



Integrative Herbalism

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and Charles Riffenburg.

Short Research Papers

Clinical Research Supports Traditional Use of *Withania somnifera*

Sasha McGarvey '15

Ashwagandha, *Withania somnifera*, is one of the prized remedies of Ayurvedic medicine. Traditionally the root is used as an adaptogen, calming tonic for exhaustion, anxiety, depression, and impaired memory and wasting disease of both children and the elderly. Ashwagandha is also highly valued as a male reproductive tonic, traditionally served in ghee or honey [1].

Two of the key constituents in Ashwagandha are its steroidal compounds including lactones (withaferin A, sitoindoside IX, X (carbon-27 glycowithanolides)) and alkaloids including topine, pseudotropine, isopelletierine, and anaferine [2].



Current clinical research validates the traditional uses of Ashwagandha. In a double blind, randomized, placebo controlled study of 130 subjects conducted by Biswajit et al. (2008) stress levels were assessed at day 0, 30, and 60. This study used a *Withania somnifera* extract at 3 different doses. Between days 0 and 60, in the WSE 240 mg BID group stress levels decreased significantly more than placebo for a mean mHAM-A score, serum cortisol, serum C-reactive protein, pulse rate, and blood pressure, and increased for mean serum DHEAS and hemoglobin [3].



Biochemical Variables															
	Serum Cortisol µg/dL			Serum DHEAS µg/dL			CRP mg/L			FBG mg/dL			Serum TC mg/dL		
Group	Day 0	Day 60	%Δ	Day 0	Day 60	%Δ	Day 0	Day 60	%Δ	Day 0	Day 60	%Δ	Day 0	Day 60	%Δ
WSE 125 mg QD (n = 19)	13.1 (3.0)	11.2 (2.1)	-14.5*	167.4 (37.8)	189.5 (40.8)	13.2*	3.8 (1.2)	2.6 (1.1)	-31.6†	88.1 (12.5)	87.6 (11.7)	-0.6	176.4 (30.0)	173.5 (27.6)	-1.6
WSE 125 mg BID (n = 30)	12.8 (3.9)	9.7 (2.4)	-24.2†	152 (48.9)	200.7 (54.6)	32.2†‡	4.1 (1.0)	2.6 (1.0)	-36.6†	94.4 (16.5)	90.0 (13.6)	-4.7*	176.0 (33.4)	163.7 (30.9)	-7.0*
WSE 250 mg BID (n = 34)	14.1 (3.3)	9.8 (2.4)	-30.5†‡	159.6 (61.7)	212.1 (74.7)	32.5†‡	5.4 (1.4)	3.5 (2.6)	-35.2†	91.9 (11.2)	86.3 (8.7)	-6.1*	193.5 (27.2)	168.1 (27.5)	-13.1†‡#
Placebo (n = 15)	13.5 (3.2)	14.1 (3.3)	4.4	166.7 (32.9)	149.3 (35.6)	-10.8	6.4 (3.7)	6.0 (3.7)	-6.3	91.2 (12.2)	93.1 (11.1)	2.1	171.1 (18.6)	172.7 (22.7)	0.9

	Serum TG mg/dL			Serum LDL-C mg/dL			Serum VLDL-C mg/dL			Serum HDL-C mg/dL		
Group	Day 0	Day 60	%Δ	Day 0	Day 60	%Δ	Day 0	Day 60	%Δ	Day 0	Day 60	%Δ
WSE 125 mg QD (n = 19)	119.4 (45.5)	114.2 (41.6)	-4.4	122.7 (25.0)	114.9 (18.3)	-6.4	25.9 (8.9)	23.6 (6.0)	-8.9*	37.9 (4.9)	39.0 (5.0)	2.9
WSE 125 mg BID (n = 30)	135.3 (40.5)	122.4 (34.9)	-9.5*	118.1 (26.2)	107.5 (22.7)	-9.0*	32.5 (12.2)	27.1 (10.4)	-16.6†	37.3 (6.4)	39.0 (5.2)	4.6
WSE 250 mg BID (n = 34)	132.8 (46.0)	117.3 (35.7)	-11.7†‡	134.7 (20.4)	111.2 (14.0)	-17.4†‡#	32.7 (7.8)	24.9 (7.0)	-23.9†‡	34.6 (7.0)	40.6 (6.4)	17.3*†‡#
Placebo (n = 15)	127.9 (31.4)	133.9 (33.3)	4.7	119.5 (28.6)	118.8 (26.9)	-0.6	27.1 (7.8)	29.4 (8.8)	8.5	39.3 (4.9)	39.1 (5.5)	-0.5

Tables 1 & 2. Mean (SD) values and percentage changes by treatment group of biochemical variables measured at Day 0 (base- line) and after 60 days of treatment with *Withania somnifera* extract (WSE) or placebo (n = 98). DHEAS = dihydroepiandrosterone sulfate; CRP = C-reactive protein; FBG = fasting blood glucose; TC = total cholesterol; TG = triglycerides; LDL-C = low-density lipoprotein cholesterol; VLDL-C = very low-density lipoprotein cholesterol; HDL-C = high-density lipoprotein cholesterol. * P<0.05 versus Placebo Group, † P<0.001 versus Placebo Group, ‡ P<0.05 versus WSE 125 mg QD Group, # P<0.05 versus WSE 125 mg BID Group.

Another interesting clinical trial by Cooley et al. (2009) compared traditional psychotherapy, with naturopathic care for anxiety in 75 Canadian postal workers with moderate to severe anxiety of longer than 6 weeks duration. Both groups were taught relaxation techniques but the naturopathic care group also received nutritional counseling, a multi vitamin and Ashwagandha (300 mg BID standardized to 1.5% withanolides, prepared from root). There were seventy-five participants (93%) who were followed for 8 or more weeks on the trial. Final BAI scores decreased by 56.5% (p<0.0001) in the NC

group and 30.5% ($p < 0.0001$) in the PT group. BAI group scores were significantly decreased in the NC group compared to PT group ($p = 0.003$). Significant differences between groups were also observed in mental health, concentration, fatigue, social functioning, vitality, and overall quality of life with the NC group exhibiting greater clinical benefit [4].

A recent clinical study conducted in 2012 by K. Chandrasekhar et al. also studied how effective Ashwagandha is in treating stress and anxiety in adults. Sixty-four people with a history of chronic stress were enrolled. Participants in the non-placebo group received 300 mg of whole Ashwagandha root extract for 60 days. The group receiving Ashwagandha saw a 69.7% reduction in anxiety and insomnia as opposed to the 11.6% of the placebo control. Even more dramatic, there was a 79.2% reduction in severe depression in contrast to a 10.6% increase in depression for the placebo group. Serum cortisol levels were reduced by 27.9% ($p = 0.002$). In conclusion, “full-spectrum *Ashwagandha* root extract mitigates not only the focal aspects of stress but also some of the precursors, consequences and associated symptoms of stress. One can think of this as *Ashwagandha* helping both directly and indirectly. This suggests, therefore, that high-concentration full-spectrum *Ashwagandha* root extract possesses the ability to improve the overall well-being of a person” [5].

In “Scientific Basis for the Therapeutic Use of *Withania somnifera* (Ashwagandha): A Review”, a total of 58 articles were reviewed. It concluded that “research reveals ashwagandha possesses anti-inflammatory, antitumor, anti-stress, antioxidant, immunomodulatory, hemopoetic, and rejuvenating properties. Ashwagandha also appears to benefit the endocrine, cardiopulmonary, and central nervous systems” [6].

These clinical trials confirm the safety of Ashwagandha and its effectiveness in treating a range of ailments that mirror its traditional use. This research supports its further integration into treatments for adrenal exhaustion, anxiety and depression. Having the clinical research to support this hopefully will open more doors for access to this safe and powerful medicine.

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Boswellia serrata

Elli Bayer '15

Boswellia serrata is one of the oldest documented herbs experimented with historically as part of many cultures and traditions. Burning of the *Boswellia* resin, known as frankincense, in ceremony as an incense smoke to elate the spirit and bring attention to the present moment [1]. Frankincense is found growing natively in Arabia, Ethiopia, and Somalia [2] with the domestication of the camel in 1200 B.C.E. the incense trade opened from Egypt to Rome and Greece bringing frankincense and myrrh [1]. These resins away from their homeland were rare and expensive, and saved for the wealthy special usually religious occasions.

Boswellia is a medium sized deciduous tree with papery bark, being adaptable to a wide range of slopes, hills, flat ground, fertile and infertile, dry arid ground, frost hardy, and is a nurse tree, which is a preliminary species to host second succession trees in their environment [2]. In 1843, Captain Kempthorne, East India Company's navy, noted when he saw *Boswellia* growing "it grows on the bare marble rocks composing the hills of that region, with very brittle soil or the slightest fissure to support it" [3]. The extract we know as frankincense is an oleo-resin that exudes from the wound of the *Boswellia* plant. The sap of the tree is tapped and punctured and exudes resin that is allowed to dry and harvested. The quality of the Frankincense was said to be found in its milky whiteness, many of *Boswellia*'s traditional names of Hebrew, Greek and Arabic translate to "milk" [4]. There is much morphological variation in the *Boswellia* species, with slight differences in resins and growing habits [5].

The resin of *Boswellia* is predominantly comprised of terpenoids, essential oils, and gums, which makes *Boswellia* an oleoresin. One of the most famous pentacyclic triterpenes is Boswellic acid. Boswellic acid, the major constituent of *Boswellia*, is thought to contain pharmacologic evidence of Inhibiting 5-lipoxygenase in vitro, animal, and human studies [6,7]. 5-Lipoxygenase is a Leukotriene which serves as an inflammatory mediator [8]. Studies of *Boswellia* acids have been focused on Boswellic acid and their effect on leukotrienes, histamine prostaglandins, and oxygen radicals, cytokines [9]. Many other cells are related to the inflammation response such as mast cells, granulocytes, macrophages, thrombocytes, red blood cells, endothelial cells and fibroblasts [10]. Perhaps its possible *Boswellia* would affect these cells as well.

Resins are not widely bio-available without addition of fat or delivery agent. Chemical make-ups of triterpenoid acids and many polyphenolics prove poor water solubility and frequent self aggregation. To help absorption the medical community has created extracts with phospholipid based delivery systems [6]. Absorption can be assisted by taking *Boswellia* with a fatty meal, to give the triterpenoids lipids to be absorbed with. Frequent dosing is also important as there is a short 4-5 hour half-life. One of the extracted forms is 5-Lixin which is a 30% 3-O-acetyl-11-keto-beta-boswellic acid (AKBA) that has proven potential anti inflammatory properties by inhibiting 5-lipoxygenase enzyme" in human

osteoarthritis early as 7 days after the start of treatment. Subjects noticed improvement in function, pain and stiffness, and reduction in synovial fluid matrix metalloproteinase-3 (an enzyme high in inflammatory conditions). All patients receiving drug treatment reported a decrease in knee pain, increased knee flexibility and increased walking distance. The frequency of swelling in the knee joint was decreased [5]. Unfortunately, still today there is no proper therapeutic intervention available to treat osteoarthritis. As opposed to NSAIDs (non-steroidal anti-inflammatory drugs), long-term use of *Boswellia* does not appear to cause irritation or ulceration of the stomach [11]. Another extract made to bypass poor assimilation is Phytosome® using lecithin as it's delivery system, proving much more effective availability to tissues [6]. *Boswellia* and it's related extracts have been proven in numerous studies to show improvement of osteoarthritis, rheumatoid arthritis, and even arthritis in canines [12]. *Boswellia* has been shown to be beneficial for the gut; it has proven to be beneficial in castor oil induced diarrhea but normalizes motility in the gut without slowing down transit time. The action working on the CA (2+) channels [13].

The medical community has show interest in the possibility of using *Boswellia* to support therapy of osteoarthritis, irritable bowel syndrome, tumors and tumor treatment, auto immune disorders and high release histamine disorders such as rheumatoid arthritis, allergies, and asthma. In addition, it has anti-depressant effects with the burning of frankincense, affecting TRPV3 channel that may play a role in emotional regulation [14,5,6,15,10,16,17,18]. Historically it is known for it's hypolipidemic, hepatoprotective, hypoglycemic, anti-diarrheal, and antimicrobial activities. It is traditionally used for its anti-asthmatic and anti-arthritis activity [18]. Fortunately, receiving interest from many different cultures and timelines of man, *Boswellia* has numbers of scientific trials and experiments where not the case with many herbal medicines, or even other similar resins. This attentiveness to the effects of Frankincense to the body makes me exuberant and excited for more realizations in the future.

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Circadian Rhythms

Marguerite Gregory '13

Circadian rhythm, often referred to as “body clock”, is an endogenously driven, approximately 24-hour cycle that affects our biochemistry, physiology, and behavior. Circadian rhythms have been observed in animals, plants, fungi, and cyanobacteria. Although they are said to be endogenous, meaning built-in to a person’s make-up, they are also “entrained” (adjusted) to the environment by external cues known as zeitgebers (German for ‘time givers’). The main zeitgeber is daylight.

It is thought that circadian rhythms began in the earliest cells as a means of protecting the replicating of DNA from high ultraviolet radiation during the daytime. These cells began to replicate only in the dark.

Circadian rhythms allow organisms to anticipate and prepare for regular environmental changes and also to regulate and coordinate internal metabolic processes, especially those that coordinate with the environment [1]. They are present in the sleeping and feeding behavior of animals as well as in patterns of body temperature, brain wave activity, hormone production, cell regeneration and other biological activities. They are also responsible for the seasonal timing of migration, hibernation and reproduction in animals [2].

The primary circadian clock in mammals is located in the suprachiasmatic nucleus (SCN), a pair of cell groups in the hypothalamus just above the optic nerve center. In addition to the rods and cones used for conventional vision, the retina contains specialized ganglion cells, which are photosensitive, containing a photo pigment called melanopsin. They project directly onto the SCN following the retino-hypothalamus tract, thus entraining the SCN. The SCN interprets this information and sends it to the pineal gland, which, in response, secretes melatonin. Secretions of melatonin peak at night and wane during the day. In addition to this entrainment, SCN cells maintain their own rhythm in the absence of external cues. Although it is known that melatonin feeds back on SCN rhythmicity to regulate circadian patterns, how this happens is not known.

In addition to the master clock of the SCN, circadian rhythms function within a single cell (i.e. they are ‘cell autonomous’) [3]. It is thought that different cells communicate with one another, resulting in synchronized electrical signals that interface with the endocrine glands of the brain and result in periodic release of hormones that synchronize the ‘peripheral’ clocks of various organs to time wake/sleep cycles, body temperature, thirst and appetite. These peripheral clocks are also called peripheral oscillators and are found in the esophagus, lungs, liver pancreas, spleen, thymus, and skin [4]. The olfactory bulb and prostate may also experience oscillations.

Adult humans have a built-in day that averages around 24 hours. The range for normal, healthy adults is narrow: 24 hours and 11 minutes, plus or minus 16 minutes [5]. Earlier

published data indicating that people preferred a 25-hour cycle may be faulty; the effect of artificial light on circadian rhythm had not been taken into account in those earlier studies [6].

The classic phase markers for measuring circadian rhythm are:

1. Melatonin secretion by the pineal gland
2. Core body temperature [7]
3. Plasma level of cortisol [8].

Melatonin is the marker that is the most stable and the most highly correlated with sleep [9].

The nadir of the circadian rhythm occurs in the early morning. The downswing before the nadir is thought to assist the brain to remain asleep by preventing premature awakening. Then the morning upswing aids awakening and throughout the day is a counterbalance to the progressive discharge of wake neuronal activity. Following the circadian apex in the early evening, the downswing aids sleep initiation. This model explains the relatively steady cognitive function during wakefulness [10].

Changes in body temperature are thought to mirror the circadian rhythm of sleep and are also under hypothalamic control. Body temperature increases during the day and decreases at night. People who remain alert late in the evening have body temperatures that peak during the evening, and those who are more alert early in the morning, have body temperatures that peak early in the evening. In addition to melatonin, prolactin, testosterone, and growth hormone also correspond to circadian rhythm, with maximal secretion at night [11].

A typical circadian pattern is as follows:

2:30 PM	best coordination
3:30 PM	fastest reaction time
5:00 PM	greatest cardiovascular efficiency and muscle strength
6:30 PM	highest blood pressure
7:00 PM	highest body temperature
9:00 PM	melatonin secretion starts
10:45 PM	bowel movement suppressed
2:00 AM	deepest sleep
4:30 AM	lowest body temperature
6:45 AM	sharpest rise in blood pressure
7:30 AM	melatonin secretion stops
8:30 AM	bowel movement likely
9:00 AM	highest testosterone secretion
10:00 AM	high alertness

Light level, color, and direction affect entrainment [12,13]. Totally blind people have free-running rhythms, suggesting that some light signal is necessary for normal entrainment. However, the light intensity threshold is very low; legally blind subjects with some light

perception are usually normally entrained. Melanopsin is most efficiently excited by light from the blue spectrum. Light from above has a greater effect than light from below.

The timing of medical treatment in coordination with the body clock may significantly increase efficacy and reduce toxicity or adverse reactions. For example, appropriately timed treatment with angiotensin converting enzyme inhibitors may reduce nocturnal blood pressure and benefit left ventricle remodeling [14]. It has been found that the effect of drugs such as cocaine are influenced by circadian rhythms and genes expressed outside the SCN [15,6].

Disruptors to rhythms cause jet lag (fatigue, disorientation and insomnia), seasonal affective disorder (SAD), delayed sleep phase syndrome [17], advanced sleep phase syndrome, free running disorder, and irregular sleep-wake rhythm and may be a factor in bipolar disorder [18]. Long-term disruption in circadian rhythms may exacerbate cardiovascular disease [19] and increase the risk of developing cancer [20]. A short “power nap” during the day has been determined not to affect circadian rhythm, but to actually improve productivity and reduce stress [21,22].

Normal, healthy adolescents tend to have delayed circadian phases, while healthy older people tend to have earlier circadian phases, going to bed and rising earlier, but maintaining circadian amplitude. Melatonin rhythms are impaired by both age and cognitive impairment (seen in Alzheimer’s Disease). Nocturnal cortisol levels are elevated in healthy aging, particularly in the early morning hours. Some people may be tolerant of large disparities in circadian synchronization, while others are more sensitive [23].

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Herbal Interventions in Cancer Prevention and Treatment

Katie Sinnema '15

Modern technology and research have made incredible strides in better understanding the pathology and treatment of cancer. Today we see chemotherapy and radiation, in combination with surgery, as the standard treatments of cancers in elevated stages. While often times these treatments can be effective, and in many circumstances the only viable solutions, these interventions can be quite extreme often resulting in intolerable side effects that can be worse than the disease process itself. Yet along the progression towards the treatment of cancer, herbal interventions appear to have gone under-utilized despite supporting evidence showing their benefit. This report serves to investigate the role herbal interventions can play in the treatment of cancer and more importantly, the prevention of cancer.

Numerous studies conducted worldwide are investing research efforts to discover herbs that may be used in conjunction with western medical interventions. The aim is to discover herbs that either enhance the effectiveness of chemo and radiation treatments and/or reduce the proliferation or vitality of already existing cancers. The Natural Standard database has graded *Chelidonium majus* (Greater Celandine) a grade B in the treatment of general cancers, most notably of the lung, esophageal, and prostate. The extract of this herb serves as the base of a semi-synthetic chemotherapy drug known as Ukrain, and is gaining increasing attention globally in the domain of oncology. A study conducted in vitro and in vivo through Emory School of Medicine in Atlanta, Georgia found Ukrain not only to induce a cytotoxic effect on >50% of breast cancer cells after 48-hours of administration, but also signals a apoptosis cascade on cancer specific cells. Additionally, the treatment with Ukrain showed a reduction of adverse symptoms when compared to control groups given placebos or conventional chemotherapeutic treatments, therefore making the treatment increasingly tolerable and favorable among patients [1]. Further research is focusing on *Boswellia serrata* for its cytotoxic, cytostatic, and apoptosis effects on cancer cells, particularly pancreatic and colorectal cancers [2,3].

While the described herbs above aided in attacking the cancer itself, others are utilized to either enhance the effectiveness and/or tolerance of conventional chemotherapy and radiation treatments. *Astragalus membranaceus* (Astragalus) is being researched for its ability to enhance chemotherapeutic interventions on cancerous cells while reducing toxic adverse-reactions from the treatments and improving overall quality of life for patients undergoing treatment [4]. *Cannabis sativa* (Marijuana) may be the most well known currently researched herb with known uses for the treatment of chronic pain. Studies are now focusing interest on its implication in cancer treatment such as the use of peripheral neuropathy induced by chemotherapy as well as reduction of nausea and anorexia associated with chemotherapy regimens [5,9]. A literary review published in the British Journal of Pharmacology attempted to illustrate how cannabis could have anti-cancer properties in a variety of cancers and even stated that smoked cannabis had no promotion of respiratory or pulmonary disease even in those with lung cancer, however, studies

supporting this proved difficult to find with many reports available to readily state the opposite [6].

The efforts to find clinical research providing evidence of herbs or foods to prevent the onset of cancer proves challenging. It is widely agreed upon that good nutrition rich in antioxidants, minerals, vitamins, and fiber promote stronger vitality and immune function. However, finding scientific evidence that conclusively showed the prevention of cancer was not readily found at this time. As an example, black tea has been promoted to prevent certain cancers while contradicting research will report its potential to increase risk of others such as pancreatic cancer [7, 8]. Further intensive investigation is required to allow for presentable material in the argument of herbal prevention of cancer.

Cancer research is of the highest importance for many across the global community; exhaustive efforts are constantly maintained. Conventional oncology physicians continue to look towards chemotherapy and radiation as the standard treatment of cancers in elevated stages in addition to surgery, often dismissing and prohibiting integrative therapies such as herbal medicines. Though written observational knowledge of many herbs dates back thousands of years, scientific data on many herbs has been deficient in keeping pace with modern scientific research methods. Despite these deficiencies, growing interest and appreciation in the chemistry found in these plants is resulting in further clinical research, leading the way towards better understanding of plants available to us and their implication in modern cancer remediation.

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Pump up the Skullcap*: Treating Anxiety and Mental Trauma with *Scutellaria lateriflora*

Lroy Meryhew '15

Mental trauma is commonplace in modern society. Most of us suffer from some sort of mental trauma whether it be through personal or societal violence and/or abuse. A lot of people I know tend to avoid naming these traumas because of what it brings up for them; the knowledge that we are susceptible to the violence and abuse that is around and a part of us. The percentage of people who experience post traumatic stress disorder (PTSD), depression, anxiety, insomnia and other related conditions has increased in the last few decades. Though there are probably many things that could be linked to this increase, I can't help but ignore the correlation between the decline in herbal use in our society and the increase in these mental conditions. My interest in this subject comes from a personal journey with anxiety and mental trauma. As a person who suffered from bouts of intense anxiety throughout the last 15 years of my life to the point of several emergency room visits and a prescription for benzodiazepines, I understand the effect that poor mental health can have on someone's quality of life. It has been a not too surprising discovery that an ancient remedy, *Scutellaria lateriflora*, works better for helping one to heal from these conditions than modern day medicine does. Through personal, anecdotal, traditional and clinical information, I believe *Scutellaria lateriflora* could help us to heal a lot of the mental conditions that are prominent in modern society today.

From the King's American Dispensatory written in 1898, *Scutellaria lateriflora* (Skullcap) is taken as a tea infusion for any nervous affections including delirium, insomnia, nervous excitability, mental overwork, a racing heart and heart palpitations from nervousness or hysterical manifestations [1]. The specific indications for Skullcap in the King's American Dispensatory are as follows:

"Nervousness, attending or following acute or chronic diseases, or from mental or physical exhaustion, teething, etc.; nervousness manifesting itself in muscular action; tremors, subsultus, etc.; hysteria, with inability to control the voluntary muscles; functional cardiac disorders of a purely nervous type, with intermittent pulse."

Interestingly enough, these specific indications are very similar to the commonly prescribed benzodiazepine Valium, which is used to treat anxiety, alcohol withdrawal (delirium), and muscle spasms. Less addictive than Valium and more readily available, Skullcap has a strong tonic, nervine and anti-spasmodic action [2]. From studying its traditional use in older Materia Medica, Skullcap has been used historically as an effective nervine and for the treatment of a wide variety of nervous conditions. Plants for a Future (www.pfaf.org) states that Skullcap contains "tonic and restorative properties [that] help to support and nourish the nervous system, it is calming and [helps to] relieve stress and anxiety... It is used in the treatment of variously problems of the nervous system including epilepsy, insomnia, anxiety, delirium, withdrawal from barbiturates, tranquillizers and neuralgia" [3].

Though little scientific research has been done on Skullcap, there are some current studies that prove Skullcap's effectiveness on mental conditions including but not limited to anxiety. A paper written by Brock et al. in 2010 called "American Skullcap (*Scutellaria lateriflora*): An Ancient Remedy for Today's Anxiety?" claims that:

"Anxiety is a common but potentially serious disorder as it can lead to somatic and social dysfunction. Orthodox anxiolytics are associated with unpleasant side-effects and dependency. American skullcap (Scutellaria lateriflora) is a popular herb in traditional medicine systems and the western Materia Medica for anxiety and related disorders. Preliminary clinical and in vitro research provides encouraging support for its potential as a safe, well-tolerated and effective alternative."

Many pharmaceutical prescriptions for anxiety have unwanted side-effects. Valium and other benzodiazepines can cause muscle weakness, amnesia, headaches, vertigo, urinary retention, slurred speech, and gastro-intestinal distress. They can also be addictive on both a physical and psychological level [4]. The side effects of anti-psychotics, another drug that can be prescribed in the short-term for severe anxiety, include tremor, abnormal face and body movements, and restlessness [4]. Beta-blockers may be prescribed for relief of physical symptoms, such as tremors and palpitations associated with anxiety. However, side-effects are similar to those of benzodiazepines and may additionally include bradycardia, vasoconstriction, and heart failure [4]. Due to the undeniable and potentially dangerous side effects of these drugs, safe and old alternatives should be used in place of them.

In a survey conducted by Brock et al. on treating anxiety with herbs, 84% of the respondents said they would prescribe Skullcap (as oppose to 15 other nervine herbs) specifically for anxiety disorders and 100% of the respondents said they would prescribe it for anxiety related co-morbidities [5]. In a study conducted in 2013 by Sarris, McIntyer and Camfield, human clinical trials using Skullcap chronically (daily) have been effective in treating a range of anxiety disorders.

