice. Tincture of the leaf or root can be taken at a dose of 1/2–1 tsp (2–5 mL) three times per day or as part of a formula with other herbs. A cup of nettle tea can be made by adding 2–3 tsp of herb to 1 pint of boiling water and then allowing the mixture to steep for 10–15 minutes. Three cups or more per day should be taken. For BPH, a decoction of the root is used instead. To make one cup of tea, boil 2–3 tsp of root. Freeze-dried preparations of the herb in capsules generally are available in 240–300 mg amounts. Patients should take 1–2 capsules three times per day.

### Conclusion

The humble and sometimes maligned nettle remains as a useful and extremely safe herbal medicine. Modern research has confirmed quite a few of the folk uses of the leaf and root. Further work is necessary to determine the active constituents as well as to clarify the therapeutic efficacy of the plant. Of particular importance for future research are nettle's use as a diuretic, as a nutritive food, and as a topical preparation. □

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