Skullcap is one of the most commonly used herbs by western medical herbalists, particularly for anxiety and related conditions [6]. It has a long history of safe, non-addictive and effective use within the western herbal tradition and should be considered a viable treatment for anxiety and mental trauma in modern society today.

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*See "Pump Up the Valium" by NOFX, 2000 for insightful attempt at early 2000's pop-punk humor.

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The Effect of *Gossypium* Species on the Uterus

Allison Dellner '15

Gossypium species have an ethnobotanical history of use as an abortifacient, emmenagogue, and parturient [1]. A decoction of the fresh inner root bark of *Gossypium* was used by African American slaves in the cotton districts of the southern United States particularly to abort early pregnancies [2]. Eclectic doctors corroborate this use, saying *Gossypium herbaceum* was known to “procure abortion without injury to general health”, noting its relative non-toxicity in the context of abortifacient herbs, but had little confidence in the efficacy of *Gossypium* to act on the uterus [3]. This paper attempts to find more a specific action for *Gossypium* and to substantiate or disprove its claims as an abortifacient.

William Cook says that although it is claimed to be abortifacient, he did not think it exerted any powerful influence on the uterus, but that its action was “rather good”. Cook thought of *Gossypium* as a “feeble medicine” to be used as a relaxant, a mild uterine tonic when the nervous system is irritable in labor, and to slowly promote menstruation in “nervous persons”. In over ten years experience, Cook “did not get a strong article in experiments” [4].

Harvey Felter blamed the freshness of the bark, saying that the “old root is valueless as medicine”, noting that the fresh root was not available to many. In his materia medica, Felter echoed Cooks experience, using *Gossypium* root as an emmenagogue in late menstruation, and claiming it was not as effective in improving uterine inertia during labor as it was touted. Felter also noted that *Gossypium* root was “non-toxic” [5].

In present day, *Gossypium* species are still used by women and midwives as an abortifacient and emmenagogue [6]. The language used to describe its action has changed to describe the synergistic effect it has with oxytocin. “Cotton root” does not contain or mimic oxytocin, but only will potentiate the effects of oxytocin already present in the body [7]. Michael Moore has some opinions on this plant, having used the species of cotton native to Mexico and parts of the southwest, *Gossypium thurberi*. Moore uses this plant as a “reliable oxytocin synergist” that increases the tone and contractibility of the uterus, and also of the seminal vesicles, prostate and the myoendothelial tissues of the breast. He points to the interest in research that *Gossypium* periodically receives, and then claims that researchers find nothing “patentable” in the plant and then move on [8].

It is interesting to me that the modern uses Moore describes for *Gossypium* are related to male reproductive anatomy because there are many studies concerned with an isolated constituent called gossypol, which causes a decrease in sperm density and motility and

eventually sterility in men [9]. The other body of research on *Gossypium* is done on cows and lambs. One cow study focused on the effects that eating cottonseed products had on the reproductive quality and ability of ruminant animals. The outcome was largely that the amount of gossypol is dangerously high in cottonseed and negatively affects the ovulation, pregnancies and fertility of the cows [10].

Another interesting animal study was done on a patent that was being created for a blend of herbs to help with encouragement of the “let down” reflex of milch animals such as sheep and cows. The animals were being treated with synthetic oxytocin to ease in the let down. The trial blends contained varying amounts of *Asparagus Racemosa*, *Gossypium arboreum*, *Foeniculum vulgare*, *Lepidium sativum*, *Cholophytum boivilianum*, *Ipomoea digitata*, *Withania somnerifa*, and *Leptadenia reticulata*. The outcome of using this formula was that the animals had an easier time in “letting down” their milk, and also the quantity of milk that they produced was greater, even up to 3 days after administration of herbs. The use of the herbal formula also had none of the same side effects that farmers were accustomed to noticing from the oxytocin shots. A “synergistic effect” was reported to occur when these herbs were used in combination with each other [11].

Although this study was done on ruminants, I find it interesting that *Gossypium* is used in this formula as a substitute for oxytocin. It somewhat substantiates the claim that *Gossypium* is an oxytocin potentiator. The body of research I did find on modern *Gossypium* actions and constituents merely underscored the fact that it is under-researched in the female population and there is much more we could know about its use as an emmenagogue [12]. It was my personal experience with a deficit of information on *Gossypium* that led me to ask what it actually does and what its mechanisms were.

All of the reading I have done now on *Gossypium* informs my own personal experience with using the root bark tincture. Knowing the actions of this herb and learning about the reputation it had to be safe with little side effects, I tried using *Gossypium* as an abortifacient in the second and third weeks of pregnancy. After doing this paper, I decided my dose of 10 drops every 2 hours was too low, as this is a very high dose plant. Now I also can understand why my combination was unsuccessful. There was probably not sufficient levels of oxytocin in my body to work together with the herbs to potentiate an abortion.

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Irish Moss as a Lubricant for Potential Prevention of Sexual Transmission of the Human Papilloma Virus

Hannah McLeod '16

Carrageenan is a polysaccharide extracted from many types of red algae, most commonly *Chondrus crispus*, which is known as Irish moss or Carrageen moss [1,2,3]. *C. crispus* is abundant throughout the western and eastern coastline of the Atlantic and is found growing on rocks at low tide. It is cartilaginous and generally around 150 mm in height, its color ranges from a deep purple to a yellow. Discoid at the base, the fronds dichotomously branch gradually to flat and curled at their ends [4]. Carrageenan is easily extracted by boiling and straining, becoming a gel when cool [5]. Carrageenan is also refined into a white powder that has the possible benefit of not holding the smell of the sea [6]. Carrageenan is used widely both as a food additive and in industrial products for its structural properties. There are many carrageenans, categorized by the degree of sulphation causing their gels to vary in rigidity and solubility temperature. The three types most often identified are: Kappa, forming the most rigid gel when boiled; Iota, forming an elastic gel; and Lambda, forming a viscous solution with extraction in cool water. Irish moss contains either lambda or kappa depending on its reproduction stage, but usually it is harvested together. All types have been shown to be extremely potent Human Papilloma Virus (HPV) inhibitors [7,8,9].

The Human Papilloma Virus, referred to as HPV, is a group of viruses that affects the skin and mucus membranes. It is the most common sexually transmitted disease in the world, including in the United States. It is contracted by almost everyone that is sexually active at some point in their lives [10,11]. There are about 100 species of HPV, including the common wart, but only around 40 that affect the genitals. These species are separated into two groups: low risk and high risk. Some low risk HPVs can cause genitals warts and lesions but do not cause dysplasia (abnormal cell growth) or cancers. There are about 15 types of high risk HPVs that can cause unusual cell changes that can lead to cancer [12]. Cervical cancer is the most common of these cancers, but some HPVs are linked to anal, vaginal, penile, oropharynx and oral cancers as well [13]. Cervical cancer has been greatly decreased with the development of pap smears in this country because it is slow to develop and can mostly be prevented with early detection. It is still a heavy killer in developing countries and a threat to those with inadequate health insurance [14]. However, applying 4-5% diluted acid, as in raw apple cider vinegar, topically to the cervix or genitalia has been practiced as a low cost way to highlight any present abnormal cells or hard to see lesions. This, along with other follow up methods of removal, has been seen effective in lowering incidents of cervical cancer in these communities [15,16]. Although all cancers of the cervix are caused by HPV and other related cancers are heavily impacted by it, most people that have HPV will not develop any health problem [13]. Ninety percent of people that contract it will be asymptomatic and their immune system will clear it within two years. Sometimes the virus will go latent with possible reoccurrence and sometimes it will persist and cancers can develop [11]. You can still transfer HPV even if you are unaware you have it due to a lack of symptoms. In addition, if you have or have had one strain of HPV you are still susceptible to getting any other strain. HPV is passed by skin-to-skin contact and

therefore is transmittable by any kind of sex or action where infected areas are contacted. This means the standard barrier methods do not provide full protection against HPV. There are no tests for HPV status and therefore it is not fully clear when it is no longer transmittable, though it is generally accepted that when someone is experiencing symptoms the viral load is larger and therefore contraction potential is greater [17,18].

Due to a need for noninvasive and low cost measures of protection against this rampant virus, researches started investigating different substances' topical inhibitory effect on HPV. Clinical trials are in process by McGill University and the National Cancer Institute after in vitro, mice, and monkey study showed promising results of carrageenan's potency. In vitro carrageenan was shown to be brilliantly potent at binding to HPV pseudoviruses. Carrageenan is already in a lot of personal lubricants as a thickening agent and many of these blocked infection in lab tests even when diluted a million times. Carrageenan's overall action is that it inhibits the binding of the HPV virus to cells. Carrageenan is chemically similar to markers in human cells and therefore mimics the receptors (made of heparan sulfate, a polysaccharide found in all animal tissues) need for HPV to attach. Carrageenan binds directly to the virus shell competing with human cells for viral attachment. Carrageenan was found to be a thousand times more effective at this than heparin, commonly used as an effective HPV inhibition model for in vitro tests [9,20]. There are many other studies that elaborate on specific concerns that have come up during the discovery process. For instance, carrageenan showed inhibitory effects in rats even in the presence of a spermicide nonoxymol-9, which was proven to increase risk of contraction [21]. Another interesting study done with monkeys first showed that the mere act of a pap smear irritated the cervix epithelium rendering it more susceptible to infection, and then showed that when a carrageenan-containing lubricant was used during examination the susceptibility was lowered [22]. Carrageenan is also being looked at as an infection inhibitor for the herpes simplex virus and human immunodeficiency virus [23,24]. The Natural Standard Database mentions some possible vaginal and urinary tract irritations of carrageenan when used this way [25].

Chondrus crispus as an herbal lubricant seems like a good candidate for further exploration. It holds the potential to improve health freedom and safety. *C. crispus* grows semi-locally along our east coast, is inexpensive, and in theory is easy to prepare. It might offer an alternative to those that don't have the access or chose not to participate in standard medical practices for HPV such as vaccinations and regular pap smears. Some topics for herbalists to explore include the differences between the *C. crispus* water extraction, the isolated refined carrageenan, and lubricant products that are being tested. More research should also be done on the best lubricant recipes for this purpose and how to dose them, if it was decided that they are safe enough to test on human subjects.

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Breathing Bitters: Exploiting Bitter Taste Receptors in the Respiratory System

Stephanie Boucher '16

Combined, asthma and chronic obstructive pulmonary disorder (COPD) affect approximately 300 million people worldwide, and are becoming more common [1]. Standard treatment for these disorders currently include β -adrenergic receptor agonists (β -agonists) such as Albuterol. Stimulating these receptors activates the sympathetic nervous system, resulting in, among other things, dilation of the bronchioles [2]. While effective, this can lead to a host of unwanted side effects, including an increase in blood pressure and difficulty sleeping [3]. Additionally, at least half of all patients do not feel they have control over their asthma with standard medications, likely due in part to the desensitization of the receptors that has been shown to occur with chronic use of β -agonists [4]. In light of all this, exciting research has emerged in recent years documenting the stimulation of bitter taste receptors (TAS2Rs) within the respiratory system to promote equal or greater amounts of bronchodilation. While most experiments have employed synthetic bitter compounds, the implication for using bitter herbs as a replacement or adjunct to β -agonist treatment is intriguing.

While it has been known for some time that bitter taste receptors are present in the digestive systems, researchers have also found that there are multiple kinds of TAS2Rs present on the airway smooth muscle (ASM) of both mice and humans. Stimulation of these receptors results in a localized release of calcium – this led the authors to hypothesize that constriction would result given that calcium usually acts as a neurotransmitter inducing muscle contraction. However, the resulting release in calcium had the paradoxical effect of inducing a bronchodilation that was not only faster, but also far exceeded that of β -agonists such as albuterol or isoproterenol. This dilation was accomplished through a different mechanism; that is, by opening calcium-gated cell-surface K^+ channels, resulting in membrane hyperpolarization. Researchers have hypothesized this is an adaptation to bitter compounds secreted by some bacteria during pulmonary infections – dilating the bronchioles would assist in expelling the pathogens [5].

Since bitters work through a different pathway than β -agonists an additive effect become possible – indeed, using both compounds leads to a greater relaxation of smooth muscle than is possible through either one alone [6]. Additionally, using bitters remains a possible therapy when β -agonists are no longer effective. In another study, for example, ASM cells that had been treated with albuterol prior to testing had markedly decreased response to isoproterenol, suggesting β -adrenergic receptor desensitization. The cells, however, still dilated fully in response to the bitter compound chloroquine [7]. Finally, as they do not rely on an activation of the sympathetic nervous system to achieve dilation, side effects such as increased heart rate, blood pressure, and sleeplessness are avoided.

While some have heralded bitters as a possible replacement therapy for β -agonists, it has been pointed out that the bitter taste receptors on ASM are of a similar structure to β -

adrenergic receptors (they are both G-protein coupled receptors) and are thus also prone to desensitization [8]. While this is true, further research has revealed that there are likely multiple mechanisms by which bitters relieve asthma, some of which have not yet been discovered. For example, while blocking the K⁺ channels responsible for the smooth muscle relaxation *inhibits* bronchodilation stimulated by bitters, it does *not completely eliminate* its effect. Thus, there are likely a number of mechanisms working in concert to open the airways [9].

In fact, not all of these mechanisms are found in ASM cells. Bitter taste receptors have also been found on airway epithelial cells. When these receptors are stimulated they also release calcium, in this case causing an increase in ciliary beat frequency presumably in an attempt to clear the airway of noxious substances [10]. This suggests that in addition to dilating the bronchioles, inhaled bitters could also have an expectorant effect. Bitter tastants have also been found to relax tracheal ring tension [11].

Further complicating the issue is the discovery of bitter taste receptors on white blood cells, including mast cells. A 2013 study showed that blood samples from severe therapy-resistant asthmatic subjects had a higher expression of TAS2Rs on leukocytes compared to those from healthy subjects. The application of bitter tastants on these receptors inhibited the release of pro-inflammatory cytokines, suggesting inhaled bitters might have systemic anti-inflammatory effects as well as local bronchodilating effects [12]. Other studies have duplicated this result, showing that stimulation of TAS2Rs on mast cells inhibited their release of histamine and prostaglandins, reducing inflammation [13].

So what does this all mean in the scheme of herbal medicine? All of the relevant studies have used synthetic and/or isolated bitter compounds such as chloroquine, quinine, denatonium, thujone, or salicin. Plants may of course contain these or similar substances, but in varying quantities and amidst a number of other compounds, so results would likely be very different. A good place to start, however, would be to look at which bitter taste receptors are present on the target cells, and then at which plants contain bitter compounds that stimulate those particular receptors. On the ASM, the most commonly found receptors were TAS2R10, 14 and 31. TAS2R10 was also found on mast cells. The makeup of T2Rs expressed in epithelial cells were slightly different than those found in the ASM – TAS2R4, 43, 38 and 46 were identified as most prevalent, although many others were still present [14].

Luckily, most TAS2R receptors are agonized by a wide variety of bitter tastants. For example, TAS2R14, one of the receptors most represented in ASM, was found in a 2010 study to be stimulated by 33 out of 104 bitter compounds tested. This suggests a wide variety of bitter herbs may be useful in promoting bronchodilation. This same study even found that TAS2R10 and 14 appeared to have "a slight preference . . . for natural compounds," being more sensitive to those than the synthetic compounds tested, giving further weight to the use of botanical inhalants over synthesized versions [15].

Some potential plant-based bitter compounds that stimulate TAS2R10 and/or 14 (the two most commonly identified receptors) include absinthin, arglabin, arborescin and thujone

(all found in *Artemesia* family plants), artemorin (found in bay laurel and tansy), caffeine (from tea, coffee, guarana, etc.), cascarillin (from the cascarilla shrub), coumarin (such as in the tonka bean or sweet woodruff), cucurbitacin B (from various *Cucurbitaceae* family plants), humulone (from hops), faltarindiol (from roots of Queen Anne's Lace, celery, or Dong Quai), noscapine and papaverine (from the Poppy family as well as *Rauwolfia serpentina*), parthenolide (from feverfew or tansy), quassin (from bitterwood), and quinine (from cinchona) [16]. Of course, many of the above plants should be used with caution and would not be appropriate for inhalation, at least not on a regular basis.

Finally, the question arises as to how to administer bitters into the airway. When using live mice, researchers used aerosolized quinine to affect the target tissue [17], so a similar technique might be needed (as opposed to simply smoking or inhaling the steam from a bitter herb). A cue might be taken from studies involving TCM formulas nebulized to treat asthma – in one such experiment a formula containing 18.75 grams each of 8 herbs including ephedra (*Ephedrae sinica*) was decocted, reduced to 350 ml, then strained and freeze-dried to produce 21g of powder. The resulting powder was diluted in a saline solution and nebulized by guinea pigs, who then experienced marked bronchodilation [18]. While in this case an association with β -adrenoceptors was found to be the catalyst, a similar process could be used with more specific (and safe) bitter herbs such as Queen Anne's Lace root, hops, feverfew, or sweet woodruff. More research and experimentation is needed before we can know how best to exploit this novel use of bitter herbs to help relieve symptoms of obstructive pulmonary disorders like asthma.

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On the Energetic Basis of Greek Medicine in Contrast with Ayurveda

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I have an interest in the “energetics” of traditional medical systems because with the language of old it seems possible to accurately describe patterns of nature, plants, and people. However, there are some discrepancies between ancient medical theories in this regard, and I've taken particular interest in two of most interest to me: Ayurveda and Ancient Greek medicine. In particular, I've felt both interest and confusion about the “elements”: Earth, Air, Fire and Water. Specifically, how could “Air” be described as “warm and moist” in Ancient Greece, while in India, Vata, which is comprised of both “air” and “space,” is described as its opposite, “cool and dry?”

I can summarize my concluding theory in this way: in Ancient Greek thought, at least since Plato, the “elements” of nature seem to be basically each a kind of “substance,” for lack of a better term (perhaps “thing” or “object” or “grouping of objects” would do), while in Ayurveda the “elements” are each more like a “process” (or perhaps a “doing”), defined as “inertia (earth),” “cohesion (water),” “vibration (air/wind),” “radiance (fire)” and “pervasiveness (space)” [1]. This is seen in some broad descriptions: in the Greek, the elements seem to be different “magnitudes, figures and arrangements” [2] of particles of matter, while in Ayurveda the elements are principles “*within* the most minute subatomic phenomena” [1]. This is a vast oversimplification of a very complex and subtle topic, however, in order to show how I reached this possible explanation of the differences I will summarize some of my research of Ancient Greek philosophy, since it is this which I most thoroughly explored due to my lack of prior familiarity.

From my research, it seems that the origins of the Western concepts of Earth, Air, Fire and Water are unknown. Many of the earliest Greek philosophers spoke of these when trying to describe the origin of things; some said one was the origin of all things, some claimed two. Empedocles appears to be the first to elevate all four to a level of fundamental originators, calling them “the fourfold root of all things” [3]. Similarly fundamental were two great forces that affected them, which were “Love” and “Strife” which continually bring the elements together into One and apart into Many. For Empedocles these four “roots” have mythical qualities: they are at times described as “gods” [3].

As Greek philosophy developed, the concept of the elements became more refined, and in my opinion, became more like “substances.” Plato is credited for having been the first that used the term “elements” in reference to Earth, Air, Fire and Water. In his time, the word “element” was the word for letters in the alphabet. Oddly enough, he explains how it seems the two “elements” are not entirely relatable: “we assume that men know what fire is, and each of these things, and we call them principles and presume that they are elements... in truth they do not so much as deserve to be likened with any likelihood, by the man who has even a grain of sense, to the class of syllables” [4]. He then says later that “in the first place, then, it is plain I presume to everyone that fire and earth and water and air are solid

bodies” [4]. He then goes on to describe them and their relationships in intricate geometric description. These things are all highly suggestive to me of elements as “substances.”

Aristotle developed things further. He said that first there is a “primary matter” which forms the basis of all things. The elements cannot be the fundamental matter themselves because he observes how they intermingle with one another and can transform into another. Since they are able to transform into one another, he then reasons that there must be something that stays the same and is more fundamental, and that is the primary matter acted upon by the “qualities.” It is worth noting that in contrast, in Ayurveda the opposite is supposed – the elements themselves give rise to the qualities.

As to which qualities he deemed fundamental, he said that they had to be both “active” and “susceptible” qualities; the elements have to be both acted upon and susceptible to being acted upon in order to intermix and change into one another. His “active” pair is hot and cold – each can actively make an object possess its quality. The “susceptible” pair are damp and dry – they are “susceptible” because they are *defined* by their object’s ability to be affected. For example, something damp has no boundary of its own, but is easily “bounded” by something else, whereas something “dry” has a strong boundary of its own. Heavy and light, on the other hand, are not primary qualities because they are not defined by their effect on something else, or their susceptibility to being affected by something else. And the other qualities he speaks of such as “coarse and fine” he says are originated by “damp” and “dry.” Since the progression is matter acted upon by quality creates an element, it sounds to me as if the movement or “processing” has more to do with the quality, and the element is more of a “substance” that comes about as a result.

So why is the Greek Air “hot and moist” while the Ayurvedic Vata “cold and dry?” “Air” itself sounds like a thing with substance, whereas Ayurvedic “air” is actually pretty much synonymous with “wind” and is defined as “vibration.” Indeed, if Air is looked at as a “substance” we can compare it to the gaseous state of matter which is warmer than liquid and solid states, and shares a “fluid” quality with liquid (and plasma) in that it “flows” when a force is applied to it (which seems analogous to “moist”). Whereas for Vata, Todd Caldecott says that while “air” is inherently “dry” (perhaps just as a humid wind may still have a drying effect) it actually has a neutral temperature. However, when grouped with “space” in Vata he says that Vata “assumes either cold or hot ... when exposed to their presence” [1]. Therefore due to how it *acts* in the human body it *becomes* cold because the body’s predominance of “earth” and “water” makes it predominantly cold. So there it may be!

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How Effective is Rosemary Aromatherapy on Cognitive Function?

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Rosemary (*Rosmarinus officinalis*) is a wonderful aromatic herb with many life-improving qualities. Otherwise known as the herb of remembrance, rosemary has great enhancement on cognitive functions such as memory and concentration as well as improving mood. Here I would like to explore these actions, particularly with its use in aromatherapy.

Rosemary has shown to be a helpful therapy in Alzheimer's disease. One clinical research group examined the effect of mixed aromas on patients with Alzheimer's disease. The patients were exposed to lemon and rosemary essential oil in the morning and lavender and orange essential oils in the evening. The results showed improvement in movement and the ability to form abstract ideas. Cognitive function and conceptual understanding were improved as well [4].

Rosemary has a significant effect on the Autonomic Nervous System; increasing heart rate, blood pressure, and respiratory rate [2]. It also has a great effect on mood. For example, in Moss's study where lavender and rosemary essential oil were compared, rosemary produced a significant enhancement of overall memory and secondary memory factors, more-so than lavender. The mood of participants became fresher and more alert [3]. The same can be seen in Sayorwan's study, participants reported feeling fresher, becoming more active and were less drowsy. Sayorwan's study also explored the frequency of alpha 1, alpha 2, and beta brain waves. Alpha 1 and alpha 2 brain waves decreased with rosemary essential oil inhalation, but the power of the beta waves increased [2].

In one case, 20 volunteers were exposed to the essential oil of rosemary while performing mental arithmetic. Mood assessments were made before and after the session as well as a blood sample. In result, cognitive tasks for speed and accuracy improved greatly, especially where higher concentrations of 1,8-cineole were absorbed in the blood [1]. This shows how 1,8-cineole is an important compound contributing to rosemary's stimulating effect on the cerebral cortex.

Aromatherapy massage also has great results in stimulating the autonomic nervous system and emotional wellbeing. When the essential oil of rosemary combined with a carrier oil was applied to skin, changes in emotional parameters were significant. Through self-evaluation, patients reported experiencing an improvement in subjective mood, and feeling more alert and attentive. Breath rate and blood pressure also increased [5], which might suggest rosemary being a supportive herb for cardiovascular disease as well. To make

another point in rosemary's effect on mood and its action in anti-stress, patients were exposed to lavender and rosemary essential oils for five minutes, upon completion, the saliva of the patients was collected to measure free radical scavenging activity (FRSA) levels. Results showed that FRSA levels increased and cortisol levels reduced when subjects were given low concentrations of lavender and high concentrations of rosemary [6]. In conclusion, we can see that rosemary has a positive effect on the brain, playing an important role in modifying emotional wellbeing and nervous system responses. The volatile oils of rosemary (cineole, pinene, camphor- just to name a few!) are largely the key constituents to this herb's wonderful indications, but how exactly these volatile oils work and interact in the body is still a little unclear to me and could be possibly discussed further.

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Estrogen and its Role in the Progression of Chronic Diseases

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The female sex hormone estrogen is implicated in hastening the progression of many chronic diseases. In particular, when compared to males, menstruating females are at higher risk of developing estrogen-dependent cancers [1], autoimmunity [2,3], and more rapid disease progression along with poorer prognosis in respiratory diseases such as asthma, chronic obstructive pulmonary disease (COPD), and cystic fibrosis [4,5]. In different tissues estrogen has differing effects that include cell proliferation, immunomodulation, and stimulation of mucin secretion [6,7,8]. Here I will briefly touch on what role estrogen is theorized to play in the pathogenesis of estrogen-dependent cancers and autoimmunity, but I will discuss in more depth the role that it plays in the disease progression of chronic respiratory diseases. Lastly, I will discuss the potential therapeutic effects of phytoestrogens on estrogen-related disease progression.

Estrogen plays a major role in certain hormone-dependent cancers. There are two types of estrogen receptors: estrogen receptor alpha (ER-a) and estrogen receptor beta (ER-b). It is thought that estrogen's agonism of the ER-a causes cell proliferation indirectly through a paracrine mechanism involving non-proliferating ER-a-positive cells. In addition, the ER-b seems to repress cell proliferation and is pro-apoptotic, therefore the ER-b might generally inhibit the mitogenic activity of estrogens mediated by ER-a [9,10]. Studies have shown that later-stage breast cancers have an over-expression of ER-a, and an under-expression of ER-b. The breast cancer drug tamoxifen is an ER-a antagonist, but may also act as an ER-b agonist [11]. Theoretically, by agonizing the ER-b in the earlier stages of estrogen-dependent cancers, tumor growth may be inhibited.

The role of sex hormones in the development of autoimmunity is complex, and sex hormone production and its related risks to autoimmunity may even interface with the human gut microbiome [12]. Females are on average 2.6 times more likely than males to develop autoimmunity, and in particular have a significantly higher risk of developing Hashimoto's, Graves', Sjogren's, lupus, multiple sclerosis, and rheumatoid arthritis than males [13]. In general, it has been shown that females have stronger immune responses than males, and this may lead to an increased production of either auto-antibodies or inflammatory cytokines, both of which make autoimmune symptoms worse. Females tend to have both stronger cell-mediated immune responses and higher antibody production than males when immunized. The T-cell mediated immune response in females is influenced by sex hormones. A helper T-cell type 1 (Th1) response is a cell-mediated and pro-inflammatory, involving the production of IL-2, IFN-gamma, and lymphotoxin. A Th2 response is less inflammatory but is focused on the production of antibodies. Females are more likely to have a Th1 response when challenged by an infection or antigen, yet during pregnancy the Th2 response is dominant. It is thought that estrogen has a biphasic effect on the immune system, with higher levels stimulating a Th2 response (e.g. during pregnancy and ovulation), and lower levels stimulating a Th1 response (e.g. during menstruation). Progesterone promotes the development of Th2 cells and therefore antagonizes the Th1

response. In females with multiple sclerosis (MS) and rheumatoid arthritis (RA), symptoms can often become worse during menstruation, when estrogen and progesterone are low, and disease can go into temporary remission during pregnancy, when estrogen and progesterone are high. Furthermore, females with MS and RA often experience improvements in their symptoms when using oral contraceptives or hormone replacement therapy. Conversely, females with lupus can see their symptoms worsen with pregnancy or hormone therapy. Testosterone seems to have an anti-inflammatory and immunosuppressive effect on autoimmunity [14].

Estrogen affects the respiratory tract in multiple ways. Chronic respiratory diseases such as certain types of asthma, COPD, and cystic fibrosis often involve mucus hypersecretion and bacterial colonization of the lungs. Cystic fibrosis (CF), a genetic disease that results in a thickening of the mucus in the respiratory tract, is typified by chronic *Pseudomonas aeruginosa* lung infections. Bacterial colonization and mucus hypersecretion in CF, COPD, and non-CF bronchiectasis results in an immune response where neutrophils are over-recruited and inefficient at cleaning up infection, and thus die in large numbers, leaving behind inflammatory cytokines and proteolytic enzymes, such as neutrophil elastase, which cause further airway damage [15]. Females with CF experience more pulmonary exacerbations during the follicular phase of the menstrual cycle, when estrogen is high [16]. Estrogen affects CF pulmonary exacerbations in at least two ways. First, exposure to estrogen causes *Pseudomonas aeruginosa* (PA) to mutate from its non-mucoid, planktonic form to its mucoid, biofilm-mediated form. PA in its mucoid form is more virulent and more resistant to antibiotics, making it harder to treat. Females with CF are colonized with PA at an earlier age and more often culture mucoid strains than males. Mucoid PA is cultured more often in females during the follicular phase (when estrogen is high) than during menstruation (when estrogen is low) [17]. Secondly, the epithelium of the airways changes when exposed to estrogen. When airway tissue is exposed to estrogen, the expression of mucin-producing goblet cells in the epithelium increases by about 635%, while the expression of ciliated cells decreases by about 64%. Furthermore, estrogen increases goblet cell mucin production by about two-fold [18].

Phytoestrogens, such as the soy isoflavone genistein, agonize ER- α less strongly than estrogen (estradiol) yet agonize ER- β more strongly than estradiol. In fact, the ER- β has a 30-fold greater binding affinity for genistein than ER- α . By preferentially agonizing the ER- β , which is anti-mitogenic, phytoestrogens may have a role preventing the formation and proliferation of estrogen-dependent cancers, and may even provide a safer alternative to hormone replacement therapy in menopausal women [19]. While there has been preliminary research on the impacts of phytoestrogens on autoimmunity [20], more research must be done to determine whether they can be used to reduce disease progression in estrogen-affected autoimmune diseases. The use of phytoestrogens in chronic respiratory diseases like asthma and CF may have beneficial effects in multiple different ways. For example, one study showed that females with CF using oral contraceptives had less frequent pulmonary exacerbations than those not using contraceptives [21]. In bronchial epithelium, the ER- β is the predominant type of ER expressed. Therefore, phytoestrogens may be preferential analogues to exogenous estradiol in their effects on the lungs.

However, research on the use of phytoestrogens such as genistein in people with CF has mainly focused on their ability to correct and potentiate mutant CFTR channels in the epithelium, addressing the fundamental cellular defect that leads to CF disease expression. One animal study showed that the expression of CFTR channels in the uterine epithelium is upregulated by genistein supplementation, possibly via agonism of the ER- β , and this results in an increase in luminal fluid accumulation [23]. Several in vitro studies have shown that genistein potentiates gating in wild-type and mutant $\Delta F508$ CFTRs, allowing chloride to flow out of the cell [24,25], which in humans would increase water outflow into the mucus lining outside of epithelial cells, ameliorating the fundamental disease process of CF. These studies show that genistein and other isoflavones can have epigenetic effects that may rescue faulty CFTR expression in people with CF. Furthermore, when paired with curcumin, a well-documented corrector of mutant CFTR function, genistein can have a significant potentiating effect on CFTR gating in G551D mutations [26]. Therefore, the epigenetic effects of phytoestrogens may prove very useful in the treatment of CF, and may even be synergistic with pharmaceutical CFTR correctors and potentiators [27].

In conclusion, estrogen has a harmful effect on the progression of disease in females with many different chronic illnesses. Estrogen can have mitogenic, inflammatory, and mucus hypersecretory effects in certain conditions. Supplementation with phytoestrogens may have beneficial effects on these mechanisms of disease, and may cause epigenetic changes that result in improved prognosis for people with cystic fibrosis.

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Female Infertility

Michelle Broaddus '16

Female Infertility is defined by the world health organization as the inability to become pregnant, an inability to maintain a pregnancy, or an inability to carry a pregnancy to a live birth [1]. There are many pathologies that can affect fertility in female-bodied people, as well as factors like stress, radiation, and diet. More and more frequently as a Maya Abdominal Therapist working with clients I am seeing female-bodied people having what I call "fertility challenges". I like this term better because it leaves the possibility of fertility open. As I search to understand the mysteries of fertility and infertility, I look at the different pathologies and factors involved to learn more.

Endometriosis is a condition that can be very painful and also affect fertility as well as quality of life. This condition is diagnosed when endometrial tissue is found outside of the uterus. This tissue can migrate to many places in the body, most commonly found in the pelvic cavity around the bowel, uterus, and ovaries [2]. This endometrial tissue that has escaped the uterus and is floating around the pelvis and/or other parts of the body responds to hormones throughout the cycle as does the endometrium in the uterus. In response to estrogen the tissue has an inflammatory response and will bleed and create scar tissue and adhesions. The inflammatory response can be extremely painful and the scar tissue and adhesions will cause even more pain. The organs in the pelvis can even become adhered to one another. This creates stagnation in the pelvis, which can cause infertility. Many women with endometriosis experience infertility as one of their many symptoms [3].

Polycystic Ovarian Syndrome or PCOS is a condition that can negatively impact fertility. PCOS is one of the most common causes of infertility. PCOS is a condition where there is an imbalance in hormones, specifically too many androgens, and insulin resistance. This causes the ovaries to stop producing mature eggs. Often cysts will also develop on the ovaries. Women with PCOS are not only likely to have fertility challenges or even infertility but also are at greater risk for type 2 diabetes, metabolic syndrome, heart disease, and endometrial hyperplasia, a thickening of the endometrium that can lead to endometrial cancer [4].

Primary ovulatory insufficiency or POI is a condition where a woman's ovaries stop working normally before the age of 40. Women with POI can either have follicle depletion where they run out of follicles before the age of 40 or follicle dysfunction where they have follicles, but they are not functioning properly. About 90% of the time we are not really sure why this happens. Sometimes it is a genetic or chromosomal disorder such as Fragile X Syndrome or Turner Syndrome that can cause follicle depletion. Sometimes it is an

autoimmune disorder like thyroiditis or Addison's disease that damages the follicles or the adrenal glands. Metabolic disorder can contribute to the cause of POI [14]. Women with POI will experience infertility, though sometimes can still become pregnant because they may still have random ovulations [5]. Women with POI may also experience hot flashes, vaginal dryness, irritability, night sweats, and decreased interest in sex, among other symptoms [6]. Women with POI are at a greater risk for heart disease and osteoporosis because of the lack of estrogen, also called hypoestrogenemia [5].

Uterine fibroids are noncancerous tumors that form inside the uterus. Uterine fibroids can negatively affect fertility if they are larger than six centimeters. Fibroids can grow inside and outside the uterine wall. They can block blood flow to the uterus, block the fallopian tubes, change the shape of the uterus, and even change the position of the cervix [7]. Uterine fibroids can cause painful periods, pain with intercourse, lower back pain, miscarriages, infertility, heavy bleeding, and anemia [8].

There are many other factors that may affect fertility such as stress, radiation, chemical exposure and obesity. Women experiencing high stress may be less fertile according to a study done by the Division of Intramural Population Health Research. This study found women with high stress biomarkers had twice the risk of infertility [9,12]. Chemotherapy can negatively affect a woman's fertility by damaging her eggs and even her reproductive organs [10]. High exposure to environmental chemicals can also negatively affect fertility [11,15]. Studies have shown that obesity especially in adolescence can affect fertility later in life because of androgen levels being higher in obese women [13,16].

There are many different things that can affect female fertility and much to learn. As we grow and evolve as a human race we have to learn how to not only survive in this state of constant chemical exposure that we are co-creating on this planet together, but also how to remain fertile so we may continue to thrive. I believe that we will continue to see more infertility in the future [16]. I believe that if we want to continue to have a future, we need to make some drastic changes in how we as a people are treating this planet. This is our home and we are destroying it, and along with the damage to the planet's fecundity we are damaging our own fertility, because we are all connected.

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The Measles-Mumps-Rubella Vaccine and Autism

Martha Waterman '16

There has been ongoing debate in the popular media around the safety of vaccines. Much of this was sparked by a 1998 article, which studied the link between measles vaccine, bowel disease, and neurobehavioral disorders, reporting a causal correlation between the three [1]. This article has since been retracted, but the debate continues. In an effort to decipher the facts from fiction, I reviewed research on the topic of the Measles-Mumps-Rubella (MMR) vaccine and its potential correlation with instances of Autism Spectrum Disorder (ASD) in children.

Several studies examined the potential causality between MMR vaccine and ASD through retrospective case studies to examine trends in vaccinations and childhood ASD diagnoses through time. Such observational epidemiological studies can be limited in scope and specificity, and may lack the precision required to detect rare occurrences of causality on a population level [2]. These studies may not allow for close examination of certain rare or non-conforming cases that may be of more interest to emerging science on vaccine safety than they are to general public health concerns at this time [3].

Other limitations of retrospective epidemiological studies include use of an inconsistent case definition of ASD and related neurobehavioral disorders among doctors and parents. Furthermore, it is difficult for parents and healthcare providers to determine the exact age at onset of ASD, making some epidemiological studies inappropriate or impractical [2]. The age at which most children are vaccinated (age 2) is also the age at which autism spectrum symptoms may begin to appear, thus leading to perceived causality among parents and potential bias in reporting and recall [4].

The present findings are nearly uniform among researchers: epidemiological evidence suggests no correlation between MMR vaccine and the onset of ASD. Though reported cases of autism have risen in Western nations in recent decades, this does not correspond directly with the introduction of the MMR vaccine or to vaccine coverage [3]. Furthermore, the increase in ASD cases in Denmark and the US occurred in 2000 or later—well after the introduction of MMR vaccine in these populations [5]. Most studies concluded that, while retrospective examinations of populations over time do not demonstrate causality between MMR vaccination and a positive ASD diagnosis, further research is necessary to determine the significance of rare cases of causality, as well as other unstudied factors that may contribute to a possible association [2,3].

One review on the topic of vaccine safety outlined the possible adverse effects of all childhood vaccines. Reviewers acknowledge that no vaccine is completely safe, but decidedly advocate for their use in general, stating that the risk of adverse events arising from all vaccines is extremely low. Though the reviewers rejected the hypothesis that MMR vaccine can lead to autism, they demonstrated convincing evidence to support a link between MMR vaccine and febrile seizures, anaphylaxis, transient arthralgia in adult

women, and measles inclusion body encephalitis. It is important to note that all of these adverse effects, especially the latter, are far more likely to occur in patients with deficient immune systems than in healthy people. This may be because immunodeficient people are susceptible to contracting measles virus from the live vaccine, leading to the aforementioned complications [6]. In fact, researchers acknowledge the unanswered questions regarding possible links between MMR vaccine, ASD, and bowel disease, as studied in the Wakefield paper. Some believe that disrupted viral immunity resulting from the administration of the vaccine could lead to a positive measles infection, thus resulting in complications such as bowel disease or autism [2].

While epidemiological and comparative retrospective studies have not demonstrated a significant correlation between MMR vaccination and ASD diagnostic rates, one study found increased levels of measles antibodies in children with autism. This study strongly suggests that the measles virus, found live in MMR, can trigger the onset of autism in children with a predisposition to the disorder: "...several children [in this study] with autism have unusual MMR antibodies that showed a temporal association with myelin basic protein (MBP) autoantibodies that was used as a marker of CNS autoimmunity in autism" [7]. Serum dilution tests of autistic children in this study showed a significantly higher level of MMR antibodies than children without autism. Researchers point out that immune abnormalities are common in children with ASD and that immune therapies can often be effective for autistic children. Researchers in this study contend that ASD is an autoimmune disease whose onset may be triggered by exposure to measles virus found in MMR vaccine [7].

There is a need for further research in a number of areas in order to determine the true safety and necessity of childhood vaccinations. One topic of interest is vaccine scheduling with young children. One study surveyed 748 parents and found that 1 in 10 have elected to abide by an atypical vaccination schedule for their children [8]. Little clinical research is available to determine the safety and efficacy of lengthening or in any way altering vaccine schedules to lower the risks of adverse events due to vaccines, nor is there available research demonstrating the safety and efficacy of the existing recommended vaccination schedule.

Additionally, I would like to see further research on the safety of vaccine adjuvants and other additives. Presently, the main adjuvant used in vaccines is alum, whose efficacy is limited and use can lead to a number of health problems in certain individuals [9]. This seems like an important, yet under-investigated piece to inform the questions surrounding vaccine safety.

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Psychedelic Therapeutics: Recent Clinical Trials and the Serotonergic Effects

Rachel Leaf '16

Clinical research into psychedelics with human subjects has a short and sordid history. D-lysergic acid diethylamide, or "LSD", is a prime example. Discovered accidentally in 1943 by Albert Hoffman, LSD was used in upward of 160 trials - with varying degrees of clinical control - from 1953 to 1973. Many of these trials showed promise for the efficacy of psychedelic therapies for a range of issues, including alcoholism and anxiety [1,5]. Very quickly, however, trials and general usage took on a more radical and countercultural form, quickly leaving the clinical setting and entering the public sphere. Along with the huge spike in recreational usage by the general public, in 1970 President Richard Nixon signed The Controlled Substances Act, labeling all psychedelics as Schedule 1 illicit substances [3,5].

Since then, psychedelics have carried the cultural stigma of this time period, with possibilities for research effectively shut down to a degree, according to current leading researcher Roland Griffiths, "...unprecedented in modern science" [5]. In the last ten years, however, there has been a resurgence of interest in the clinical study of psychedelic therapies, with a clearer focus on stringent clinical procedures that were lacking in the earlier trials [5]. In just the last 6 months these trials have gotten a lot of press, including articles in both the New Yorker and The Washington Post [2,4,5,6]. Larger-scale trials have been approved at Johns Hopkins University, UCLA, and New Mexico University [7,8,9]. These trials have produced promising results for the efficacy of psychedelics (specifically psilocin) for treating mental distress related to cancer and alcoholism [8,9]. Other examples include the well-documented clinical trials finding success treating PTSD with MDMA [10, 11].

The mechanisms of action of psychedelics for these conditions are obviously very complex. Based on subjective experiences of individuals - in trials and otherwise - some combination of meaning-making, feelings of universality and interconnectedness, and encounters with an ineffable, noetic presence seem to be common [1,4,5,6,16]. According to Robert Carhart-Harris, a neuroscientist at Imperial College in London, a certain loss of "ego" or self occurs by the lowering of activity in an area of the brain called the "default-mode network" [5]. This part of the brain controls and filters our daily experience in favor of survival, effectively over-riding and quieting deeper, more subconscious realms. With psychedelics, however, "...the boundaries between self and world, subject and object, all dissolve... Regions [of the brain] that don't ordinarily communicate directly with one another strike up conversations" [5]. In the case of addiction, depression, or PTSD, this re-positioning and re-valuating of one's life, trauma and choices can be extremely helpful.

In addition to these more spiritual and perceptual mechanisms of action, a common and well-documented physiologic effect is the influence of psychedelics on serotonergic systems of the brain and central nervous system. Serotonin (or 5-hydroxy-tryptamine, 5-HT) is a

neurotransmitter: a chemical signal released by a neuron that affects the neuron's target cells via specific cellular receptors. Serotonin has a multitude of physiological functions including hormone secretion, immune system functioning, energy balance, and food intake [12], as well as higher-brain functions, especially mood and emotional regulation [12,13]. Serotonin is also an influential neuromodulator, exhibiting effects on other neurotransmitter systems such as GABA, glutamate, and indeed on the connectivity and proper functioning of the brain overall [12, 14, 15].

Both classes of psychedelics (tryptamines and phenylethylamines) have shown to have an agonistic effect on serotonin, specifically 5-HT₂ receptors [15,17]. In other words, a constituent of the psychedelics resembles serotonin closely enough in structure that it is capable of activating its receptors. The fact that the simple indoleamine structure of psilocin and DMT are nearly identical to serotonin makes this unsurprising [17]. MDMA also has the neurological effect, albeit through a more indirect mechanism, of raising serotonin levels in the human subject [17,19]. This is extremely significant for the trials that are currently underway. In nearly all recent studies, a reduction or malfunctioning of serotonin is a part of the symptom-picture of the pathology of the subjects. Alcoholism, depression, anxiety, and drug addiction are all associated with abnormal serotonin levels [17]. As stated earlier, the new psychedelic research has shown great preliminary success for these conditions, with many subjects reporting significantly lowered symptoms, months and even years later [3, 15, 18; alcoholism: 9, 20; depression: 15, 21; PTSD: 10, 11, 19].

Michael Winkelman, in his article, "Psychedelics as Medicines for Substance Abuse Rehabilitation: Evaluating Treatments with LSD, Peyote, Ibogaine and Ayahuasca," names this serotonergic effect of psychedelics "psychointegration." To him, psychointegrative effects "...are epitomized in the functions of serotonin in modulating the activities of dozens of bodily and brain processes and neurotransmitters systems" [15]. This enhanced integration incorporates "...normally unconscious emotional and self information into the frontal cortex and consciousness." To me, this description seems to at least partially elucidate the psychological and emotional re-positioning that happens in nearly all of the therapeutic psychedelic treatments, especially in relation to the subjects' trauma, addictions, or existential position. Psychedelics disrupt the rigid pattern of thinking of the default-mode network associated with these patterns, and the serotonergic effect seems to play a significant part in that. In terms of MDMA for PTSD, the emotional and induced state of oxytocin and serotonin affords the subject with PTSD to re-visit their traumatic memories in a different way [11]. This phenomenon is also well-described by Roland Griffith in speaking of psilocybin, likening its therapeutic experience "...to a kind of 'inverse P.T.S.D.' - a discrete event that produces persisting positive changes in attitudes, moods, and behavior, and presumably in the brain" [15].

The serotonergic aspect of the psychedelic experience is obviously one of many mechanisms of action psychedelic substances possess, and an interesting point of further study to better understand and use psychedelic substances. The truth of these trials, however - and of the history of entheogenic, or "God-inducing" substances in general - is that there is not a clear-cut, rational explanation of what causes or occurs during a psychedelic experience. It is magic - at the very least insofar as consciousness is magic, and

in its entirety currently beyond the scope of our scientific understanding. To researchers and proponents of psychedelic therapies, the importance of these substances is not necessarily in deconstructing the biochemical processes that occur while under their influence: it is in the truth of the (technically preliminary) success they have in helping people live fulfilled, connected, and trauma- and symptom-relieved lives.

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Comparing Medicinal Values of Wild Versus Cultivated Plants

Kenzie McDonald '16

In the herbalist community, wild varieties of plants are commonly considered higher quality than the cultivated varieties. However, are these statements based on a culture of identifying the “old ways” as inherently better, or is there a scientific foundation based on chemical constituents to defend these claims? Is there an adaptive advantage for the wild varieties of plants to contain higher medicinal qualities? In the examination of scientific studies on different medicinal herbs and foods that analyze chemical constituents and their actions, the question of medicinal value and quality becomes more complex.

In general, plants defend themselves via chemicals or physical structure to deter browsers. However, plants must direct their limited energy either towards either growth or defense. This is exemplified in slow-growing plants, which statistically have higher levels of secondary metabolites. In one study on *Olea europaea* variety *europaea*, cultivated olive trees, suggested that the selection for increased yield and growth rate that occurs with domesticated plants may contribute to the reduction in secondary metabolites [1]. In this study, the cultivated olive trees were found to have lower concentrations of secondary metabolites compared to the wild olive trees, the *O. europaea* variety *sylvestris*, which was attributed to the selection process for longer shoots for cultivation purposes [2].

In many scientific studies comparing wild and cultivated plant constituents, phenolic acid is often assessed. Phenolic acid functions as an antioxidant and an anti-inflammatory [3]. In two plant studies on blueberries and olive trees, the wild varieties expressed higher quantities of phenolic acids than the cultivated varieties [4,5]. *Vaccinium angustifolium*, the lowbush wild variety of blueberry, contains three times the quantity of phenolic acid, including chlorogenic acid, when compared to *V. corymbosum*, the highbush cultivated blueberry [6]. In the olive trees, scientists found higher levels of tannic acid in the wild variety compared to the cultivar [7]. These two studies expressed a high capacity for the wild plants to exhibit antioxidant and anti-inflammatory qualities due to their high content of phenolic acids [8,9]. Although both populations of *Paeonia lactiflora*, or peony, in one study had significant quantities of phenolic acid, the *Paeonia lactiflora* variety Baishao, or cultivated peony, had more gallic acid (a kind of phenolic acid) than the *P. lactiflora* variety Chishao, or wild peony [10]. In a study comparing the phenolic acid content in wild and cultivated *Ganoderma lucidum*, or Reishi mushroom, cinnamic acids were found in both, while p-hydroxybenzoic was only found in the wild reishi and p-coumaric acids only found in the cultivated reishi. Wild reishi had the highest protocatechuic acid content, which contributed to the highest total amounts of phenolic acids [11].

Antimicrobial action is also compared in many studies on wild versus cultivated plants. Fungal endophytes are microbes that live asymptotically within plant tissue and produce secondary metabolites. Gene transfer can occur between plants and endophytes resulting in microbes acquiring the ability to produce the same compounds originally produced by the host plant, and vice versa [12]. In natural environments the fungal

endophytes are much more present, and therefore the plant constituents will be higher in quantity and strength due to symbiotic synergy. In a study on the comparison of fungal endophytes in wild harvested and greenhouse cultivated *Anemopsis californica*, or yerba mansa, the wild variety contained 11 genotypically unique fungal strains (13 total), while the cultivated variety had two genotypically unique fungal strains. Furthermore, when the fungal endophytes were tested for antimicrobial activity in the wild yerba mansa, four of the fungal strains inhibited the growth of *Staphylococcus aureus*, and three inhibited growth of *Pseudomonas aeruginosa* [13]. The two fungal strains in the cultivated yerba mansa displayed no significant antimicrobial activity [14]. In a similar test on antimicrobial activity, the sativas variety of *Daucus carota*, or cultivated carrot seed, had the strongest overall antimicrobial properties when tested against four species of bacteria and two fungal species compared to the carota variety of *Daucus carota*, or wild carrot [15]. While the wild carrot expressed less antimicrobial effect, the strongest antimicrobial actions occurred from the mature umbels (as opposed to the seed where the cultivated plants held their strongest actions) [16]. This data suggests the difference in chemical action is dependent upon the different parts and the maturity of the plant, which is another factor to consider when harvesting medicinal herbs.

Volatile oils are another antimicrobial constituent in plants, and are researched in many studies comparing wild and cultivated constituents. In one study, similar volatile oil content was found in the wild and cultivated *Achillea millefolium*, or yarrow, in Himalayan habitats. However, in the wild yarrow, the monoterpene 1,8-cineol, also known as eucalyptol, was found to be higher than in the cultivated yarrow. In the same study, the cultivated yarrow had a higher amount of the phenylpropene eugenol compared to wild yarrow [17]. The oxygenated monoterpenes borneol, terpinen-4-ol, and α -terpineol, were higher in the cultivated variety of yarrow. The major sesquiterpene hydrocarbon β -caryophyllene was also higher in cultivated yarrow [18]. In the study on peony, the wild peony had a higher albiflorin content, a monoterpene glycoside, than the cultivated variety [19]. In a study on the difference in oil content of wild versus cultivated carrot, the wild carrot variety consisted mainly of monoterpene hydrocarbons (72-84%). The cultivated carrot was much higher in sesquiterpenes at 51% [20]. In the same study, the scientists observed the cultivated carrot seed to contain the strongest overall antimicrobial properties comparatively to the wild carrot seed when tested on four different bacterial species and two fungal species [21]. The various findings in these different studies on volatile oil content suggests that there is not conclusive evidence stating that wild or cultivated plants in general are preferential.

Although there is data that supports the claim that wild plants do have specific constituents that are higher than the cultivar varieties, the generalization that wild varieties are inherently more medicinal is false. The findings specifically suggest some potential adaptive benefits to the secondary metabolites and symbiotic fungal relationship that occur in wild plants. The medicinal variability depends on many factors including the environmental conditions of browsing activity and climate, fungal endophyte content, parts and maturity of plant, and genetic expression. Through the analysis of multiple research studies, the consideration of whether to cultivate or wild-harvest a medicinal plant will depend on the specific plant and the targeted constituents.

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Medicinal Mushrooms: *Trametes versicolor* as a Supportive Cancer Treatment and Immune Enhancer

Ayeen Telopa '16



Trametes versicolor

Trametes versicolor, also known as *Coriolus versicolor* and commonly called Turkey Tail, is a fungus belonging to the Polyporaceae family [1]. True to its name, the fan shaped fungi displays an array of ringed colors, often in different shades of brown, white, grey, and blue. A key characteristic of Turkey Tail is the small pores displayed on the underside of the cap that do not blemish when scratched. It is found commonly in the northern woodland regions of the United States, Britain, Ireland, continental Europe, and Asia. It grows mostly on dead hardwood trees, fallen or standing. This Fungus is an important part of the forests ecology as it helps decompose dead wood, thus providing nutrients for surrounding woodland growth [2]. Mycologist Paul Stamets has described fungi as “the grand recyclers of the planet and the vanguard species in habitat restoration”.

The use of *T. versicolor* and medicinal mushrooms has been a long standing practice throughout history. Traditional Asian Medicine has used *T. versicolor* and other medicinal mushrooms as health promoting tonics as well as anti-cancer treatments. The fruiting bodies of fungi are used as medicines to enhance the strength, and longevity of an individual [3,4]. Hippocrates, “the father of Western medicine”, often described the use of medicinal mushrooms to help with the healing process in chronic illness: “let thy food be thy medicine and thy medicine be thy food.” Dioscorides was said to have called Agarikon fungi “ the elixir of life”.

Within recent history *T. versicolor* has been adopted and studied within the western medical system for its anti-cancer, and immune enhancing qualities. Cancer, being one of the leading causes of death within this country, provides an adequate reason to dive further into the benefits of *T. versicolor* as an anti-cancer agent: “among U.S. women, breast cancer is the most commonly diagnosed cancer (excluding skin cancers) and the second

leading cause of cancer death, following lung cancer. In 2012, an estimated 226,870 new cases of invasive breast cancer and 39,510 breast cancer deaths are expected to occur among U.S. women” [8]. The National institute of Health, in conjunction with Bastyr University has conducted clinical studies on *T. versicolor* for its immune stimulating qualities within the treatment of women undergoing chemotherapy for breast cancer. Prior to and during chemotherapy, giving 3 doses of *Trametes versicolor* at 3, 6, or 9 grams per day displayed increased lymphocyte counts, increased natural killer cell activity, and increased T cell and B cell activity. This improved and enhanced the function of the immune system in its lowered immune state due to chemotherapy. Therefore, in most cases this shortened the recovery period from chemotherapy and improved the quality of life for individual patients [4]. Other significant studies performed in Japan have shown that *T. versicolor* greatly extends survival at five years and above of breast cancer, lung cancer, cancers of the stomach, and other cancers by improving immune cell function and providing considerable pain relief in 60-70% of patients [5].

The immunomodulating and anti-tumor action within *T. versicolor* and other medicinal mushrooms has been most attributed to their triterpenes, large groups of secondary plant metabolites constructed from various 5-carbon isoprene units and heteropolysaccharides, which are made from different types of monosaccharides into branched-chain-like molecules linked to proteins by covalent bonds. Two of the main biopolymers used in clinical studies are krestin, a water-soluble immunostimulating constituent, and polysaccharide-peptide [2,5,10,11]. The heteropolysaccharides’ mechanisms of action within the body are not completely understood, but it seems that polysaccharides extracted from the cell walls of *T. versicolor* and other fungi have the potential to “initiate the immune response because they resemble similar molecules found in the cellular membranes of bacteria” [2]. This then triggers the immune response within the body without causing any real harm. Around 60% of immune signals occur in the gut, and these signals can recognize the heteropolysaccharides, which may then lead to a cascade of immune responses. They may also be anticancer: “mushroom polysaccharides also prevent oncogenesis, show direct antitumor activity against various allogeneic and syngeneic tumors, and prevent tumor metastasis” [9]. It has been shown that *T. versicolor* has the potential to increase white blood cells as well as antibodies, promoting free radical scavenging and having antioxidant effects. In general it has immune-stimulating characteristics that enable the body to fight infections and cancer more readily [5,6,2,7].

The overall extrapolation that can be made for the use of *T. versicolor* is that it indeed shows great promise in the support and prevention of different forms of cancer, specifically breast cancer, as well as being a great immune enhancer.

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Usnea barbata and Usnea longissima: Polysaccharide Content and Potential Medicinal Applications

Nicole Dunnan '16

"Lichens are by definition symbiotic organisms composed of a fungal partner, the mycobiont, and one or more photosynthetic partner, the photobiont, that may be either a green algae or cyanobacterium," [1]. Two species of lichen that grow around the world and have been used historically for medicine are *Usnea barbata* and *Usnea longissima* [2]. Although there has been some research about potential medicinal applications of secondary metabolites in *Usnea* species and other lichens, far less research has been undertaken regarding their component polysaccharides, which account for up to 57% of lichen content [3]. In fact, only about 100 species of lichens overall have been investigated for their polysaccharide makeup [4].



Image 0: *Usnea* spp. (*Usnea* sp., 2005)

The Lichen Polysaccharides

Based on previous research, it is currently understood that all lichens contain

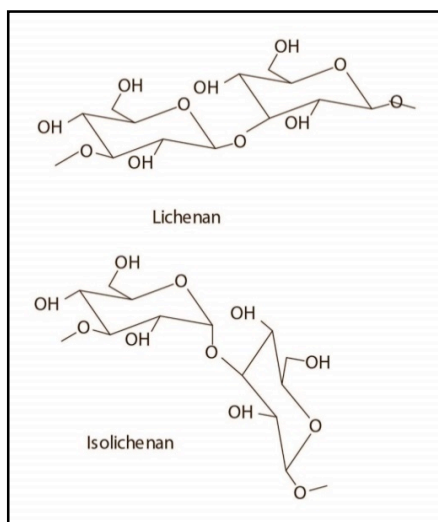


Figure 0: Lichenan & Isolichenan Structure (Karunaratne, Jayalal, & Karunaratne, 2012, p. 216)

polysaccharides of three main structural types: β -glucans, α -glucans, and galactomannans [4]. Specific studies of lichen polysaccharides, particularly β -glucans, have shown promise as possible sources of treatment for inflammatory and autoimmune diseases and even cancer [5]. To date, few, if any, research studies have focused on applications of *U. barbata* or *U. longissima* polysaccharides specifically. However, the primary polysaccharides in *U. barbata* and *U. longissima* have been identified as the β -glucan, lichenan (β -1-3 & β -1-4 linkage type), and the α -glucan, isolichenan (α -1-3 & α -1-4 linkage type) [4]. Of the research studies examining the actions of lichen polysaccharides, several have investigated both lichenan and isolichenan, although the compounds were extracted from lichen species other than *U. longissima* and *U. barbata*.

The Research

S. Omarsdottir et al. headed a study in 2006, investigating several β -glucan type polysaccharides, including lichenan and isolichenan, for their effects on dendritic cells. This research was unique in that most previous research on lichen polysaccharides had focused on the innate immune system. According to Omarsdottir et al:

“Although dendritic cells (DC’s) belong to the innate immune system they play an important role as a bridge between the innate and adaptive immune response. In a resting stage, the DCs reside under the skin and mucosa as immature DCs where they act as the sentinels. During an invasion of a pathogen, the DCs become activated and migrate to the draining lymph nodes...” [6].

In the lymph nodes, dendritic cells interact with naïve T-cells (part of the adaptive immune system), affecting their multiplication and differentiation into either Th1, Th2 or T regulatory phenotypes. For the study, researchers isolated lichenan and isolichenan from a water extract of *Cetraria islandica*, along with a number of other lichen polysaccharides from *Thamnolia vermicularis* and *Umbilicaria probosidea*. Dendritic cell secretion of IL-10 and IL-12p40 (cytokines that mediate T-cell differentiation) was measured in the presence of each isolated polysaccharide. High IL-10 and low IL-12p40 was considered indicative of a Th2-like response (anti-inflammatory), while high IL-12p40 and low IL-10 was considered indicative of a Th1-like response (inflammatory). Isolichenan was not found to have significant effects on cytokine levels, however, lichenan and several other polysaccharides were found to increase production of both IL-12p40 and IL-10. However, when compared, the production ratio of both cytokines was skewed much more in favor of IL-10, and thus, indicative of a more anti-inflammatory response [6].

In 2007, J. Freysdottir et al. conducted a similar, combined in-vitro and in-vivo study, exploring the polysaccharides lichenan and isolichenan, as well as secondary metabolites protolichesterinic and fumarprotocetraric acids, isolated from a water extract of *Centraria islandica* (Iceland moss). Once again, each extract and isolate was tested for its influence on IL-10 & IL-12p40 cytokine secretion by human dendritic cells. In a new twist, the effects of the whole plant extract were also tested in-vivo on rats with antigen-induced arthritis. It was found that both the whole plant extract and isolated lichenan caused increased secretion of IL-10 and IL-12 by dendritic cells, with IL-10 secretion being most pronounced. Isolichenan and the secondary metabolites did not display any significant effects. As both the whole plant extract and isolated lichenan had similar effects, while other tested constituents were found to be inactive, researchers extrapolated that the effects of the whole plant extract were possibly mediated by lichenan, although additional study would be needed. In addition, the whole plant extract, administered subcutaneously to arthritic rats, resulted in a significant reduction in arthritis when compared to rats treated with only saline, suggesting that the whole plant extract of *Centraria islandica* has an anti-inflammatory effect [7].

Another in-vitro study, published in 2009 by Minoru Ujita et al., examined the carbohydrate binding specificity of dectin-1, a transmembrane receptor of human macrophage cells. The carbohydrates tested included lichenan (β -1-3 & β -1-4 glucan) and barley β -glucan (β -1-3 & β -1-4 glucan) among them. It was found that the dectin-1 receptor bound to lichenan and paramylon (another β -1-3 glucan), but did not bind to barley β -glucan, nor the other carbohydrates. The study surmised that dectin-1 exhibited definite preference for binding with β -1-3 glucans, but not β -1-4 or α -glucans. They also postulated that while barley β -glucan is technically a β -1-3 glucan, its lack of binding to dectin-1 may be due to the presence of significantly fewer continuous β -1-3 linkages than are present in lichenan [8].

Conclusion

These are just a sample of currently available studies involving lichen polysaccharides. Based on these initial research results, the polysaccharide lichenan appears to have potential for immune and anti-inflammatory applications due to its observed ability to interact directly with human immune cells in-vitro. While further investigation will certainly be required to clearly understand lichenan's mechanisms of action on the human body in-vivo, the results of these preliminary in-vitro and animal investigations clearly recommend continued exploration. Although the isolated lichenan used in these inquiries was extracted from other lichen species, the results of these combined studies suggest that *U. barbata* and *U. longissima*, which contain high quantities of lichenan and grow widely around the world, would make excellent candidates for further research on potential immunomodulatory and anti-inflammatory therapies.

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Treatment of Urinary Tract Infections Using Plants Native to the Northeastern United States

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Urinary tract infections (UTIs) are one of the most common reasons for visits to health care providers annually, accounting for over 8 million visits in 2006 [1]. The National Institutes of Health (NIH) describes the symptoms of UTI as frequent, intense, and painful urination; discomfort and/or pain in the lower abdomen and lower back; bloody urine; fevers, chills, and malaise [2]. Most urinary tract infections (85%) are caused by bacteria known as E.coli [6], a bacteria with proven antibiotic resistance [8]. For mostly anatomical reasons [2,6] women are almost five times more likely than men to contract a UTI [6], and statistically over half of women will in their lifetime [6]. In fact, 25-40% of all women have a UTI by the age of 40 and 20% of these women will have recurrence [7]. A study published by *The Annals of Internal Medicine* in 2001 concluded that women can accurately self-diagnose and self-treat recurrent uncomplicated UTIs [9]. Antibiotics are the primary treatment strategy for infection [6] in medical establishments and the use of the more expensive fluoroquinilone and broad spectrum antibiotics in particular has risen [6,10], increasing the chance for antibiotic resistance [6].

These factors warrant an investigation into the modern use and efficacy of native plant species for the treatment of uncomplicated urinary tract infections and associated symptoms. Plants have been used for centuries to treat UTIs. Before bacteria were discovered in the 1670s [4], hundreds of plants were listed in Dioscorides' 15th century herbal [5] compendiums specifically for the treatment of "difficult, frequent, painful urination" as well as accompanying "gripping" and "urgency," using the same language to describe the symptoms recognized by the NIH today. Representative plants native to the Northeast United States [11] used historically for the treatment of UTIs still used today include: juniper, pipsissewa, uva-ursi, cranberry, Canada cocklebur, fragrant sumac, yarrow, agrimony, wild carrot, goosegrass, goldenrod, eastern hemlock, white oak, slippery elm, and joe pye weed. Here is an exploration of the use and efficacy of a select few of these plants- cranberry, goldenrod, and juniper.

One cause behind recurrent UTIs may be the ability of bacteria to attach to mucosal cells lining the urinary tract [6]. Multiple studies have shown that cranberry (*Vaccinium macrocarpon*) inhibits the ability of E. coli to adhere to the cell walls of the urinary tract [11,12,13,14,15] suggesting its use for the prevention of recurrent infection as well as in the acute stages of infection [16]. Cranberries are native to Cape Cod, Massachusetts and the Pine Barrens of New Jersey, although they are cultivated in bogs all over the Northeast region of the US and nearby Canada. The berries are used medicinally and they are harvested in the Fall [21].

Goldenrod (*Solidago canadensis*) has antibacterial properties useful in the treatment of UTIs with action similar to that of cranberry in that they both prevent the adhesion of bacteria to the lining of cell walls in the urinary tract, and also decrease biofilm

development [14]. When *E. coli* colonize, they adhere to the cell membranes of their host and also to one another in a sheet called biofilm. In this way, they are able to act effectively as one organism that is stronger than each bacterium on their own [8]. Eclectic and physiomedicalist practitioners traditionally used goldenrod in UTI protocols to tone the mucous membrane of the urinary tract [22], as a diuretic [23], and to reduce inflammation and the suppression of urine [24]. Goldenrod is native to 44 of our 50 United States and throughout Canada, and can be found in unmanaged fields and roadsides in almost any soil. The above ground parts are used medicinally when the plant is in flower in late Summer [21].

Juniper (*Juniperus communis*) berries are used as an antiseptic in the treatment of urinary tract infections [17]. These berries contain essential oils that possess antibacterial, antifungal, antiviral, insecticidal, and antioxidant properties [19,20]. Essential oils work by injuring the cell membrane of gram-negative bacterium, including *E. coli* [18,20], thereby disabling their function. Juniper grows in fields and pastures all over New England and is one of the most commonly distributed plants in the world. The berries mature for harvest in the Fall [21].

While this paper explores only a few plants native to the Northeastern United States, there are plants all over the world with proven efficacy in the treatment of urinary tract infection and its associated symptoms. The use of plants to treat UTIs predates the discovery of bacteria. The bacteria primarily responsible for UTI are increasingly resistant to the pharmaceutical antibiotics used to treat infections today, posing a public health risk. UTIs are also one of the most common reasons for a doctor's visit in spite of the proven ability of women (most commonly infected) to self diagnose infection. It is clear that public awareness and education about the use of plant therapies is in order to reduce the healthcare and humanitarian costs associated with the current treatment of uncomplicated urinary tract infections.

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Case Studies

Case Study: Hypertension and Acute Prostatitis

Linden de Voil '14

Presentation

The client is a 58-year-old cis-gendered male, 180 lbs, 5'8", first seen at the VCIH clinic on May 6, 2014. He had initially scheduled the appointment seeking support for cardiovascular health, decreasing use of hypotensive pharmaceuticals, and education on a cancer-preventive diet following a recent diagnosis of enlarged prostate and subsequent biopsy. Results were negative for malignancy, but both he and his wife remained concerned. However, in the days preceding the intake the client had also developed acute genito-urinary pain and discomfort.

For the last two nights, the client woke up approximately every 45 minutes throughout the night to urinate, which was painful with an interrupted stream and sense of incomplete voiding. Daytime urination was slightly less frequent. He described a similar experience four years ago; at that time he was given a medication to reduce prostate swelling, which he later discontinued due to side effects, though he couldn't recall more details. The client had seen his PCP for urinalysis and expected results within the next 24 hours.

He described an extremely high stress level; in spite of being a person who "tends to thrive on a certain amount of stress," he was currently experiencing significant extra stressors at home and at work that he linked to recent high spikes in blood pressure, around 140/90 in the evening. Typically he copes with stress by exercise, including cycling, running, and cross country skiing, but had not been doing so in recent weeks. He had previously been diagnosed with cardiac arrhythmia, and although the initial episode was self-limiting he remained on Atenolol (25 mg qd) and Aspirin, in addition to which he regularly takes turmeric and saw palmetto capsules. The client expressed concern about long term use of Atenolol; on the evening his urinary symptoms began to flare, he had experimented with cutting his dose in half. On the same day he had experienced a particularly stressful family episode, and his evening BP had spiked to 152/110, though it returned to normal range the following day. There is family history of cardiovascular disease, with heart disease and stroke in both parents. He described a tendency to developing soft tissue and joint injuries due to exercise, with some current moderate pain in the right elbow joint.

The client was also previously diagnosed with IBS, symptoms of which lasted about five years before resolving through a switch to a more whole-foods based diet and, particularly, use of alternating days of liquid fasting three times per week. He has maintained this diet for six years, and typically has regular, comfortable, well formed bowel movements, but in the

preceding two days stools had become looser and slightly more frequent with mild gas and bloating.

The client has a moderate build, muscular and stocky, with a square jaw and notable ruddy complexion. Although his posture while we talked was somewhat rigid, he joked and laughed comfortably. His tongue was pink to reddish, distinctly narrowed or flame-shaped, and dry with a slight white coat; there was some central cracking, a small divot at the tip, and some purpling to the sublingual veins, but without ropiness or distention. His skin was warm and dry to the touch; pulse was tense, and had excellent strength and moderate rate in all positions except the right superior proximal (Fire/triple burner position.) Heart rate variability was present, but less than expected given his long history of regular exercise.

Assessments

Energetically, many things about this client indicated excess heat, or pitta imbalance - his ruddy coloring, energy and stamina, self-described "addiction to exercise" to work off stress, as well as the thick, flame-shaped reddish tongue and forceful pulses. From a Chinese Medicine perspective, the divot at the tip of the tongue suggests heat in the Heart, with dryness indicated by the dry coat and narrow width.

This is borne out physiologically by the prevalence of heat conditions including hypertension, and a history of tendency to high inflammatory cytokine expression, producing inflammatory joint and skin issues.

The known diagnosis and history of enlarged prostate, absence of history of UTI, recent acute emotional stress and reduction of beta-blocker medication suggested the possibility of prostate inflammation exacerbated by stress, with secondary GI distress.

Goals and protocol

We agreed to focus initially on relieving his pain and GI discomfort and improving urinary function, with a plan to meet the following month to address longer terms goals. The immediate formulas focused on modulation of inflammatory response, decreasing perception of stress, regulating smooth muscle tone and pain relief. We used the following, including anti-inflammatory, carminative, antispasmodic, aromatic nervine, and anodyne herbs.

Formula #1, tincture:

2 parts kava, 1 meadowsweet, 1 yarrow, 1 hydrangea root. 5 mL every 2-4 hours.

Formula #2, tea:

Equal parts skullcap, wood betony, linden, and chamomile; 8 g infused in 1 qt water daily.

Outcome

We kept in touch by phone and email over the following days. His PCP confirmed that his urine test results had shown no signs of infection, and diagnosed acute inflammatory prostatitis. The client reported that his pain and frequency of urination improved significantly within the first two nights of treatment on the herbal protocol, decreasing from 10 to 3 instances of night time awakening; by day four, GI and urinary symptoms had abated completely.

After a week he switched from the above acute use formulas to the following maintenance formulas, including cardiovascular tonics/hypotensives, antispasmodics, relaxing nervines, and prostate tonic/5-alpha-reductase inhibiting herbs.

Formula #3, tea:

4 linden, 2 hawthorn leaf and flower, 2 gotu kola, 1 lavender/ 9 g QD in 1 qt water

Formula # 4, tincture:

5 hawthorn (berry, leaf and flower), 4 nettle root, 3 motherwort, 2 solomon's seal, 1 horse chestnut. 5 mL TID with meals.

First follow up visit

The first follow up took place on June 3, four weeks after the initial consult. The client reported no recurrence of GI or prostate issues, and improvement to previous elbow pain. Working with his PCP, he had replaced Atenolol with an ACE inhibitor and was monitoring BP twice a day, generally remaining within normal range with some evening highs of 140/100. He had not taken any of his formulas in the preceding week, because he had run out and not gotten around to refilling; he also didn't like the lavender taste of the tea and said he felt a little dried out after drinking it.

In the weeks between visits, he had developed a minor cutaneous staph infection on his left cheek and treated with a seven day course of prescription antibiotics. He described the initial appearance of the infection as red, itchy, and painful; several small, raised white spots were left behind, and he felt he might not have cleared the infection completely. He mentioned that he had been sick much more than usual throughout the previous winter, with 3-4 colds during the season, one of which lasted several weeks.

He reported feeling "generally less stressed," although some of the stressful circumstances were unchanged. He had noticed night sweats 2-3 times in the previous week, and did not feel particularly well rested. His tongue was still reddish and flame shaped with a dry white coat, but the indent at the tip was no longer visible, and central cracking was diminished. Pulse was still tense but less forceful than previously, with no notable variation between positions.

At this time there were no major changes to my assessments, and goals remained similar, focusing on modulation of stress and inflammation, cardiovascular support, with some additional emphasis on general immune support, including promotion of circulation and lymphatic clearance.

Maintenance tincture formula remained the same. I created the following tea blend, with the herbs to be used as a compress on the spots on his cheek, after being steeped and cooled.

Formula #5, tea:

3 oats, 2 hawthorn leaf and flower, 2 gotu kola, 2 cleaver, 1 yarrow, 1 marshmallow leaf.

We spent a good deal of time talking about use of flavonoid rich plants and medicinal mushrooms as part of a heart health and anti-cancer diet, and as immunomodulants; we outlined a plan for a soup stock the client could make at home, rather than receiving a formula from VCIH, using astragalus, reishi, and turkey tail mushrooms. We also discussed the long-term health consequences of stress, and potential avenues for the client to build in opportunities for relaxation, including a return to regular slacklining, a practice he finds meditative and deeply relaxing, and use of inhaled lavender essential oil, which he already had on hand.

Second follow up visit

Second follow up took place on October 14. The client had taken both the tea and tincture regularly for two weeks, then stopped completely, and had not taken any herbs for several months prior to the visit.

In the preceding two weeks he had developed a recurrence of the previous symptoms of frequent urination, especially at night, with interrupted stream and difficulty stopping and starting, although this time there was no pain and no accompanying digestive disturbance. Again, he had been experiencing a particularly stressful time at work for several weeks leading up to the episode, but his mood had generally been good in spite of the stress. He expressed a desire to decrease use of his blood pressure medication, although he had not changed his dose; he had discontinued regular BP monitoring, but the most recent check had been 135/88. At this time he didn't feel he would be able to commit to regular use of a tea preparation, and requested use of tincture only.

His pulse was tense and forceful, unchanged from previous, and the tongue was pink with red at the tip, a light, dry white coat and a recurrence of noticeable central cracking, now extending into the red area at the tip - again, all suggesting a general condition of heat, specifically in the Heart.

After talking through various options and scenarios, the client requested that we refill his original acute use formula of kava, yarrow, meadowsweet and hydrangea, and to try another round of the following relaxing, hypotensive, anti-inflammatory, antispasmodic formula for cardio and prostate support.

Formula #6, tincture:

4 crampbark, 3 nettle root, 3 chamomile, 3 dan shen, 2 motherwort; 7.5 mL BID, before breakfast and bed.

He committed to participating in his chosen stress-reducing practices of slacklining or moderate exercise a minimum of three times per week. I emphasized that if he decides to move forward with any plan to decrease use of BP meds, he needs to resume regularly monitoring BP as well as talking it through with his prescribing provider.

Case Study: Transman with Sciatica, Post-surgical Pain, and Digestive Complaints

Danielle Rissin-Rosenfeld '14

GS is a 26-year-old female-to-male transgendered man, height 5' 5", weight 165 lbs. I first saw GS in March of 2014. He was rosy cheeked, robust looking with a cheery disposition and kindness to his eyes. His primary goals were to feel less sluggish, reduce sciatic pain, and reduce chest pain from surgery.

At this point he had been taking an injection of Testosterone Cypionate 0.5ml every 10 days for approximately 3 years. After he started taking Testosterone he noticed that his skin was drier, with bumps on his arms and back, and that he had a heightened sensitivity to gluten. His pulses were deep, slow, consistent, and very slippery. They were strongest in the Large Intestine positions, as well as the Gallbladder/Liver position. His Triple Burner/Pericardium and Water pulse (Bladder/Kidney) were relatively weak.

His tongue was pink with a thick, white, cracked coat; moist, scalloped, with a red tip; red along the sides with a furry sulcus that went way off to the right side.

He had just had top surgery(radical double mastectomy) that past December with a supposed 7 week recovery but was still feeling pain on the left side of his chest especially at night and upon waking.

One of his main complaints was that he had sciatic pain down the right side of his body for at least 10 years. The pain ranged from his very lower back, with right gluteal spasms down the middle leg to his knee, especially right before bed. The pain would start off sharp and then gradually become dull, lingering for a while.

Accompanying his feeling of sluggishness, his digestion felt full and stagnant. He complained of feelings of fullness from his throat down to his stomach. His bowel movements were regular but not relieving. He was defecating once a day in the morning, a big log, medium brown with some undigested food in it.

He claimed to have a general fogginess and often felt distant and removed. He had trouble crying which was accompanied by a feeling of fullness and mucus in his throat. Initially he was reluctant to acknowledge his stress, but rated it as a 6 or a 7 on a scale of 1-10. He described his stress manifesting as a slower, anxious overwhelmed feeling. He often found it hard to get out of bed and get moving even though he would regularly get 8 or 9 hours of sleep a night. He also had consistent dull headaches that would last through-out the day. He was always thirsty and unable to feel hydrated even though he drank 18 cups of water a day.

Considering his heavy bogged down feeling, slippery pulse and slow digestion, not to mention his instinct to put others first, it was apparent that he was a classic over-expressed

Earth picture. Another way over-expressed Earth was manifesting was Plum Pit Qi - his emotions getting stuck in his throat, tears that couldn't come as a result of having difficulty with expressing his emotions. Furthermore, the arth imbalance was partnered with Spleen qi deficiency which I characterized by his scalloped tongue, heavy feelings after eating and low energy.

From a bio-medical perspective I assessed him as having compression of the nerves resulting in sciatic pain and pain in the left side of his chest after surgery. I hypothesized that he may have hypoacidity possibly causing heart burn/acid reflux. I also determined him as having poor assimilation and slow metabolism, indicated by his low energy, slow heavy feelings and sometimes undigested food. I also speculated his hepatic function possibly being compromised due to exogenous testosterone and the skin differences and digestive complaints that commenced when starting HRT treatment.

My goals based on my assessments were to prevent extra estrogen activity to protect the uterus and ovaries, general support of liver function, increase assimilation, stimulate digestion, increase water absorption, decrease spasm and pain, support the nervous system, move stagnation (fluid), astringe tissue and protect and heal the mucus membrane. The actions required to meet these goals were bitter, hepatic, lymphatic, anti-spasmodic, spleen-qi tonic, astringent, carminative, expectorant and hormonal modulator.

The protocol:

To start off with I gave GS a topical liniment application of 22ml Lobelia (*Lobelia inflata*) and 8ml Datura (*Datura stramonium*), in a 1 ounce bottle, to be applied generously to painful area as needed for sciatic pain.

To decrease scar tissue and help with the healing process and pain in his chest, I gave him a salve of St Johnswort (*Hypericum perforatum*), Gotu kola (*Centella asiatica*) Yarrow (*Achillea millefolium*), Calendula (*Calendula officinalis*), Arnica (*Arnica montana*) and Ginger (*Zingiber officinale*) with rose geranium essential oil.

To move stagnation, increase assimilation, support his liver, increase bile production and give him a little spark I formulated a tincture. The tincture was made up of 3ml Schisandra (*Schisandra chinensis*), 2ml Codonopsis (*Codonopsis pilosula*), 1.5ml Mugwort (*Artemisia vulgaris*), 1ml Juniper (*Juniper communis*). With a recommended dose of 7.5ml a day to be taken before meals in ½ teaspoon increments, three times a day.

Lastly I gave him a tea to help ease the gut, support the lymph, help modulate hormones and help him better absorb his testosterone.

The tea was made up of: 3g Anise Hyssop (*Agastache rugosa*), 2g Red clover (*Trifolium pratense*), 1g violet (*Viola spp.*). With a recommended dose of 1 tablespoon of tea infused in 1 pint of water, to be drank through-out the day.

For general liver support and overall health I recommended that he consume lots of isoflavones to help support his liver as well as increase the absorption and beneficial

effects of Testosterone. Beyond drinking his tea I suggested that he eat foods high in isoflavones such as soy, miso, peanuts, chickpeas, fava beans, alfalfa and all members of the legume family. And to eat lots of cruciferous vegetables such as kale, collard greens, cabbage, Brussels sprouts, broccoli, cauliflower, bok choy, rapini, turnips, mustard greens, arugula, daikon radishes.

For future consultations I made a note to ask more into his emotional well-being and communication. In the appointments to follow we delved more into his emotional and physical wellbeing.

First Follow-up in May 2014

When GS came in he was obviously tired and he seemed less vibrant than last visit. This time his pulses were weaker, slippery, bouncy and still strongest in the Earth and Spleen positions. His Triple Burner and Water pulses had substantially decreased. His tongue was still swollen, pink with a white coat, red on the sides and the tip, with a cracked coat at the back.

Despite taking adaptogens and building herbs, there are always other factors in life that can deplete and wear you out. He described having more stress in his life and that his sciatic pain had increased throughout the day. He was also experiencing lower back pain separate from the sciatica. Unsurprisingly, as it could be seen in his pulses, he was having a harder emotional time since the last visit. He had changed his dose of Testosterone to .5 ml every week which was a change from his previous dose .75ml every 10 days. He expressed having a harder emotional time since the change in dosing and that he was still having difficulty expressing his emotions and had congestion in his throat. This was heightened by his recent challenges with loved ones and feeling like he was giving so much of himself to them and them not reciprocating.

However, the herbs had made some positive changes. His poop was softer and he was feeling less heavy after eating. His headaches had decreased to one to two times a week and didn't last all day. His chest pain from surgery was significantly better, however he was still a little sensitive in the chest and couldn't sleep on that side of his body. This time I had similar overall assessments to the last time. However, this time I observed an increase in HPA dysregulation with his increase in stress and increase in lower back and sciatic pain.

My additional goals were to reduce his pain throughout the day, help increase his energy and support his adrenals. The added actions to meet these goals were blood mover, anodyne and adaptogen.

The protocol:

I continued him on his initial tincture of: 3ml Schisandra (*Schisandra chinensis*), 2ml Codonopsis (*Codonopsis pilosula*), 1.5ml Mugwort (*Artemisia vulgaris*), 1ml Juniper (*Juniper communis*). With a recommended dose of 7.5ml a day to be taken before meals in ½ teaspoon increments, three times a day.

I continued with the topical liniment for sciatic pain of 22ml Lobelia (*Lobelia inflata*) and 8ml Datura (*Datura stramonium*), in a 1 oz bottle, to be applied generously as needed for sciatic pain.

I adapted his tea blend to be 2pt Damiana (*Turnera diffusa*) 2pt Red clover (*Trifolium pratense*) and 1g violet (*Viola nova*). To be taken 4 tablespoons in one quart of water to be drank throughout the day.

I added an internal day-time pain formula of 1pt Prickly ash (*Zanthoxylum americanum*), 1pt Corydalis (*Corydalis yanhuso*), 1pt Fennel (*Foeniculum vulgare*) and .5pt cinnamon (*Cinnamomum zeylanicum*). This was to be dispensed in a 2oz bottle and taken one to two droppers full, three times a day as needed.

He was really excited about a bliss ball mix, so I gave him an adaptogen powder formula of 3g Eleuthero (*Eleutherococcus senticosus*), 2g Codonopsis (*Codonopsis pilosula*), .5g Cinnamon (*Cinnamomum zeylanicum*).

The bliss ball recipe called for:

2 part powder

1 part oil

1 part honey

Make balls with coconut oil or honey and add coca, hempseeds and bee pollen.

The recipe made three balls a day to eat throughout the work day.

For further support he was about to start seeing a physical therapist the next day which I encouraged. I also suggested to him to stretch before work, sing and continue working with a counselor.

Second Follow-up in July 2014

GS's pulses were definitely stronger and more vibrant this time, present in all positions and flooding in the Earth position. His left pulse was a somewhat tense, whereas his right pulse was still slippery. His pulses were short but still present in all positions.

His tongue was moist and pink. His coat was no longer thick but slight and white and still patchy at the back. The scallops had significantly decreased.

Despite the obvious improvement in his tongue and pulse, GS's stress was still heightened due to stress in the workplace and interpersonal relationships. This had manifested in loose bowel movements, with lighter stools, once a day that were not relieving. He was still feeling bogged down and stagnant. Unfortunately, his chest pain had resurfaced and was keeping him up at night due to constriction. Numbness in his arms and legs had developed when he was partaking in extreme cardio or lifting weights. Furthermore, his joints were feeling achier. His thirst had come back but his headaches had been getting consistently better.

I had the same assessments of him as the previous visits, as it takes a long time to change long-term imbalances and physiological patterns. However, I had some additional goals to

add. I wanted to continue attempting to reduce the pain which would also help in increasing his ability to fall asleep; increase his circulation/decrease numbness; and continue supporting his adrenals to decrease his perception of stress.

The further actions required to meet these goals were antispasmodic, circulatory stimulant, connective tissue tonic and adaptogen.

I decided to stick with the pain liniment of 22ml Lobelia (*Lobelia inflata*) and 8ml Datura (*Datura stramonium*).

I continued with the tea of 2pt Damiana (*Turnera diffusa*) 2pt Red clover (*Trifolium pratense*) and 1g violet (*Viola nova*).

He also continued with his bliss ball mix of 3g Eleuthero (*Eleutherococcus senticosus*), 2g Codonopsis (*Codonopsis pilosula*), .5g cinnamon (*Cinnamomum zeylanicum*)

However, this time I decided to switch up his tincture changing it to 3ml Eleuthero (*Eleutherococcus senticosus*), 3ml Anise Hyssop (*Agastache rugosa*), 3ml Hawthorn (*Crataegus mongyna*), 2ml Solomon's seal (*Polygonatum biflorum*), 2ml Gotu kola (*Centella asiatica*) 1.5ml Mugwort (*Artemisia vulgaris*) and 1.5 ml Rose (*Rosa rugosa*). I increased his dose to 15ml a day with a dose of 1 teaspoon three times a day before meals.

For the future visit I made note of checking in about his digestion, pain, numbness, communication, joints, achiness, sleep and feelings of heaviness and stagnation.

Third Follow-up in September 2014

GS's pulses this time were fairly similar to the last time, except it was no longer flooding in the Earth position and his Water pulses had become weak again. His left pulse was tense and a little constricted whereas his right pulse was slippery, sunken and strongest in the Spleen position. His tongue was puffy, only slightly scalloped, moist, with a heavy white coat that was patchy at the back, and had red papillae and a red tip.

Unfortunately, some new challenges had arisen this time. The whitening toothpaste he was using had swelled up his gums and he wanted some relief. Despite taking the connective tissue tonics, his joints were feeling tender. I related this to the fact that he had been "cleansing" for the past month and had eliminated most protein and fat from his diet. Since starting his cleanse because of his lack of consumption of essential fatty acids and protein, he noticed himself being clumsier and bruising more easily. I suggested that he stop cleansing or at least start eating bone broth and that it would help decrease his joint tenderness and pain.

Still the herbs had been helping him on a variety of different levels. He was no longer being kept awake at night by his chest pain. His perceived stress levels had decreased. (However, I suspected not drastically- his Water pulses were feeling weak and depleted.) His bowel movements were more regular, ranging from two to three times a day, with a nice soft-serve consistency. He was also feeling less physically congested and stagnant.

The numbness in his arms and legs had ceased. His chest pain was feeling a little better but not significantly. He said that the salve was really helping his healing process though and that the liniment really helped with the sciatic pain. Unfortunately the sciatic pain had been

feeling worse and more present. I speculated that there may be an emotional connection to the increase in pain. He confided that he had finally cried but it didn't help much with his feelings of being emotionally congested and self-sacrificing to accommodate others.

Together we came up with some personal goals to facilitate some changes in his life:

1. Making time with the people in his life he felt close to that he didn't feel heard by and voicing his concerns
2. To see a massage therapist
3. Take warm baths with essential oils like lavender, eucalyptus and clary sage
4. To go for a walk three to four times a week

This time I decided to revamp my assessment. It was still clear to me that GS had a lot of over-expressed Earth going on considering his sluggish heavy feelings and self-sacrificing to accommodate others. Elaborating on that overarching assessment, I determined he had damp stagnation because of the thick coat on his tongue, slight scalloping of the tongue and feelings of heaviness and back pain. It also occurred to me that he also had a minor Kidney yin deficiency because of his insatiable thirst and weak water pulses.

Bio-medically speaking, he was still exhibiting classic signs of HPA dysregulation because of his high stress perception, feeling awake at night and not having energy during the day. I thought that his chest pain could be related to internal adhesions and improperly formed scar tissue. His sciatic pain was due to compression of the nerve, which resulted in constriction and spasm. I also believed the swelling in his gums to be inflammation due to irritation.

To help support and shift deficiencies and physiological patterns, I decided that it was important to move his stagnation. I also saw it important to continue to try to reduce his spasm and pain, uplift and support his emotional heart/preservation of voice, support his adrenals/Kidneys and reduce the inflammation in his mouth.

This time I brought forth additional anti-inflammatories, connective tissue tonics, adaptogens and antispasmodics.

The protocol

The tea seemed a little bit bland and not really hitting the spot so I went ahead and bulked it up. I wanted something a little more aromatic and uplifting, as well as something that addressed gut brain connection, that was both nourishing supportive and would help him absorb water better.

His new tea consisted of: 3g Tulsi (*Ocimum tenuiflorum*), 2g Anise Hyssop (*Agastache rugosa*), 2g Wood betony (*Stachys officinalis*), 2g Nettle (*Urtica dioica*) and .5g Rose (*Rosa rugosa*). The daily dose was 9.5g a day infused in one quart of water to be drank throughout the day.

For his inflamed gums I gave him a temporary mouthwash of 1.5 ml Yarrow (*Achillea millefolium*) with one drop of clove oil. Half a teaspoon of the mouthwash was to be diluted in one ounce of water and gargled at night for five to ten minutes.

For his sciatic pain I kept with the liniment of 22ml Lobelia(*Lobelia inflata*) and 8ml Datura (*Datura stramonium*).

As for his chest pain, I gave him two ounces of skin Salve-ation Oil to apply liberally and self-massage one tablespoon onto his chest for at least five to ten minutes.

The Salve-ation oil contained virgin avocado oil, extra virgin olive oil and castor oil. It was infused with Comfrey (*Symphytum officinale*) root and leaf, Calendula (*Calendula officinalis*) flower, Lavender (*Lavandula angustifolia*) flower, Plantain (*Plantago lanceolata*) leaf, Bladderwrack (*Fucus vesiculosus*); with beeswax, shea butter, sea buckthorn oil, hypoallergenic lanolin, rosemary extract and vitamin E.

Instead of giving GS a separate internal tincture for pain, I decided to increase the antispasmodic and lymphatic action in his daily formula. I also wanted the tincture to continue supporting connective tissue and building of his endocrine system, while decreasing his body's perception of stress. The tincture was also intended to decrease the buildup of scar tissue in his chest and help improve cognitive function. All that taken into consideration, I also wanted his formula to be supportive of his liver and healthy absorption of Testosterone.

Therefore, the tincture was comprised of 4ml Schisandra (*Schisandra chinensis*), 3ml Solomon's seal (*Polygonatum biflorum*), 3ml Gotu kola (*Centella asiatica*), 3ml Calendula (*Calendula officinalis*) and 2ml Prickly ash (*Zanthoxylum americanum*).

At 15ml a day, the tincture was to be taken in one teaspoon increments, three times a day before meals.

Lastly, I decided to revamp his bliss ball mix. The scallops on GS's tongue were going down significantly and I wanted to focus more on helping GS increase his energy levels and stamina, so I took out the Codonopsis and replaced it with Maca. To spice it up I gave the mix a little circulatory and heart support by adding in Hawthorn, and have a little more carminative action switching Cinnamon for Cardamom. I also wanted to give GS some of the same herbs that had previously been in his tincture. The bliss ball mix ended up being 2g Hawthorn (*Crataegus mongyna*), 2g Eleuthero (*Eleutherococcus senticosus*), 2g Maca (*Lepidium meyenii*) and .5g Cardamom (*Elettaria cardamomum*). With an increase in the dosing to 7g, equaling 4-6 balls a day.

The only additional advice I gave GS was to put electrolytes in his water so that he could better absorb it. For future consults I made a note to check in on his sciatic pain, chest pain, numbness, joint pain, digestion, thirst and if he ever had spinal damage. I also put it in my back pocket to possibly add turmeric to his formulas for next time.

Fourth Follow-up in October 2014

This time GS's Water pulses had returned. They felt present and strong. They were both slippery and the left pulse was no longer tense. The left side was a little thinner and shorter than the right side. His Spleen pulse was feeling a little tense and the Triple Burner pulse was feeling a little weaker than the rest of the pulses. His tongue was again even less scalloped, with no red papillae and a thick white coat that was patchy toward the back. The tip of his tongue was still red. As before, the whole thing was moist.

It was only a little over a month later and there had seemed to be a drastic improvement. He was excited about the formulas and could really feel them making a difference. He especially liked his tea and said it was soothing and helped balance his nerves. His chest pain had dissipated and hadn't come back at all. The numbness wasn't consistent and would only occasionally come and go. His sciatic pain had flared up again after starting another physically demanding job, but the liniment helped with the pain. The inflammation in his mouth was completely gone.

He was only having headaches sometimes, at the very end of work. But when he drank the electrolytes in his water or switchel when working we wouldn't get any headaches at all. However, he was still really thirsty all of the time.

He had been working on his personal goals. He had some hard conversations and was feeling in a more balanced place in his relationships. His overall stress levels had decreased and he was continually feeling less full and heavy. Overall he was feeling much clearer and more present mentally. He was happy with his herbs and we both decided that he keep with these herbs a little longer to see further transformations and long term effects.

Conclusion

Chronic body pain like sciatica can be a long process in trying to find ways to find relief or heal. In the future I would focus more on moving stagnation, nervous system support and reducing spasm. Future herb consideration would be to add more astringent herbs like meadowsweet, demulcents like marshmallow powder, as well as anti-inflammatories such as turmeric and bilberry. Overall, GS had made amazing progress in the seven months and I am excited to see how that process continues.

Case Study: Seasonal and Generalized Anxiety Disorders with Food Sensitivities, Acne, and Dysmenorrhea

Salix Scoresby '14

LM is a 20-year-old cis-gendered female weighing 115 lbs. She first came to see me in mid-March, with primary complaints of seasonal anxiety disorder and multiple food sensitivities. Client presented as very withdrawn, frequently verging on tears and expressed strong desire to not have a male-assigned observer for our appointment. Family history of anxiety and depression, as well as heart disease, liver disease, breast cancer and obesity. No current medications or severe allergies, although client was taking 2000 IUs vitamin D, 24 oz tea and 5-10mls tincture of Lemon balm daily, as well as 4-6mls daily of St. Johns wort tincture and tea of Skullcap multiple times weekly.

Client described severe SAD, beginning yearly around October for the last 3 years. General high levels of anxiety with depressive symptoms, trouble sleeping, negative self-talk, very low energy, constant fatigue and trouble concentrating, worse in the winter but present year-round. Anxiety was the worst in social situations, and client was also at the time experiencing an almost total lack of community and social support. Acute anxiety manifested as “panicky feelings”, stricture of solar plexus with holding of breath, heart palpitations and stomachache. Former use of medications including Prozac, BuSpar and Clonazepam, while lessening anxiety somewhat, had caused enough negative repercussions to discontinue usage.

In winter 2011-2012 client experienced severe gastritis, concurrent with and possibly triggered by traumatic events. This eventually somewhat resolved, although lasting food sensitivities, which were present previous to the episode of severe gastritis/trauma remained in a much-heightened state. Foods causing adverse symptoms included all grains (esp. wheat), dairy, soy, coffee and alcohol. Results of eating these foods included facial redness, gas, bloating, swollen lymph nodes, and hives; although some of these symptoms (hives, bloating) largely resolved after a round of unspecified antibiotics taken for tonsillitis in 2012. Stress was also attributed as a frequent cause of bloating and non-smelly farts. Client ate a vegetarian diet consisting mostly of vegetables and fruit, with limited protein sources including eggs, peanut butter, nuts and seeds, and some quinoa and beans. Probiotic foods were not part of the client's diet. Stool was described as light brown with undigested food regularly present, and elimination happened 1-2 times per day.

Client's menstrual cycles were somewhat irregular, with menstruation occurring every 35-40 days, although sometimes she would miss one or more months. Period would start brown, turn red after the first day, and lasted for 4 days. Brief usage of oral contraceptives ended in 2011 after less than one year of use. Swollen breasts and acne occurred cyclically.

Tongue was decidedly pale, although the tip was redder with pale dots, no coat and distinct scalloping with a very shy presentation. Sulcus present but unremarkable. Pulse was overall weak and tense, obstructed on the right side and especially deficient in the Triple

Burner, Pericardium, Liver and Bladder pulses. When asked to take a full, slow, deep breath, all pulses became much more forceful and round.

Assessment

I concluded that client was experiencing general stagnation and tension, and lymphatic stagnation with blockage resulting from trauma. All symptoms were worsened by cold as exhibited in her sensitivity to cold temperatures, lack of digestive fire, depression and lack of Fire in demeanor. Windy conditions were also present, as shown by her alternating, sudden symptoms (anxiety attacks, facial flushing) and extreme anxiety. Some symptoms of Blood Deficiency were also present, with pale tongue, spider veins, scanty and infrequent menstruation and vegetarian diet. Her scalloped tongue, history of antibiotic use, presence of undigested food in the stool, multiple food sensitivities and lack of probiotics in the diet led to a high index of suspicion for extreme dysbiosis. Maladaptive stress reactions, anxiety, lack of sleep, low energy levels and lingering evidence of trauma also led me to an assessment of hypothalamus-pituitary-adrenal axis dysregulation.

Therapeutic Plan

Our primary initial goals were to decrease feelings of anxiety and perceptions of stress, increase quality of sleep, increase assimilation of food, build and move blood, improve overall mood and increase quality and quantity of gut flora.

On a more subtle and profound level, I wanted to protect her Heart. I wanted to give her some herbal allies to work through and move on from her trauma, which I felt was a huge part of the overall etiology of her current complaints. In talking about this with her, she agreed with the assessment that a singular traumatic occurrence triggered the appearance or worsening of almost all of her health issues. We discussed using Dan Shen to uncover and confront this, but both agreed that she did not have the resources, both physiologically and emotionally, to go there yet. More gentle approaches, such as blood building and Heart protective herbs and flower essence therapy seemed more appropriate for the time being.

Some other herbal actions that I decided where necessary were anxiolytics, antidepressants, adaptogens, bitters and mucus membrane tonics.

The first formulation that we decided on was a tea consisting of:

- 4g Lemon balm
- 3g Wood Betony
- 2g Hawthorn (leaf and flower)
- 2g Violet
- 1g Calendula

This was infused in one-quart water, to be drunk daily. This tea was focusing on the mind-gut connection, heart protection, lymphatic stagnation and tissue toning.

Our second formulation was an as-needed anxiolytic tincture formula, to be taken in ½ tsp. doses up to 4 times daily. This formula consisted of:

- 2pts Skullcap
- 2 pts Kava-kava

- 2pts Rose glycerite
- 1pt Motherwort
- ½ pt Anemone,
- 7 drops of White Yarrow Flower Essence per 8 oz.

The third formula, a daily tonic tincture, was geared towards blood building, increasing adaptive responses and regulating blood and lymph movement, as well as being slightly bitter and increasing digestive assimilation. It consisted of:

- 3pts Jujube
- 2pts Ashwagandha
- 2pts Burdock root and
- 1pt Burdock seed
- 2pts Mugwort
- 7 drops of Black Cohosh Flower Essence per 16 oz of tincture formula.

This formula was to be taken in 1tsp. doses, three times per day, directly before meals.

We talked about cognitive behavioral therapy and somatic therapy as being possibly helpful in dealing with trauma and anxiety. Unfortunately, because of insurance and financial concerns, this route did not seem likely to happen anytime in the near future. Another adjunctive therapy discussed was to increase proteins and fats in the diet, with more beans and eggs, as well as consuming more coconut and raw olive oils. Probiotics were discussed and options that were easily homemade, cheap, and dairy/soy free were suggested.

First Follow-up, Early May

In our first follow-up appointment, client reported that she was taking all formulas exactly as directed (how often does that happen?!), overall “doing better” with lower levels of anxiety and improved sleep and energy levels. Digestion was “good” for a while, but seemed to worsen after taking Diflucan for a vaginal yeast infection. She reported loose stools and some digestive discomfort. Worryingly, she had not menstruated since early February, and felt a vaguely uncomfortable physical and emotional pelvic stagnation.

My assessments remained largely the same, all symptoms still being extant though lessened. Continued tonification of mucus membranes and building of a healthy inner biome were still main foci, but continued amenorrhea called for stronger blood movers. More color in the tongue and stronger pulses signified that some reserves had been built up, and that an additional focus on moving blood could be sustained.

At first we considered replacing the Ashwagandha in her formula with White Peony. But after some discussion client requested that we keep the Ashwagandha, and we decided upon a separate blood-building and emmenagogue formula to be used for up to two months or until menstruation.

This formula was:

- 4pts Dong Quai
- 4pts White Peony
- 2pts Motherwort

It was to be taken twice a day in 1 tsp.(5ml) doses.

The client had been continuing to use St. Johns wort and Lemon Balm tinctures daily, and at this time requested for it to be dispensed from the apothecary. She had been taking these as equal parts, 5mls two times per day. We agreed to meet again in two months time, and to be in touch in the meantime via email concerning menstruation status.

Second Follow-up, Early July

Client was still experiencing amenorrhea, and reoccurrence of lingering, low-grade yeast infection. Digestion was improving, but undigested food in stool still present. Sleep variable, but she frequently woke up at around 4 AM. Client related that she is not feeling the drastic increase in mood that summer normally brings, but felt somewhat “stuck on a plateau.” She also reflected that she’s often seen a pattern in herself of poor mental health being associated with amenorrhea.

Her tongue remained pale-pink, but had a slight white coat and decreased but still present scalloping. Pulses were overall stronger, especially in the Stomach and Spleen positions, but still quite weak in the Triple-Burner and Bladder positions.

The overall stuckness, poor fat digestion, 4 AM waking and what seemed to me like poor processing of sex and stress hormones made me want to address her liver function, as well as all of the other previous goals. Goldenseal stood out to me as a shining star that could simultaneously address all of this, as well as being a premier mucus membrane tonic. She still had many ounces of her existing tonic formula left, so rather than change it right away I gave her a Goldenseal simple, 1ml BID.

I formulated a new tonic tincture to be dispensed once her old formula was finished off. I changed some ingredients but left some old friends in.

- 3pts Ashwagandha
 - 2pts Burdock root
 - 2pts Mugwort
 - 2pts Schisandra
 - 1pt Goldenseal
- 5mls to be taken before meals, twice daily.

I also made a sitz bath formula for her, to be done daily, consisting of

- 2 pts Calendula
- 2 pts Beebalm
- 1 pt Lavender
- 1 pt Ladies Mantle

Topical vaginal application of sugar-free yoghurt with lavender essential oil was also recommended to help with itching, burning, and to repopulate her vaginal flora.

E-mail Check-In

Two weeks after starting with Goldenseal, client reported some spotting, but no actual menstruation. Sitz bath use was inconsistent at first, but when she did use it everyday for a week, in conjunction with topical yoghurt, her yeast symptoms cleared up.

In mid-August, client had a normal menstrual period with 5 days of bleeding, with 2 days of spotting on either side. Around this time she also finished off her old tonic tincture formula, and began taking the new formula with Schisandra, Goldenseal etc.

Third Follow-up, Late October

The first thing I noticed at our third follow-up appointment was a huge change in demeanor compared to our first meeting. She was outgoing, visibly more relaxed and talkative, laughing and seemed much more comfortable with herself. She reported that her normal seasonal depressive pattern felt completely absent, that anxiety levels were very low, mood was overall good, and she was able to let go of repetitive negative thoughts rather than focusing in on them. Client was also having a much easier time socializing, and her sleep was “mostly better.” Her digestion was “good,” with zero undigested food in the stool, and a newfound ability to eat foods that she had previously been very sensitive to. Her period had been largely regular since August, with the exception of one cycle being almost 10 days later than normal. Yeast symptoms were mostly gone with mild flare-ups premenstrually, which she managed by applying a mix of coconut oil and lavender essential oil. She exhibited noticeably less acne and said her skin felt “much better.” Her diet remained largely the same, with the addition of some alcohol (1-3 drinks, once a week), and a cup of coffee on most days (which caused immediate facial flushing). Her skin was fairly pale, and menstrual bleeding, while present, seemed still deficient. We both agreed that she was possibly anemic, as she had switched vitamins to one with less iron and felt paler and more fatigued since, as well as very easily bruising.

Client expressed feeling so much better overall, that she was able to realize and address some long-standing issues that had been overshadowed by the more pressing problems she had been experiencing for years. She described chronically swollen and painful tonsils, which she reported one otolaryngologist had described as “big and nasty.” Upon visual examination, they were indeed larger than average, with the right side being so swollen that the uvula was pushed to the left about half an inch, but with no obvious pits, whiteness or signs of infection. She also expressed being sick of her tea blend, and that she felt ready to tackle the blood-moving and possible emotional volatility that Dan Shen can cause, and that she’d like to include it in a new formula. She had recently dug up and eaten some Dan Shen root, and described it as “delicious.” She also had some concern about continuing to take Goldenseal, so we decided that we would switch it with Dan Shen in her daily tonic formula.

Tongue remained the same though slightly paler. Pulses were across the board noticeably stronger and less tense, with especially notable improvement in the Triple Burner, Liver and Pericardium positions.

The new tea blend that we decided on was still focusing on anxiolytic and lymphatic properties, and consisted of a base of

- 3pts Wood Betony

- 2pts Anise Hyssop
- 2pts Violet
- 2pts Linden,

which leaves plenty of room for her to add in whatever other herbs or flavors she feels is appropriate for herself on any given day.

Her daily tonic tincture formula remained the same, as mentioned, but with 1pt Dan Shen rather than Goldenseal.

A lymphatic gargle was made for her swollen tonsils, being a tincture of

- 2pts Cleavers and
- 2pts Spilanthes
- 1pt Red Root

with instructions to mix 5mls with 1 oz of water to gargle and swallow twice daily.

An additional formula was made to further address her ongoing poor tissue integrity and anemia, continue to support digestive function, and both build and move blood. This was a powder of

- 4pts Nettle Lf
- 4pts Codonopsis
- 3pts Gotu Kola
- 2pts Dong Quai
- 1pt each of Rose
- 1pt Cardamom.

She was instructed to mix 5g daily into yoghurt, smoothies, bliss balls or electuaries.

Throughout the year of my relationship with this client, many measures were taken to ensure her own continuing education about her body and the plants. As she is also a student of herbal medicine, I wrote her between sentence and a paragraph about each herb that I included in her formulas. We also talked about multiple different nutrition strategies, including thinking about affordable ways to get more of a variety of foods into her diet-work-trade on farms, gathering wild foods, going to local food banks, and dumpster-diving fresh produce from local grocery stores (I like to call this “advanced gleaning”). Counseling was recommended, and we had some discussions about the ins and outs of applying for state healthcare to get these services covered, although ultimately she decided not to pursue that route.

Case Study: Fibromyalgia with Chronic Fatigue, Digestive Issues, and Dysmenorrhea

Anna Powell '14

My client is a 23-year-old cis-gendered female, 5'6", 130 pounds. Her primary goals in seeing an herbalist were to improve energy, understanding and addressing her autoimmunity, and addressing her irregular and short menstrual cycles. She also had some digestive complaints, a history of Lyme disease, chronic pain, and fatigue.

She was currently taking vitamin D and fish oil but no medications. Past medications included Flexeril (muscle relaxant), Prevacid (proton pump inhibitor), and Prilosec (proton pump inhibitor).

At our first meeting, she reported an allergy to gluten and dairy, and had tried many restrictive diets. She ate mostly local food and prepared meals at home. She ate three times per day, with snacks after work. She had daily consumption of coffee, eggs, nuts and seeds, fruits, greens and other vegetables. She consumed red meat and beans weekly, and alcohol bi-weekly.

She reported her primary emotions were joy, stress, over-tiredness, and low energy. Her stress levels were: work-3, health-5, and social/family-4, on a scale of 0-10 (0 being low stress, 10 being very high).

Initial consultation: July 1, 2014

Client reports having Lyme disease at ages 5, 7, and 11 with severe symptoms. She took medications each time and began developing "digestive issues" such as feeling sick to her stomach and food sensitivities. By middle school, she was experiencing intense acid reflux, which she was put on medication for and was then unable to keep weight on. By high school she had bad acne, flakey skin, and ongoing digestive issues. She tried different food elimination diets and concluded allergies to both gluten and dairy. The dairy was more serious and would cause pain within 5 minutes of consumption. The gluten was not as quick, but over time would lead to loss of energy, weight gain, and flu-like symptoms. During a stressful period in 2009 while in college, she was diagnosed with Fibromyalgia (FM). She was experiencing pain and soreness where there was "nothing" and was sleeping but "always tired". She was put on muscle relaxers, which she took till 2011, and medications for the FM which she stopped taking due to associated nausea.

In the past few months she has been re-experiencing many of the FM symptoms, including soreness, exhaustion, and phantom pain in arms and legs. She is unsure if the pain is from Lyme or from another source. Her current job requires early mornings and active physical work. She has a history of sleep disturbance and uses sleep aids including *Cannabis sativa* tincture to alleviate pain and help in "shutting down" her mind at night. With this, she falls asleep fast and sleeps till the morning, but has a lot of difficulty getting up. During the day, her energy levels feel lacking. She is able to make it through the workday with a peak of

energy between 10:30am and 1:30pm, but once home she has no energy for much else and by 7pm she reports being “done”. On the weekends, she loves hiking, but if she exerts too much energy she feels “messed up” the whole week. On sunny days and in the summer time, she usually feels better. Winters are hard because of increase in pain, lack of energy, and a tendency towards Seasonal Affect Disorder (SAD). She has tried taking Vitamin D, with slight improvements.

She describes her immunity as being better now than it has ever been. Throughout college and childhood she describes always catching the bugs going around and getting them worse than others. She reports getting strep and sinus infections every winter and the most recent winter was the first she did not get take antibiotics. She gets at least one stomach bug in the winter and was out for a week this past year with one.

She eats well and describes the last year as being the best she’s ever eaten. She occasionally eats dairy and gluten, which lead to diarrhea and lighter stools (dairy especially). Since last August/September she has noticed a change in her bowel movements to being more routine, a darker brown and semi solid. She still has a lot of odorous flatulence, gas pain in the lower and middle abdominal regions, and burping. She describes having a strong appetite and feels sensitive to hunger levels.

Stress manifests in the solar plexus region, leading to cramping and nausea, as well as constriction and tension in her chest and back, leading to shallow breathing. When she is stressed she states wanting to sleep more, being tenser, and having more body pain.

Over the last 5 months, her menstrual cycle has been shortening substantially. Before March, she had a regular 28 day cycle, but since then her cycle has been shortening a few days each month and is now down to 17 days. She describes experiencing more swelling and bloating, lasting most of the month, significant cramps and breast tenderness, and more vaginal discharge. She bleeds for 5 days and describes having a heavy flow for 3 of them (emptying a diva cup every 1.5 hours). She describes the bleeding as being heavier for longer now with the cycle changes.

In the fall, she is starting graduate school and predicts that it will be stressful and feels concerned about symptoms of FM increasing.

Physical Presentation

Client presented with tired, blood-shot eyes with dark circles underneath. Her pulses were rapid, tense and thin with weaknesses in third position in both arms (Fire- Triple Burner/Pericardium and Water Bladder/Kidney). Yin pulses on the right hand side were very thin and deep. Her Fire- Small Intestine/Heart pulses felt echoic-y and were weak in the yang position but a bit flooding in the yin position. Her tongue was pale to pink with red tip and edges that looked irritated/burnt. It had a slight dry whitish coat, a cracking sulcus in the back 2/3rds, swollen appearance in the middle area, and quivering. Overall the tongue was dry and irritated looking.

Assessment

Client was assessed as having an irritated tissue state as well as yin, immune, adrenal and hormonal deficiencies. Physiological processes contributing to the energetic pattern include dysbiosis impacting immunity; hypersensitivity, stress and tension impacting adrenals/cortisol and other hormones, immunity, digestive function, and pain levels.

Goals set included

Supporting digestion, repairing tissue; decreasing inflammation; supporting hormone balance (esp. estrogen); supporting liver function; decreasing tension; improving circulation; supporting adrenals and helping to improve energy levels; and supporting the immune system.

Herbal actions needed to meet these goals included

Nervines, adaptogens, antispasmodics, carminatives, vulneraries, bitters, hormonal modulators, immune modulators, and anti-inflammatories.

Supportive strategies included:

-Digestive Reset: 1 week of goldenseal tincture (1ml BID) to clear out any pathogenic factors that maybe contributing to digestive issues before starting to heal the GI; followed by GI vulneraries (Slippery elm powder, 1.5 tsp QD) for 2 weeks to begin the healing process

This was followed by:

- A carminative, GI supporting, relaxing tea (2pts meadowsweet, 2pts calendula, 2pts skullcap, 2pts lemon balm, and 1pt fennel- 10g a day) to continue to help with the healing of the GI as well as aid in digestion and help decrease perception of stress
- Building, nutritive Bliss Balls with immune, adrenal and hormonal support (2pts maca, 2pts licorice, 2pts shatavari, 1pt nettle, 1pt hawthorn, .5pts cinnamon- 8.5g a day made into bliss balls)
- A daily tonic tincture (3pts eleuthero, 2pts black cohosh, 2pts sarsaparilla, 2pts wood betony, 1pt dandelion root- 5mL BID) that is a nice gentle bitter formula to further aid digestion and hepatic function, as well as being supportive of the endocrine, nervous and immune systems, and helping to decrease rheumatic pain and spasm

The client was also encouraged to:

- Take probiotics and eat fermented foods to help rebuild good gut flora
- Eat good fats to help build and moisten the body while supporting neuroregeneration and healthy hormone production and lessening inflammation
- Eat bone broth to help heal the GI and support joints, tendons and immune system
- Add turmeric and other flavonoid rich foods to diet, to help with inflammation and support neuroregeneration
- As well as making sure to get proteins, minerals, and vitamins through continuing to eat lots of good vegetables and meats

Follow up: October 20, 2014

Client came back for a follow up 3 months later and after starting graduate school. She reported the experience with the goldenseal as being “intense” with lots of “pooping”. She

followed it with the slippery elm and reports having a more sensitive stomach for almost a month with more frequent bowel movements that fluctuated from loose to solid. She also followed the goldenseal with probiotics for one month and has been taking “good belly” every day, as well as increasing her intake of sauerkraut, fermented dilly beans, and miso. Now, she accounts her stomach feeling “so good” and her bowel movements have evened out to be well-formed stools 80% of the time with some looser stools. She reported multiple bowel movements a day with some undigested foods (i.e. quinoa). She also reported a decrease in gassiness with some stomachaches still occurring with “stress eating” and snacking.

Her periods have become more regular and although still short, they have consistently been 21 days. She reports less bloating, no cramps, less vaginal discharge (only for 2 days now), and not as heavy of a flow.

Client describes school as stressful and she communicates still having stiff and achy body pain and fatigue symptoms. She has been stretching and doing yoga daily to help, but does not feel like it is “making a dent” rather just “preventing”. She reports feeling exhausted all the time and has not been able to sleep as much as she’d like, due to the heavy workload. She has been sleeping 5-6 hours a night with short naps and reports having stress dreams with anxiousness and exhaustion upon waking. In the classroom setting, she describes experiencing brain fog and trouble paying attention.

Client requested something to help with pain relief and to “wind down” at night as well as something to take during the day as needed for stress.

Physical Presentation

Client presented with dark circles under her eyes. Her pulses were still thin and still weaker in the third positions, although the yin pulses had more force to them. Her metal pulse was the strongest of all the pulses. Her tongue was pink with red edges and some scalloping. The body of the tongue appeared thick. It was still very quivery, but not as irritated looking. The coat was colored by hibiscus tea.

Assessment

The assessment made was an irritated tissue state with yin, immune, adrenal and hormonal deficiencies impacted by stress and dysbiosis. The irritation in the GI seems to be decreasing with the use of herbs, probiotics, and dietary interventions. The hormonal picture seems to be shifting in a more favorable way as well, but still shows signs of deficiencies.

Goals include

Continue to support digestion; support hormones and liver function; decrease tension and increase circulation; support adrenals; support immune function; decrease perception of stress; improve sleep; modulate pain and inflammation.

Actions needed to meet these goals include

Nervines, adaptogens, antispasmodics, carminatives, bitters, vulneraries, anti-inflammatories; immune modulators; hormonal modulators; circulatory stimulants; sedatives and anodynes.

Client was offered

- As needed pain and sleep formula (3pts Jamaican dogwood and 2pts valerian- 5mL PRN and before bed split into ½ doses ½ an hour before bed and just before bed) to help ease tension, spasm, perception of pain and improve to sleep
- As needed stress formula (1pt skullcap, 1pt viburnum, ½ pts rose- 2.5mL as needed up to 5 times a day) to help decrease clients perception of stress and reduce stress related spasm and tension
- Daily tea to support digestion, stress, and tension as well as circulation (2pts nettle, 3pts chamomile, 3pts linden, 2pts tulsi- 10g QD)
- Building nourishing bliss balls (3pts eleuthero, 3pts shatavari, 1pt hawthorn, ½ cinnamon. ½ ginger- 8g QD made into bliss balls) to continue to nourish the body while increasing the body's resistance to stressors and supporting the immune system and circulation
- The daily tincture was split into two formulas- an A.M. and an afternoon formula
 - AM formula (2pts rhodiola, 2pts licorice, 1pt oats- 5mL QD) to help support energy levels and prevent immune depletion while feeding the nervous system and supporting the adrenals. The licorice and oats also moisten and warm up the coolness and dryness of the rhodiola.
 - PM formula (3pts wood betony, 3pts dong quai, 2pts sarsaparilla, 2pts gotu kola- 5mL BID) to build blood, improve circulation, decrease stress and its impact on digestion as well as the rest of the body, to support mental facilities, as well as continue to decrease rheumatic pains

Other supportive strategies:

- Discussion was had on use of topical cannabis oil for pain
- Client was encouraged to continue eating fermented and probiotic foods, and mineral rich foods, as well as anti-inflammatory omega3s, turmeric, and flavonoids.

Follow up (by phone): December 4, 2014

Client just finished final exams 2 days ago, which was reported as “very stressful”. Between the cold weather, not enough sleep (for the last 2 weeks) and the stress of school, her body pains continue to be intense with lots of achiness, especially in hips and knees, and fatigue. She did report that the stress does not seem to be affecting her digestion as it has in the past, but she still feels tightness in her chest and back pain between her shoulder blades. Historically in very stressful times, she reports becoming disengaged along with low energy, and feels she is now able to be productive despite the tiredness, which feels like an improvement. She also stated that “every year” in the past she has gotten a sinus infection at this time of the year as well as strep throat, and this year she has only experienced a 24-hour stomach bug where she was nauseated and vomiting for 12 hours but woke up the next morning feeling much better and was able to eat food.

She reports her digestion continuing to be good and the moments when it is “not good” are reportedly due to eating foods she “can’t digest” (like dairy). She is experiencing regular

bowel movements 2 times a day with no undigested food seen in them (she is also avoiding quinoa now). She feels less gassy in general and the gas pains are rare now even when eating “bad food”.

Her menstrual cycle has been 25 days the last 2 cycles, bleeding still lasting around 6 days with heavier bleeding the first day. She reports less bloating and less breast tenderness. During her last cycle she did experience some cramping the first day and “really clotty and dark red blood”.

Client accounts some brain fog and trouble with attention still in the classroom setting, but feels that maybe it is just not the environment she thrives in. Next semester, she is planning on taking one less class so she can have more time for sleep and less stress.

Client reports taking the PRN stress tincture one or less times most days, unless “it’s a really bad day” where she has taken it multiple times and reports feeling some calmness from it.

When she does use the sleep tincture, she reports feeling more “settled down” and some of the aches are calmed, but over all she still reports feeling “really achy”.

Client reports running out of some of her formulas recently, but waiting to refill them in case changes were made to the formulas. She describes enjoying the bliss balls and the tea, taking them both every day. She has also been taking her morning tincture most mornings and does find she feels more awake half way through breakfast. She has been using her after-noon tincture 1 time a day with dinner rather than with dinner and lunch. It was suggested to put a smaller amount of tincture into a smaller bottle so it could fit in her bag and be more accessible, which seemed to feel like a good idea to her. She also reports continuing to eat fermented foods, like miso and kombucha, as well as the Good Belly product.

Overall the client feels satisfied with the formulas the way they are and would like to continue with them for a while and see what happens with some more consistency on her part and some lifestyle changes, like more time for sleep. The formulas seem to be helping with hormonal, digestive and immune support, as well as few changes seen in body’s ability to cope with stress and energy levels. The client felt that the one area she continued to need support with was pain, so the previous sleep/ pain formula was reformulated.

To enhance circulation during the colder months, hydrotherapy- warm water baths, lavender and yarrow footbaths was also suggested.

Prepared Rehmannia (3 parts) was added to the PM formula in place of Dong quai to provide more support for adrenal recovery.

Dong quai (1 part) and codonopsis (2 parts) were added to the Bliss Ball formula as well.

Pain Formula: (4 pts Corydalis, 3 pts Jamaican Dogwood, 3 pts Kava- 5mLs PRN up to 4 times a day) anti-inflammatory, analgesic, muscle relaxant and sedating

Discussion

I wrote about this case because I found the progression of symptoms interesting. It felt to me as if the long term dysbiosis due the use of antibiotics and proton pump inhibitors contributed to the later occurrence of fibromyalgia-like symptoms. It's hard to say if chronic Lyme could also be part of the picture, but I decided to approach this case first by trying to support the gut flora and reduce the irritation of the mucus membranes. The dysbiosis seemed to be effecting not only digestion, but also having a big impact on the immune system. Since stress seemed to be a big trigger for body pain and exhaustion (not to mention its impact on the little gut bugs), it felt important to try to reduce the perception of that as much as possible. Stress appeared to lead to tension and inflammation in the body, so antispasmodics were used along with anti-inflammatories and nervines (with particular affinities for the digestive system). The client also appeared to be putting a strain on her adrenals, which was affecting her immune system, energy levels and hormone production (manifesting in irregularities in the menstrual cycle). Adaptogens were used to rebuild the depleted state, while supporting the whole body and its ability to cope with stressors. Formulas were made with warmth and moisture in mind to fit the client's constitutional picture.

Despite a rough start with the goldenseal, the client stuck with the herbs and upon follow up three months later reported improved digestion and a shift in the positive direction with their menstrual cycle. Probiotics and dietary changes also contributed. However, the client had begun graduate school and the stress was continuing to exacerbate the fibromyalgia-like symptoms and exhaustion. A request was made for something to help with pain, anxiety, and sleeping at night and for anxiety during the day. The remedies given were antispasmodic nervine formulas, and for sleep, pain-relieving sedatives were added. The other formulas the client was offered remained focused on nourishing the body, especially the adrenals and the nerves, while continuing to support and soothe the GI, liver, and immune system.

A phone consultation follow-up occurred 2 months after the 2nd meeting. The client had just finished finals for the semester and was feeling the effects of the cold, stress and lack of sleep, manifesting as stiff and achy body pains and fatigue. Despite the tiredness, the client seemed to be able to work through it whereas in the past she described it being more defeating. Her digestive system also appeared to be less effected by the stress than it has in the past. Her immune system appeared to be strengthening, based on historic sinus infections, strep throat, and stomach bugs this time of year. She reported catching a stomach bug, which only lasted a day, whereas in the past they seem to have had much longer effects on her system. The client also reported that her periods continue to increase in length (up to 25 days now) rather than the former trend of shortening cycles, with less bloating and tenderness. After discussion on how to continue working together, the client felt that she would like to remain working with the current herbs (with a few slight changes) and see what happens with time and consistency. The as-needed pain remedy was reformulated due to the persistent and intense effects the pain was having on her

everyday life, with the hope that the adaptogens and other herbal support will over time help shift the overall picture and eventually she will need the formula less and less. Lyme continues to be a possibility in this case and needs to be ruled out.

Case Study: GERD, Stress, and High Blood Pressure

Emily Peters '14

Client History and Subjective Data

The client N.U. first came to clinic in June 2014. He is a cis-gendered male, 37 years old, 6" tall, 165 pounds. His primary concerns were symptoms of Gastroesophageal Reflux Disease (GERD), high blood pressure, and chronic fatigue.

His GERD symptoms at the first visit were occurring daily and included frequent belching, a burning sensation in his throat, and a sore throat with hoarseness. He had been taking the proton pump inhibitor Omeprazole for 8-10 years for the GERD and had stopped one year prior. The symptoms were relieved when he took Omeprazole; he could eat anything, though he suspects that Omeprazole damaged his stomach. He also has a history of anxiety attacks, sometimes with feeling of his throat closing. When he stopped the Omeprazole one year ago, he started on a Magnesium (Mg) supplement and the anxiety improved, though his GERD symptoms returned. He was given digestive enzymes by a naturopathic doctor, which had made the symptoms worse, and he stopped taking them. Other things that made it worse were acidic foods, water, spicy foods, greasy foods and stress. He said chamomile tea and exercise helped. He has a history of alcohol and substance abuse for 10-15 years previously, which he suspects contributed to developing GERD.

He presented with high blood pressure, averaging at 130/90 in the AM and 140/100 in the afternoon. He had occasional angina and a history of palpitations and hemorrhoids. He had a family history of varicosities, but no family history of high blood pressure. The heart palpitations were resolved when he started taking the Mg supplement one year ago. He had high blood pressure for 7 years, and had taken 10mg Lisinopril (an ACE inhibitor) daily for 5 years as prescribed by his MD for high blood pressure. He stopped taking this about a year previous because it stopped working. I inquired about his exercise, and he said he tried to walk for an hour each day, but wasn't doing any rigorous cardio exercise.

His stress levels were very high, he described it at a level of 8-9 out of 10 for the last few years. His stress was mainly about his child and finances. He felt a lot of tension in his whole body. Higher levels of stress triggered GERD, angina, agitation, difficulty breathing and lower back pain, and anxiety attacks before he started taking a Mg supplement. He felt constant fatigue daily for the past 3-4 years, and was sleeping 8-10 hours every night. His ways of coping with stress were to take a walk or smoke cannabis.

His diet was fairly rich in meat and other protein sources, and deficient of vegetables and good fats. We talked a lot about a diet rich in a rainbow of fruits and vegetables, anti-inflammatory fruits like blueberries, and good healing fats like fish oils. He generally ate quickly. He drank about a gallon of water each day. His bowel movements were healthy and regular, though tending towards looseness of stools.

He had popping and grinding joints in his elbows, ankles, knees and shoulders that he felt was caused by a history of construction work. His body aches with physical work and he has some back pain from an injury.

The client had IgG tests for Lyme that were neither conclusive nor positive.

Objective Data

The client presented with a pink complexion and a tense, uncomfortable posture. His tongue was pale to pink, with red sides over the Liver and Gallbladder. The coat was white and only present towards the back. Overall his tongue was dry and scalloped with deeper cracks in the middle and shallower cracks on the sides. There were some swollen papillae or taste buds in the back. His pulses were rapid, somewhat weak, and showed poor heart-rate variability with the breath.

Assessments

His dry tongue, weak pulses, deficient diet, anxiety, and grinding joints point to dryness and Yin Deficiency. His high blood pressure, deficient but rapid pulses and pink complexion point to a Deficiency Heat or False Heat. I assessed some excess Wood element, with Liver tension because of his overall stress and tension, as well as the red sides of his tongue and history of drug and alcohol abuse. I suspected HPA (hypothalamic-pituitary-adrenal axis) dysregulation secondary to long term stress, leading to exhaustion and tension, and aggravating his blood pressure, GERD and angina. I suspected the GERD to be secondary to stress and long term drug and alcohol use, possibly with excess HCl shown by the aggravation from digestive enzymes. He showed signs of tissue irritation and inflammation in the throat from GERD, and inflammation in the cardiovascular system shown by high blood pressure, rapid pulses, and poor heart-rate variability. I assessed his high blood pressure as being secondary to stress, a lack of exercise and a history of alcohol, drug and tobacco use.

Herbal Protocol

The goals based on the assessments were: support the heart and cardiovascular system, reduce endothelial inflammation, reduce stomach acid and improve tissue integrity of the esophagus, support the HPA axis and reduce perception of stress, improve energy levels and moods, and tonify and build the Yin (moisten, nourish, cool). The herbal actions required were: anti-inflammatory, tissue tonic/vulnerary, hypotensive, nervine, adaptogen, yin tonic, blood mover and cardiotonic.

His temporary formula, to be taken for stress until his tonic formulas were ready, was:

- 2.5ml Chamomile
- 2.5ml Hawthorn
- 2.5ml Linden
- 2.5ml Motherwort

Dose: PRN (as needed) for stress and anxiety, 2ml up to 5x/day.

His tonic formulas, dispensed a week later, were the following:

GERD and stress relief tea:

- 2g Meadowsweet
- 2g Chamomile
- 2g Tulsi
- 2g Marshmallow leaf
- 2g Linden

Dose: 10g/day, infused in 1 qt water for 20-30 minutes, and to be drunk throughout the day.

Adrenal supportive, tonic, hypotensive, nervine tincture:

- 4ml Hawthorn
- 3ml Reishi
- 3ml Ashwagandha
- 3ml Motherwort
- 2ml Yarrow

Dose: 5ml TID (3x/day).

Dietary and Lifestyle Recommendations

- Vigorous exercise to raise his heart rate for at least 20-30 minutes 5x/week, as a tonic for the cardiovascular system
- Blueberries or bilberries daily, as an anti-inflammatory and tonic for the cardiovascular system.
- Fish oil supplement, as an anti-inflammatory
- Eat a variety of vegetables daily, of different colors, as an anti-inflammatory and for essential vitamins and nutrients
- 3 meals a day and slowing down to eat, to get enough nutrients, and have a relaxing and grounding time
- Yoga or meditation practice for promoting relaxation

Follow-up

He came in September, three months later, for a follow-up. His GERD symptoms were resolved as long as he drank the tea and avoided the aggravating foods. He still had high levels of stress but felt much more able to deal with it; he felt not as quick to freak out, with less depression and clearer thinking, though he still felt fatigued daily. His blood pressure was not significantly changed, though it seemed lower on average. He admitted that he hadn't done much of the diet and lifestyle changes for his health. He was taking the tea daily and the tincture twice daily.

His primary concern at the follow-up was the onset of neuropathy symptoms such as burning behind the legs; tingling and numbness in the head, arms and legs a few times per week; frequent sensitivity to light in his sight; frequent urination at night; and pressure in the back of his head. He was also having trouble sleeping. He suspected the development of Multiple Sclerosis as a possible cause of these symptoms. He said he was going to see his doctor for a referral to a neurologist. In the meantime, we decided to increase support for his nervous system. He also asked for more of his herbs to be in bulk instead of tinctures, to reduce costs.

I agreed that the neuropathy symptoms resembled early Multiple Sclerosis (MS). I was not comfortable to begin a full-on MS protocol without a clinical diagnosis by a neurologist, and recommended for the client to see a neurologist for testing and diagnosis.

The same assessments as before include: yin deficiency, HPA dysregulation, cardiovascular inflammation, and musculoskeletal tension. New assessments include: Spleen Qi deficiency (scalloped tongue, thick coat and a history of Omeprazole); neuropathy and nerve sensitivity (numbness, tingling, sensitivity, frequent urination, trouble sleeping); and general Qi deficiency (chronic fatigue, depression).

Goals and actions were the same as previously, with the addition of using Spleen Qi tonics and bitters to support Spleen Qi and digestion, neurotrophorestoratives and neuroprotective herbs to support the nervous system, sedatives and adaptogens to improve sleep, and more antispasmodics to reduce musculoskeletal tension. The tea formula remained the same, to reduce inflammation in the GI, reduce GERD symptoms, and reduce perception of stress.

We switched the tonic tincture for a decoction for cost effectiveness, to balance the HPA axis, tone Yin and Spleen Qi, reduce inflammation, and support the cardiovascular system:

- 3g Ashwagandha
- 3g Hawthorn
- 3g Codonopsis
- 2g Reishi

Dose: 11g/day, as a decoction in 1Qt water.

A new nerve tonic, antispasmodic, sedative tincture was added, to be used for acute neuropathy symptoms or before bed to support sleep:

- 3ml Oats
- 2.5 ml Passionflower
- 2.5 ml St. John's Wort
- 2ml Blue Vervain

Dose: ½ tsp. as needed up to 4x/day.

Other recommendations include all from the first visit, plus a referral to a neurologist. I educated the client to identify, harvest and process Hawthorn berries.

We had a phone check in one month later, and the client reported that the neuropathy symptoms were getting worse, and his BP was going higher. He hadn't continued taking the decoction and nerve tonic tincture past the 2-week samples. He was still taking the tea regularly and was very grateful for the relief of GERD symptoms. He said he planned to continue the tea. He advised me that he was going to seek out other practitioners to look into possibly heavy metal toxicity or Multiple Sclerosis to address the neuropathy and fatigue, and he did not expect to come in for another follow-up. He also had moved to Massachusetts and it was much less convenient to come in to VCIH.

Discussion

The client initially was the most concerned with his GERD and high blood pressure. The tonic formulas seemed to help when he was taking them. When he stopped taking the herb formulas, sometime after the follow-up, the symptoms returned. The GERD symptoms returned if he didn't drink the tea. I suspect that if the client took the adaptogens, nervines and hypotensives long-term then he would have seen more significant changes in his blood pressure, moods and energy.

The client was looking for answers for his unexplained neuropathy, which I wasn't able to provide, as I don't have the tools or the scope of practice to diagnose neurological conditions. It would have been interesting to find out what diagnosis he received from a doctor, and whether herbal support could have been helpful for him.

Overall, this case was interesting because it showed successes and limitations. The use of herbs instead of proton-pump inhibitors for GERD was successful, having a supportive effect for digestion instead of inhibitive. The limitations that I found were in the client's willingness to take the herbs consistently, and in the difficulty of being the first line of support for someone with undiagnosed neurological symptoms.

Pathophysiology and Therapeutics

Gastroesophageal Reflux and Fat Malabsorption in Cystic Fibrosis: A Unique Opportunity for Digestive Bitters

Mica McDonald '16

Cystic fibrosis is an autosomal recessive genetic disease that effects mucus production in the epithelial tissues of the body, leading to disorders of the lungs, sinuses, digestive system, exocrine and endocrine pancreas, and other organ systems¹. The long term use of stomach acid-lowering drugs such as proton pump inhibitors (PPIs) in the cystic fibrosis (CF) population, both adults and children, has been common for approximately 20 years. Today, more than 50% of CFers are using PPIs². They are used for two main reasons: to treat gastroesophageal reflux and to improve supplemental pancreatic enzyme activation, particularly lipase. However, there are flaws in the reasoning for use of acid-lowering drugs in both of these situations. Firstly, the predominant cause of reflux in both CF and non-CF populations is not excessive secretion of stomach acid but dysfunction of upper gastrointestinal (GI) motility and secretions³, and further reducing gastric acidity with PPIs or antacids will further exacerbate reflux, causing a dependency on the drugs and worsening symptoms over time. Furthermore, the long-term use of PPIs has significant and far-reaching side effects that can negatively affect CF prognoses. Secondly, although several preliminary studies have demonstrated that the pH of the duodenum can be too low to provide the right environmental for supplemental pancreatic enzyme activation, it is not completely clear that bicarbonate secretion is inadequate in all cases, even if steatorrhea is present. A 2014 Cochrane Review of the use of PPIs in CF found that related clinical trials were not only biased, but showed zero or overall insignificant improvement in gastrointestinal symptoms⁴. In fact, there may be other mechanisms at play within the duodenum that cause steatorrhea and contribute to low duodenal pH, namely inadequate bile secretion, possibly due to a diet low in bitter plant constituents. Here, I will discuss the issue of gastroesophageal reflux disease (GERD) in CF and the negative consequences of using PPIs to treat it. I will also discuss the many negative side effects of long term PPI use in the CF and general populations. In addition, I will discuss the low bicarbonate theory in its relationship to pancreatic enzyme activation, and how the use of PPIs may not be helpful in this situation. Lastly, I will discuss the role of bitter plant constituents in stimulating release of GI hormones and bile in the duodenum, their relationships to macronutrient absorption, and how the use of bitter tastants in the CF population may kill two birds with one stone: addressing GERD by correcting gastric sphincter function and GI secretions, and improving lipase activation by stimulating release of bile which emulsifies fats and stimulates bicarbonate secretion.

Gastroesophageal Reflux Disease

Gastroesophageal reflux disease is a common complaint in the CF population. Possible causes for the prevalence of GERD include frequent antibiotic use (for treatment of respiratory infections) that disrupts the gastrointestinal microbiome⁵, and the Standard American Diet and CF diet recommendations. These diets are high in low-quality fats (i.e. industrial seed oils) and refined carbohydrates, guaranteeing a shift in the gut microbiome⁶ that can also contribute to GERD. Another likely contributing factor of GERD in CF is a low-plant diet. In terms of GERD treatment, the use of PPIs and other acid-lowering drugs actually makes GERD worse over time and significantly increases the likelihood of patients becoming increasingly dependent on PPIs to address symptoms of reflux. Reflux coincides with *low* stomach acid in the majority of cases^{7 8 9}, because the lower esophageal sphincter (LES) closes upon release of gastrin¹⁰ and exposure to stomach acid, preventing acid from moving upward into the esophagus. Episodes of reflux are most commonly the result of transient lower esophageal sphincter relaxations (TLESRs) that happen during stomach distention and subsequent gas release after meals, and are exacerbated with consumption of fermentable carbohydrates^{11 12}. This could mean that excessive bacterial carbohydrate fermentation due to intestinal dysbiosis is a likely comorbidity in reflux diseases, and therefore the most sustainable treatment method would be to correct the underlying dysbiosis with dietary, herbal, and lifestyle changes.

Most health care practitioners still believe that reflux is caused by excessive stomach acid production, thus many practitioners rely almost exclusively on acid-lowering drugs to treat GERD. PPIs work by blocking the gastric acid pump in the parietal cells of the stomach from secreting protons¹³. By blocking acid secretion they can produce a short-term reduction of acid reflux into the esophagus by reducing total gastric acid load. However, studies have also shown that low stomach acid (hypochlorhydria) contributes to delayed gastric emptying (gastroparesis)^{14 15}, which is a major contributing factor of stomach distention and subsequent weakening of the LES, leading to TLESRs¹⁶. Gastroparesis is a fairly common complaint in cystic fibrosis, especially in children, and is likely due to hypochlorhydria. Therefore, taking acid-lowering drugs reduces LES tone, allowing stomach acid to continually reflux up into the esophagus with no way to suppress tissue damage by the acid except with more acid-lowering drugs, creating a vicious cycle and drug dependency.

Side Effects

In addition to over-relaxation of the LES, long term PPI use can result in protein malabsorption and protein-bound nutrient deficiencies, since gastric acid is an essential part of protein digestion. This is especially concerning for CFers who commonly already have protein and fat malabsorption issues. Gastric acid digestion of protein is an important first step in protein digestion before proteases (contained in pancreatic enzymes) can work effectively. Furthermore, a number of insidious nutrient deficiencies can result from hypochlorhydria including vitamin B12 deficiency, iron deficiency and anemia, calcium deficiency and osteopenia, and magnesium deficiency^{17 18}.

Moreover, having low stomach acid significantly increases the risk of gastric and enteric infections from pathogens such as *Clostridium difficile*¹⁹, which have become more common in the CF population, especially during hospitalizations²⁰. Stomach acid is a primary barrier against infection of the human digestive system, and low stomach acid can lead to dysbiosis²¹. A multi-center study showed that in children, acid-suppressing drugs increased the risk of both GI infections and community-acquired pneumonia, likely due to disruption of the microbiome and interference with normal white blood cell activity²². Acid-lowering drugs dampen the immune response by effecting leukocyte activity, especially the bactericidal activity of neutrophils²³.

Lastly, use of PPIs in the CF population increases the frequency of pulmonary exacerbations²⁴ likely due to increased risk of aspiration of stomach acid and bile acids, as well as functional changes in white blood cell activity. In GERD, not only is LES tone reduced, but often pyloric sphincter tone is also reduced, allowing bile acids to move from the duodenum into the stomach and reflux into the esophagus. One study found that bile acids were present in 86% of the aspirate of people with GERD, compared to 58% in normal subjects, with aspiration worst after meals and laying down²⁵. Another study found that people with advanced lung disease are more likely to aspirate bile acids, which contribute to further lung injury²⁶. Bile acid reflux and aspiration is higher in CF than in healthy controls, with post-transplant patients at even higher risk. Bile acid reflux also corresponded to unexplained cough episodes in the CF study group. PPI use does not help patients with bile acid reflux²⁷, and may even exacerbate it. Mucosal damage is much greater when bile acids are present in refluxate compared to acid reflux alone, and a major cause of alkaline (bile acid) reflux is gallbladder removal²⁸ and/or inadequate cholereresis. Cholecystokinin (CCK) is a hormone released when the GI tract detects fats or bitter substances, and is responsible both for the closure of the pyloric sphincter and release of bile from the gallbladder²⁹. Without adequate secretion of CCK (due to a diet deficient in bitter plants and/or fats) the pyloric sphincter may not close properly and bile acid reflux may result. A slow leakage of bile from an unstimulated gallbladder, or from the liver when the gallbladder has been removed, can contribute to bile acid reflux when pyloric sphincter tone is weak. Furthermore, proteolytic enzymes are activated when pH is above 2 for pepsin, and 5 for trypsin, and so if these activated enzymes are refluxed into the esophagus and possibly aspirated, this can cause even greater mucosal damage³⁰. This is another important reason why gastric pH must be kept acidic: to prevent activated enzyme reflux.

Duodenal Acidity and Pancreatic Enzyme Activation

The second reason that PPIs are used in CF is that some studies have shown duodenal pH to be excessively acidic^{31 32}. It has been theorized that deficient pancreatic bicarbonate secretion is responsible for this. In vitro and animal studies have shown that mutations in the CFTR do impair bicarbonate secretion³³. Although several studies have measured duodenal pH in the CF gut, I could find none that measured bicarbonate secretion directly. Therefore, the mainstream assumption that bicarbonate secretion is inadequate in the CF gut is largely unsupported by scientific

evidence. By raising gastric pH, PPIs subsequently raise the pH of chyme leaving the stomach, providing a more alkaline environment for supplemental enzymes' enteric coating to break down (which dissolves above a pH of 5.8) and preventing the enzymes from being denatured at a pH of 4.0 or below³⁴. While taking PPIs may indeed help bring the pH of chyme to a level appropriate for enzyme activation, the effect that they have on reducing overall stomach acid levels will produce all of the side effects previously mentioned when used long term. Using these drugs for the purpose of enhancing fat absorption will conversely reduce absorption of protein and protein-bound nutrients. Furthermore, studies have shown duodenal pH in CFers varies greatly, and in some it is normal³⁵. Clinical experience has shown that introduction of PPIs does not guarantee improved fat absorption but instead may create serious side effects with long-lasting or permanent consequences³⁶.

In CF, an alternative reason why fat malabsorption may be present (even concurrent with PPI therapy) is deficient bile production and/or bile flow, given that some CF patients may develop liver and/or gallbladder pathologies, or functional inadequacies. Bile is a critical part of fat digestion as it emulsifies fats, breaking them into micelles so that lipase can further break them down into fatty acids for absorption into the portal vein. Without adequate bile, supplemental lipase may not work effectively. I propose that a major cause of fat malabsorption in CF is inadequate bile secretion due to a common absence of bitter constituents in the CF diet. Bile itself has a moderately alkaline pH of between 6 and 8.5³⁷, therefore it may contribute somewhat to the neutralization of acid in chyme entering the duodenum. Furthermore, the presence of bile stimulates the release of pancreatic bicarbonate into the lumen³⁸, therefore bile secretion may also have an indirect role in neutralizing the acid in chyme. In addition, the presence of acidic chyme entering the duodenum stimulates the secretion of secretin, a hormone that stimulates bicarbonate release from the pancreas, bile production in the liver, and inhibits gastrin and stomach acid secretion³⁹. If the chyme entering the duodenum is not acidic enough (due to hypochlorhydria and/or PPI use) to trigger the release of secretin, this may further impede mechanisms to alkalize the duodenum. It is therefore possible that fat malabsorption in CFers taking pancreatic enzyme supplements is due not from a pathological inability to produce enough bicarbonate, but from a functional (and therefore reversible) bile deficiency, or even hypochlorhydria. I will next discuss how bitter plant constituents may help with these issues.

Bitter Plant Constituents' Roles in Aiding Digestion in CF and Beyond

Mainstream nutritional recommendations given to CF patients emphasize calories from fat, protein, and refined carbohydrates at the expense of foods that are high in phytonutrients but low in calories (i.e. vegetables and fruits). One important class of plant constituents contained in many vegetables, especially leafy greens, is bitter tastants. Bitter compounds in plants, especially wild plants or gently bred food crops like kale or arugula, include lactones, iridoids, and alkaloids⁴⁰. Bitter compounds agonize the TAS2R bitter taste receptors located on the tongue, all along the GI tract, on immune cells, on respiratory mucosal cells, and even in the brain⁴¹. The human digestive system coevolved with these bitter constituents in plants and the lack of

them in the modern diet can cause significant functional deficiencies that lead to gastrointestinal distress and malabsorption, especially in populations who already have primary GI pathologies, such as cystic fibrosis.

Bitter taste receptor stimulation has cascading effects mediated by the vagal nerve. In the GI tract, agonism of bitter receptors stimulates the release of CCK, which stimulates gastric secretions, bile release, insulin production, pancreatic enzyme secretion, and eventually leads to bicarbonate release from the pancreas⁴². Bitter stimulation and release of CCK will also constrict the pyloric sphincter, preventing alkaline reflux⁴³. Human coevolution with plants created these responses to prepare the digestive tract for potentially harmful plants ingested, as maximization of digestive secretions ensures reduced ingestion and optimal metabolism of toxic chemicals, many of which taste bitter. With a deficiency of bitter tastants in the diet, the GI tract lacks the cues it needs to stimulate adequate release of GI secretions, leading to low stomach acid, poor fat metabolism, deficient pancreatic enzyme release in the non-CF population, sluggish hepatic metabolism, inadequate bicarbonate release, and acid/alkaline reflux. That is, in general, a lack of bitters can lead to indigestion. Increased GI secretions with bitter taste receptor stimulation means more efficient digestion of food and increased nutrient absorption, two things that the CF population is generally very concerned about.

In several studies on healthy humans and animals, agonism of the bitter taste receptors reduces appetite, induces feeling of satiation earlier in the meal, and slows gastric emptying⁴⁴. However, in populations with already decreased appetite and delayed gastric emptying, as in many people with CF, bitter taste stimulation seems to have the opposite effect, increasing appetite and possibly even hastening gastric emptying⁴⁵. The amphotericity of bitter tastants may be due to the fact that in many people with CF gastrointestinal secretions are reduced at baseline, leaving one ill-prepared for a meal. But when stimulated with a bitter tastants, secretions may increase to physiologic levels, which may have a positive effect on appetite and gastric emptying.

To stimulate GI secretions and to prepare the digestive tract for an impending meal, bitter tastants from plants can be taken by mouth 5-15 minutes before a meal. This can be in the form of a salad of bitter greens like arugula or dandelion greens, or a medicinal preparation (often alcohol extract) of bitter herbs like gentian root, dandelion root, motherwort, artichoke leaf, yellowdock root, and many others. It is traditional in many cultures for a pre-meal appetizer to feature bitter or pickled foods or herbs before the main course as a digestive aid. If the individual currently suffers from painful GERD symptoms and/or is using PPIs, introduction of bitters may need to slow as the GI tissue is encouraged to heal with soothing anti-inflammatory herbs, and as the individual is slowly weaned off of PPIs.

It is clear that there is indeed great promise for the use of bitter tastants in the management of GERD, enhancement of fat absorption, and improvement of appetite and gastric emptying in CF patients. This is especially true since pharmaceutical

options for treatment of these issues, such as PPIs, are inadequate at best and create iatrogenic pathologies at worst. Further study is needed on the use of digestive bitters as GI secretory stimulants, as well as their ability to improve clinical outcomes in gastrointestinal pathologies of CF patients.

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Understanding The Diagnosis and Treatment for Generalized Anxiety Disorder From an Integrative Perspective

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Anxiety is a normal and even beneficial emotion to experience at times. It is part of our hard wiring for safety and survival, giving us the internal cue to gear up for “fight or flight” when sensing potential harm or dis-ease. Anxiety from health issues, financial concerns, or troubled relationships are ordinary responses to stressful situations. When these worrisome emotions become excessive, unrealistic, persistent, and interfere with normal daily activities, this may be a form of mental illness [1]. Anxiety disorders are pathological presentations of arousal, tenseness, and increased autonomic activity, such as heart rate, blood pressure and respiration [2,3]. For people with anxiety disorders, the constant and overwhelming worry can be crippling. This paper will engage in a discussion about the causes of anxiety and the current modalities of therapy, with a specific focus on generalized anxiety disorder.

Understanding Anxiety Disorders:

Anxiety disorders are the most common psychiatric illness in the United States, with each year an estimated 18% (40 million) adults in America affected and 8% of teenagers [4]. There are several categories of anxiety disorders, including panic disorder (PD), obsessive-compulsive disorder (OCD), post-traumatic stress disorder (PTSD), social anxieties, specific phobias, and general anxiety disorder (GAD). Although the varieties of anxiety disorders each specify unique characteristics, all have common feelings of excessive and irrational fears and dread [4].

The overwhelming percentage of Americans with anxiety disorders is all together heartbreaking and concerning. If the evolutionary purpose of anxiety is to foreshadow danger ahead, what does this say about the population of our country? Anxiety is not only a serious psychological disorder; it is also a ‘canary in the coal-mine’ for underlying health concerns. Compared to the general population, clients with anxiety disorders are more likely to develop a medical illness [5], as well as prolong the duration of a medical illness [6]. Conversely, patients with a chronic medical illness are more likely to be diagnosed with an anxiety disorder [7]. Certain medical conditions have higher comorbidity with anxiety, including Grave’s disease, anorexia nervosa, Alzheimer’s disease, mitral valve prolapse, heart arrhythmias, hypertension, chronic obstructive pulmonary disease, irritable bowel syndrome, and diabetes [8, 9, 10]. Overall, patients with anxiety disorders have higher rates of mortality from all causes [11]. Although there have been incredible advances in western medicine’s understanding of the body and brain chemistry, it appears the deeper researchers look, the more difficult it is to separate what is an emotional or physical ailment [9].

Tendency towards chronic anxiety may be a behavior that is learned, inherited, triggered or chemically imbalanced [12, 13]. From an integrative perspective, it is important to understand the root cause of the disorder in order to effectively treat the person. Much like depression, growing up in a household with an anxious parent increases the chances of an anxious child [14, 15, 9]. There is also evidence that a genetic component is at hand [16], making the idea of coming from “a long line of worriers” much more genetically plausible! Emotional triggers may induce anxiety for any number of reasons, such as with depression, trauma, illness, financial concerns, family issues, abuse, divorce, and other major life changes. Chemical triggers that may exacerbate anxiety are long-term alcohol [17], nicotine [18], and caffeine use [19, 20]; as well as medications like benzodiazepines [21], steroids, over the counter sympathomimetics, selective serotonin reuptake inhibitors (SSRIs), digoxin, thyroxine, theophylline, and antihistamines [13, 20]. Environmental triggers may also be an overlooked cause for increasing anxiety in the US and around the world [2, 9]. Life today may not have the same primitive fears of survival it once had, but it may be argued that it is more stressful, complicated and confusing than ever before. The social expectation for the standard of a “happy” life has become nearly unachievable. As a culture, we have shifted away from being a reflection of nature and rocketed into a technological craze of consumerism and perpetual dissatisfaction. When expectations of security are unrealistic and excessive, it is no wonder that anxiety will follow this same pattern.

The pathophysiology of anxiety disorders is still being unraveled, although current evidence hypothesizes some degree of imbalance of serotonin, noradrenaline, glutamine, and GABA neurotransmitter levels and transmissions [16]. Neurotransmitters are an infinitely complicated orchestra of chemical messengers that help move information from nerve cell to nerve cell, and without the proper levels, messages cannot be communicated properly. This break in communication will then alter the brain’s reaction and initiating stress responses [4]. The understanding of the “neurotransmitter imbalance” theory is based on the observable mood improvements that occur when taking selective serotonin reuptake inhibitors (SSRIs), selective serotonin and noradrenalin reuptake inhibitors (SNRIs), and benzodiazepines [22, 16].

Whether the stressors stems from physical or emotional root, the body is equipped to respond in the same defense through the Hypothalamus-Pituitary-Adrenal axis (HPA axis) [2]. The HPA axis is a major part of the neuroendocrine system that controls reactions to stress and regulates many body processes, including mood and emotions, digestion, immune system, sexuality and energy storage / expenditure [2, 23]. HPA exhaustions involves the suppression of dehydroepiandrosterone (DHEA), testosterone and estrogen synthesis, all hormones which work to improve mood [2]. Low estrogen is associated with decreased serotonin production, while progesterone acts on GABA receptors, showing correlation between both sex hormones deficiencies and increased anxiety. This is also evident pre-menstrually and peri- menopause, when estrogen levels decline and there is a distinct change in mood, specifically anxiety [24, 2].

Generalized Anxiety Disorder:

Many anxieties can remain on-going, debilitating and “beyond the control” of the client, ultimately adversely affect their daily life [3]. The diagnosis can be difficult since many anxiety disorders share common symptoms, but for now I will highlight the most common diagnosed anxiety, Generalized Anxiety Disorder (GAD). GAD affects 3.1% of US adult population (6.8 million US adults) and twice as many women as men [4]. There has been some refining of the definition of GAD over time, as originally there was little distinction between panic disorder and GAD. Panic disorders are now better understood to be intense, brief, acute anxiety, with variable periods of remission and relapses [13]. GAD on the other hand, is not associated with these intense physical attacks, but as defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) it is a “chronic state of apprehensive expectation and uncontrollable worry concerning multiple daily life events or activities and accompanied common manifestations of psychic or motor tension for more than half the time of at least 6 months” [3, 25].

Symptoms and behaviors associated with GAD fall under 3 categories :

- (1) Excessive physiological arousal: Muscle tension, irritability, fatigue, restlessness, insomnia
- (2) Distorted cognitive processes: Poor concentration, unrealistic assessment of problems, worries
- (3) Poor coping strategies: Avoidance, procrastination, poor problem-solving skills [3].

Understanding the client’s medical and mental history is the first step to an initial assessment, as well as gathering an understanding of family relationships, career, spiritual

connection, acute and chronic stressors, and somatic ailments [2, 9]. Clients' symptoms can present in a wide range and degree of severity. Many complaints may be the result of anxiety without the client aware of their connection, just as other seemingly unrelated factors may be triggering anxiety [26]. It is important to differentiate the anxiety between "acute" (brief or intermittent episodes lasting hours to weeks, often preceded by stressors) and "chronic" (persistent or unremitting lasting months to years, can even be seen as a personality trait) in order to better understand if the anxiety tends more towards panic attacks or depression [26]. This will help differentiate the most effective therapeutic path to recommend.

There is also a well established trifecta between anxiety, depression, and sleep disorders, with nearly 50% of adults with depression also diagnosed with an anxiety disorder [11], 65-90% of adults with depression experience a sleep disorder, and 50% of adults with sleep disorders experience generalized anxiety [27]. Although this connection and intertwining of ailments is not the focus of this paper, I feel it is critical to point out how closely symptoms of imbalance will perpetuate each other, and therefore how important it is to address sleep, depression, anxiety, and underlying health concerns together.

Therapeutics for Generalized Anxiety Disorder:

Non-pharmacologic modalities should be the first line intervention for clients with GAD symptoms and behaviors. There are a variety of therapy options, each focusing on different ways to discover what anxiety triggers and how to lessen and even reset them. Psychotherapy involves talking with a trained mental health professional to discover different ways of thinking, behaving and reacting to situations [8]. Some of its methods include relaxing and breathing techniques, and finding new ways to support a balance in the patient's life. Psychotherapy practitioners listen and offer objective feedback, while helping clients examine stressors in life and find better ways of coping or eliminating them [28].

Cognitive-behavioral therapy (CBT) works with people to change thinking and behavioral patterns when reacting to anxiety-provoking situations [4]. Through psych education, relaxation training, cognitive restructuring and behavioral aspects, fears can be confronted and desensitized [30]. Mindfulness-based cognitive therapy is clinically effective at relieving anxiety and depressive symptoms in clients with generalized anxiety disorder [29], although only when the client is ready to confront their fears [15].

Pharmacological medication:

For clients whose anxiety is significantly impairing their daily function and quality of life, pharmaceutical medications are very often prescribed. However, it is important to note these medications do not cure or address the root of the anxiety, they simply control the symptoms [31]. Starting with the very first dose, pharmacological drugs work by altering brain chemistry, although full effect requires a series of changes to occur which sometimes takes several weeks (NIMH “Anxiety disorder”). A variety of drugs have proven effective in generalized anxiety disorder management, although each drug has its benefits and drawbacks that need to be carefully considered for each individual [31,12]. There are many cases that prescription medication is specific and warranted, such as anxiety that is unresponsive to therapy, herbal, dietary and lifestyle modifications or for severe disorders while other therapeutic support is in progress. However, prescription drugs are most often the primary action for addressing anxiety, with 11% of middle-aged women and 5.7% of middle-aged men using anti-anxiety medications, and 11% of the entire US on anti-depressants [32].

Antidepressants

Antidepressants were developed to treat depression but are also effective for anxiety disorders, although generally take 4 to 6 weeks before taking full effect [4].

Antidepressants such as venlafaxine (Effexor®), paroxetine (Paxil®) and imipramine (Tofranil®), have a high incidence of non-adherence to treatment (NIMH “Anxiety disorder”), and side effects of cholinergic symptoms, sexual dysfunction, insomnia, and withdrawal issues [31, 16].

SSRIs

Some of the newest antidepressants are called selective serotonin reuptake inhibitors, or SSRIs [12]. These work to alter levels of serotonin in the brain, which, like other neurotransmitters, help brain cells communicate with one another [12]. SSRIs must be started at low doses and gradually increase until they reach the beneficial effect over several weeks [15]. Popular SSRIs for anxiety disorders are fluoxetine (Prozac®), sertraline (Zoloft®), escitalopram (Lexapro®), paroxetine (Paxil®), and citalopram (Celexa®). Venlafaxine (Effexor®) is closely related to SSRIs and is often used to treat GAD [4]. SSRIs have fewer side effects than older antidepressants, but still can cause an initial increase in anxiety in early stages (problematic for patient compliance), nausea, headaches, sleep difficulties or sexual dysfunction in over 50% of users in the long term [15].

Anti-Anxiety Drugs

High potent benzodiazepines are the most commonly prescribed anxiolytic and act on gamma-amino-butyric-acid (GABA) / Benzodiazepine receptors [4]. They have established efficacy for quick relief of many anxiety disorders but do not actually decrease worrying [15]. They act to lower anxiety by decreasing vigilance and by eliminating somatic symptoms (ex. Muscle tension). Some popular benzodiazepines are diazepam (Valium®) for anxiety, clonazepam (Klonopin®) for social phobia and GAD, lorazepam (Ativan®) for panic disorder, and alprazolam (Xanax®) for panic disorder and GAD [4]. Benzodiazepines are quick acting, but not without limitations and side effects. They are not suitable for long term because of concerns of dependency and tolerance development. Benzodiazepines risk sedation, amnesia, potential abuse and/or dependency, withdrawal syndrome, and possible long-term cognitive effects from interactions with depressants of the central nervous system [31, 14, 15, 6].

Buspirone (Buspar®)

Buspirone is a newer anti-anxiety medication for GAD [4]. It is similar in the mechanism of action to a benzodiazepine, but take at least 2 week for effectiveness and without the concern for tolerance and dependency. Possible side effects include dizziness, headaches, and nausea [4]. Also, despite the potential interest of many new pharmacological treatments of GAD, recent years have shown that the development of new anxiolytic drugs often appear limited by high-rates of placebo response in numerous clinical trials [25].

Herbal Medicine:

In the human body, there are infinite molecular processes involved in the stress response mediated by the central nervous system (CNS). Many of these compounds are active against a wide range of targets, and may cause numerous effects and changes [16]. Considering the complexity of mental disorders, the modulation of a single neurotransmitter target may not necessarily treat the patient as successfully as approaching multiple targets of the neuro/endocrine systems [16]. Supporting this theory is the ever-increasing validity of traditional herbal medicine to treat anxiety [16, 33, 12]. Unlike synthetic drugs made in a laboratory, plants are influenced by a phytochemical profile that is as different as the soil it was grown in, resulting in overall biological effects that rely on synergistic interactions between plant constituents [12, 34, 16]. Furthermore, anxiety disorders are more both under-treated and over prescribed, motivating patients of all kinds to seek non-conventional treatment [15]. In a recent US cross sectional and longitudinal survey (2012), 43% of individuals diagnosed with an anxiety disorder use a variety of complementary therapies [15]. With the rising cost of prescription medications and their unwanted side effects, patients are exploring herbal and other natural remedies [35].

The main goal for supporting a client with GAD is to help reduce their perception of stress. This may be regulated through supporting the HPA axis, the CNS function via neurotransmitters, and sometimes sedating or supporting cognition function [2, 12].

Secondary goals may be to improve digestion and nourishment since the mind-gut connection is so tightly connected, and address inflammation exacerbated by chronic stressors. When supporting someone with GAD, the herbal actions may include antidepressant, anxiolytic (relaxing nervine), adaptogen, bitters digestives, nootropic (cognitive enhancing), sedative, hypnotic, anti-inflammatory, and analgesic effects [2].

Herbal medicines work in similar mechanisms as pharmacological drugs, which makes sense since it is estimated that 25% of all drugs on the market today contain compounds that are directly or indirectly derived from plants [12, 36]. Some plants modulate anxiety disorders through the modulation of neuronal communication and through the alteration of neurotransmitter synthesis [16]. Anxiolytic herbs may have effects on the GABA system, either via inducing ionic channel transmission by voltage-gated blockage, through alterations of membrane structures, GABA transaminase or glutamic acid decarboxylase inhibition, or less commonly via binding with benzodiazepine receptor sites (e.g. GABA-A) [16]. Other actions may involve stimulating or sedating CNS activity, and regulating or supporting the healthy function of the endocrine system and HPA-axis [11].

A comprehensive review of plant-based medicines that have clinical evidence of anxiolytic activity (as of 2012) revealed 21 human clinical trials [12]. Efficacy was found for several herbs for treating a range of anxiety disorders [37]. Specifically for reducing generalized anxiety with herbal preparations, the most promising evidence supports the use of Kava (*Piper methysticum*) [38, 39]. Additional research points towards a beneficial effect from Ginkgo (*Ginkgo biloba*) [40], Passion flower (*Passiflora incarnata*) [41, 42, 43], Chamomile (*Matricaria recutita*) [44, 45], Scullcap (*Scutellaria lateriflora*) [46], Lemon balm (*Melissa officinalis*) [47, 48], Bacopa (*Bacopa monniera*) [49], Rhodiola (*Rhodiola rosea*) [50], Hawthorne (*Crataegus oxyacantha*) [51], California poppy (*Eschscholtzia californica*) [51], and Ashwagandha (*Withania somnifera*) [52, 16]. There is currently little evidence supporting the use of St. John's Wort (*Hypericum perforatum*) for anxiety disorders, while there is strong evidence for its use in depression [16, 53, 54]. Many of these anxiolytic herbs have the potential for additional applications to support secondary goals often paired with anxiety, such as improving mood (Chamomile, Kava, Lemonbalm, St. John's Wort), support for insomnia (Passion flower, Scullcap), enhancing cognition via nootropic activities (Bacopa, Ginkgo), and adaptogenic tonics to combat chronic stress (Ashwagandha) [16, 55].

Diet and Lifestyle:

The connection of diet and physical activity to mood regulation is clearly linked [2]. There is much research in this area of study, but for brevity I will just skim the surface. To start, anxiety levels are greatly decreased by walking for 60 minutes, or running 20-30 minutes, for at least four days per week [11]. Other modalities of exercise that show beneficial results in modulating stress and anxiety are mindfulness, yoga and tai chi [15]. Diet and nutrition are gaining evidence everyday about their close relationship with anxiety and mental disorders. With strong evidence for the prevention and treatment of psych

disorders with Omega-3 fatty acids, which have shown specific support in mood disorders and depression [56].

Conclusion:

It is clear that anxiety disorders are a destructive pandemic that is affecting nearly 1 in 5 adults in the US. Anxiety is too easily becoming a way of life and accepted state of mind. Without fully understanding where these mood disorders are stemming from, they will continue to perpetuate a blurring memory of how it feels to be truly content. Prescription drugs may be effective at masking the symptoms, but not without the cost to health and our right for pure, non-medicated happiness. The topic is not whether synthetic drugs or natural methods are better, as this is as complicated as the individuals and compounds in question, but simply that complimentary therapies can support each other while the root of the anxiety disorders are being addressed. Through herbs, nutrition, lifestyle, therapy, and pharmacological medications, there is great potential to increase the efficacy of not simply repressing the symptoms of anxiety, but serving to better understand and overcome them.

"Worry is a thin stream of fear trickling through the mind. If encouraged, it cuts a channel into which all other thoughts are drained."

- Arthur Somers Roche, American journalist, writer, 1883-1935.

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Herbal Support for Autism

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Autism is receiving a lot of attention in recent years as it has become more widely recognized and reported. Major questions still remain as to understanding its nature, including what defines it and how best to go about providing support. Despite the unresolved questions, it seems clear that there are multiple ways in which the difficulties Autistics face can be eased, including with holistic therapies. This paper will address some of the attempts to define Autism, describe some of the physiological processes that underlay its development, and suggest theoretical ideas for providing support with herbal remedies.

What is Autism?

There is by no means a consensus about what Autism actually is. There are those who advocate for the neurodiversity perspective, which sees Autism as a genetic variant on neurological development that is simply different, not pathological. From the neurodiversity perspective, Autism has not increased in prevalence - it has simply become more recognized and reported. In this paradigm, the term “neurotypical” is used in contrast to “neurominority”¹.

Katja Swift, herbalist, says that even the term “neurotypical,” the development of which was an important step, is too constricting because it still implies that there is something more normal just by the fact of it being more common. Rather, she uses the term “normative” which instead implies that what is considered “normal” is a fluid, socially constructed set of standards².

With this in mind, Swift describes Asperger's syndrome (and implicitly Autism in general) this way:

“What we currently identify as Asperger's or as ADD/ADHD are just imbalances, like any other constitutional imbalance, and not a disease that must be cured. Like any other imbalance, this imbalance can have some advantages, but may also cause discomfort”².

In contrast, from the mainstream medical perspective, Autism is a mental disorder, the official definition of which is determined by the American Psychiatric Association (APA). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) was published in 2013 with some significant changes in the definition of Autism compared with the previous DSM-IV-TR published in 2000. What were previously defined as four separate disorders, including Asperger's, were combined to be included under the newly defined Autism Spectrum Disorder (ASD)³. The severity is rated on a scale from 1 (“requiring support”) to 3 (“requiring very substantial support”). The criteria include social deficits and repetitive behavior. Symptoms must begin in early development and impair everyday functioning⁴.

Regardless of the actual prevalence of Autism, it's a fact that there is an increasing in reporting of what people are calling Autism: according to the CDC, in 2010 Autism was estimated at about 1 in 68 children, which had increased from an estimated 1 in 150 in 2000. Autism is estimated to be about five times more prevalent in boys than in girls⁵.

Physiological Context

Researchers have found a number of things that provide useful context for understanding how Autism develops, physiologically. First of all, as many people suggest, there's almost certainly a genetic component in Autism, because there is a high rate of concordance in identical twins as well as a significantly increased rate of concordance amongst siblings. However, even with identical twins the rate is not 100%, suggesting that even if there is a genetic component it may not be the only factor⁷.

Many people suggest that genes are relevant, but that they only provide one part of the picture; that in order for genes to express themselves in a way that looks Autistic, other conditions or causes must be present, such as difficulties in pregnancy and childbirth⁷.

There are a number of speculations regarding environmental factors and Autism, such as exposure to mercury or thimerosal in vaccines⁷. The association with vaccines is hotly debated, although the majority of scientific research has dismissed this possibility.

In terms of the physiological picture once Autism develops, there is a lot of correlation with abnormal activity in the brain. As many as 20% of Autistics will develop seizures and EEG, MRI and autopsy studies have found abnormalities in structures including the limbic system⁷.

Approximately 10-30% of Autistics have an associated medical condition. Conditions with the strongest associations are fragile X and tuberous sclerosis, and other possible associations include phenylketonuria and congenital rubella⁷.

Whatever is at the root physiologically, be it genes, external factors, or a combination, it seems possible for the so-called "symptoms" of Autism to go away with time, to the point where a person may no longer fit the DSM diagnostic criteria for Autism. This has been shown in a number of studies and case reports of individuals who have this experience. Some estimates are that around 10 percent of children will get to a point of no longer meeting the diagnosis. Many of these children receive intensive behavioral interventions such as applied behavior analysis (A.B.A.). This suggests that so called "abnormal" brain development is mutable and changeable, and that even if genes are a factor, they do not mean that a person cannot grow and change⁸.

Supporting Autistics

Based on seeing broader patterns within the Autistic population, there are three major areas in which support for Autistics can be theoretically addressed with herbs: the nervous

system, the digestive system and the immune system. A fourth which will not be addressed in this paper is detoxification systems of the body. Other systems may be relevant, and for greatest results, getting an individualized picture of where someone needs support will be best.

A big picture that may be helpful is what Katja Swift suggests which is that Autism is an imbalance of the “head-brain” being highly overdeveloped in comparison to the “heart-brain” and “gut-brain”². In fact, research has shown increased brain size in Autistic children⁶. This metaphor points to emotional health and digestive function as fundamental areas to address.

Research on herbal support for Autism has not been common. Therefore, most of the herbal ideas suggested here are speculative and theorized based on matching known issues in Autism with well-known uses for relevant herbs.

A major challenge for herbal or nutritional supports with this population is that quite often Autistics will have very narrowly defined dietary preferences and are resistant to changes. Therefore, people in a supportive role may want to be creative, such as by offering herbs or supplements in a non-traditional, food-like form, such as elixirs or mixing herbs with occasional treats like chocolate.

Addressing the Nervous System

Nervous function in Autistics

Perhaps the most over-arching and challenging aspect of the Autistic experience is that of chronic stress and frequent traumatic experiences. Sean Donahue, herbalist, suggests that this either causes or exacerbates most of the “co-morbidities,” such as digestive issues or immune dysfunction in Autistics⁹. The chronic stress has both biological bases in the nervous system as well as social aspects which are intermingled with the biology.

Biologically, the Autistic nervous system seems to function in such a way that sensory experiences are dysregulated compared to non-Autistics. Sensations are often more intense (hypersensitive) but can also be unusually dulled (hyposensitive). This can vary within the same person, as well as from moment to moment. Even things which to an observer would appear to produce pain (i.e. banging the head against the wall) may be preferred to other stimuli. Involved senses can include sight, taste, touch, smell, hearing and proprioception.

In relation to this, Autistics often live in a chronically heightened state of stress which often includes significant anxiety. Additionally, stress and anxiety are connected to other cognitive processing difficulties such as having trouble anticipating when sensory stimuli will occur. This all is exacerbated by the fact that Autistics are living a social world that is designed for the normative sensory experience, so exposure to negative stimuli is incredibly frequent and almost completely unavoidable.

Ways to address challenges with the sensory world

There are number of ways in which sensory challenges may be helped through utilizing herbs that relate to the nervous system. Theoretical herbal actions and herbs that would apply are as follows:

Possible herbal Actions: Nerve tonic, nervine relaxant, anodyne, anxiolytic, hypnotic.

Example herbs:

Nerve tonics: Milky oats, gotu kola, bacopa, ashwagandha.

Nervine relaxants: Passionflower, lavender, blue vervain, hops, wood betony.

The theory for herbs would be first of all to generally support and tonify the nervous system with nerve tonics. The effect of these may be for the person to become more resilient in the face of stress and have a more balanced nervous system response.

The other major action here is nervine relaxants. These herbs relax nervous system activity in general. Where hypersensitivity to stimuli is present, they may be particularly helpful at brining down the nervous stimulation to a more tolerable level. They may be used acutely as needed, at certain times such as bedtime, or throughout the day as general support. In some cases of sensory hyposensitivity, the opposite action of nervine stimulant may be theoretically helpful, with herbs like sage or rosemary.

Ways to address challenges with the social world

In conjunction with the intense sensory experience of the world, Autistics characteristically have difficulties in their relationships. Socially, Autistics are for the most part living in a society in which they are very highly misunderstood and in which non-Autistics often do not know how to communicate with or relate to them. At the same time, Autistics have a hard time understanding and relating to non-Autistics.

The experience of continually and repeatedly having negative social encounters as a result of this misunderstanding can be traumatizing. Additionally, some Autistics are completely non-verbal, and their challenges in relating to the social world are the same to a much higher degree.

In order to address this aspect of the Autistic experience, it may be helpful to think about nervine relaxant herbs that have a mood uplifting or emotional component, some of which have a special affinity for both the physical and emotional heart. In some cases, they are known for helping to heal from the effects of trauma and to help people feel more safe and confident in social situations.

Example herbs: Linden, hawthorn, rose, motherwort, St. John's Wort, tulsi.

Addressing the Digestive System

Research has clearly shown a greater incidence of GI dysfunction in Autistics. A lot of

attention has been placed on addressing these issues as a core treatment, or even the sole treatment for the mental challenges that Autistics face. Because of this, the “gut-brain” analogy seems quite appropriate.

Studies have shown wide variability in attempting to estimate what percent of Autistics have GI dysfunction, but as a whole show that incidence of GI dysfunction does appear greater than in the non-Autistic population. Additionally, there have been studies associating increased severity of behavioral difficulties with GI dysfunction. This may be due to the discomfort of GI distress, or possibly more indirect mechanisms, such as the effects that an altered micro-biome can have on metabolites that are circulating in the body¹⁰.

One way in which some have theorized that GI dysfunction can have neurological effects in Autistics is due to “leaky gut.” “Leaky gut syndrome” is a theoretical condition. It refers to a state in which the lining of the intestines becomes excessively permeable, causing an increase in the absorption of substances that would normally be excreted. The thought is then that these substances can cross the blood-brain barrier and impact the brain.

Leaky gut is sometimes described in conjunction with problems digesting dairy and gluten. Many people advocate a gluten-free, casein-free (GFCF) diet for Autistics. Some studies have shown this to indeed be effective in improving the “symptoms” of Autism¹¹. However, other studies, including a 2015 meta-analysis, have shown that the effects are inconclusive¹². It seems possible that food allergies may be a significant factor for some Autistics, and for them a GFCF diet would be helpful, whereas many Autistics may not have food allergies and would not benefit from the change in diet.

Whether GI problems are causative of Autism, a direct result of Autism or simply a co-morbidity is unclear, and a subject of debate. Regardless, where there is G.I. dysfunction, addressing it may not only help somebody feel better but may also impact neurological challenges of Autism.

Possible Herbal Actions: Bitter, carminative, hepatic, demulcent, astringent, anti-spasmodic, tissue tonics.

Example herbs:

Bitter/hepatic : Artichoke, calendula, dandelion root, burdock, yellow dock.
Carminative: Catnip, chamomile, fennel, cinnamon, peppermint, ginger.

The main ideas presented here are to tonify digestive function with the use of bitters and to relieve digestive discomfort with carminatives. Bitters stimulate the production of digestive juices in the stomach and bile in the liver. Taken before meals they help the body to more efficiently break down food. This can help to normalize transit time, relieve symptoms of indigestion, and improve the nutrient assimilation of food. Carminatives can have similar effects, and additionally help relieve spasm in the gut and can help relax the body as a whole.

Addressing the Immune System

A third area in which attention may be helpful is the immune system. It's quite common for Autistics to have altered immune function, allergies, asthma, auto-immune disease or increased inflammation in general.

The immune system has a strong connection with the nervous system, which is becoming increasingly clear. The function of the immune system can impact cognition and development of the brain. Studies have found a number of things which point to immune dysregulation being involved in Autism: an association between Autism and mutations in immune genes; pre-natal immune factors correlating with Autism; and chronic immune perturbations being present in some Autistics¹³.

As to how the immune system could have such an impact on the nervous system, this is an active area of research with multiple proposed mechanisms. It's been suggested that pro-inflammatory cytokines found at atypical levels in Autistics including in the brain tissue can alter neuronal survival and proliferation. Other consequences of immune dysfunction can be abnormal cell lysis and generation of brain-reactive antibodies¹⁴. Overall, it's been suggested that increased inflammation in Autism can damage neurological tissue¹⁶.

Additionally, it's been suggested that the dysfunction in the GI tract can be involved in dysregulation in the immune system, because the GI is very involved in immune function. This may be increased reason to address both GI function along with immune function and other areas¹⁵.

Research into immune function and Autism is continuing and not yet completely conclusive. However, it seems like it could potentially be very useful to address immune function when supporting Autistics. Immunomodulants can be used to help train the body toward having an appropriate level of activity. Additionally, many of the herbs that relate to the immune system have other beneficial effects that would certainly be useful irrespective of the immune effects. For example, some of the immunomodulant herbs are also known as adaptogens. Adaptogens are known for helping to regulate the body's response to stress, probably by regulating levels of stress hormones secreted by the adrenal glands. Therefore, the potential benefits are many.

Possible Herbal Actions: Immunomodulant, adaptogen, anti-inflammatory, anti-oxidant.
Example herbs:

Immunomodulant/adaptogen : Reishi, Siberian ginseng, ashwaganda, ginseng, astragalus.

Anti-inflammatory: Turmeric, willow, meadowsweet.

Somewhat related, many people, including herbalist David Winston, also suggest giving attention to the body's detoxification mechanisms¹⁶. Supporting proper elimination of metabolic wastes and exogenous toxins can help reduce the overall inflammatory load that the body is dealing with. This can be addressed by supporting liver, kidney and/or lymphatic function, and would be especially helped by herbs with an alterative action.

Conclusion

Though still many questions remain regarding Autism, it's clear that there are many ways to provide support. From the herbalist's perspective, looking at the nervous system, digestive system and immune systems are good places to start given the high rates at which Autistics have problems in these areas. Additionally, addressing detoxification mechanisms of the body is a possible area to explore. More research is needed to determine whether imbalances in any of the systems are primary over the others, although in any case, a holistic approach should seek to address the whole picture.

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Transforming Trauma Stored in the Body: A Holistic Approach to Post Traumatic Stress Disorder

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Post Traumatic Stress Disorder (PTSD) has a significant effect on the lives of many, but because it's not visibly debilitating it is often overlooked. The purpose of this paper is to provide a more comprehensive look at the causes of PTSD and the ways that it manifests in people's bodies. It is also a platform to briefly overview supportive strategies, healing practices and herbal therapeutics.

Post Traumatic Stress Disorder (PTSD) is a reaction to one or more traumatic events which presents anywhere between one month and a year after the occurrence. People experience trauma in situations that are emotionally and physically painful and distressing, and which overwhelm their ability to cope. Trauma may begin as acute stress from a perceived life-threat or as the end product of cumulative stress [1]. Trauma can stem from childhood abuse and neglect, medical/surgical interventions, war and violence, physical, emotional and sexual abuse, accidents and natural disasters, grief, or witnessing acts of violence [2]. To be diagnosed with PTSD, one must exhibit symptoms from three categories: re-experiencing, hyper-arousal, and avoidance [3].

Symptoms of PTSD may include catatonia (speechlessness), black-outs (memory loss), robotic actions, flashbacks (remembering when you don't expect to), sleeplessness, irritability, quickness to anger, listlessness, hopelessness, purposelessness, defeatism, depression, anxiety, panic attacks, nightmares, bad dreams, and disassociation [4]. Drug and alcohol abuse are often present. Risk factors for PTSD include: experiencing dangerous events or traumas, having a history of mental illness, getting hurt, seeing people hurt or killed, feeling horror, experiencing helplessness or extreme fear, having little or no social support after the event or dealing with extra stress after the event such as loss of a loved one, pain and injury, or loss of a job/ home [4].

Hypothalamic-Pituitary-Adrenal Axis

During a traumatic event the individual should mount a "fight, flight, or freeze" response. If the person's body is unable to fully process the stressor and release the shock of the event, it gets stored in the cerebral cortex and muscle memory [5]. The stress during the traumatic event, as well as ensuing stress, activates the Hypothalamic-Pituitary-Adrenal axis, which leads to the suppression of DHEA, testosterone and estrogen synthesis, all of which affect mood. Low estrogen is associated with lower serotonin production, which can impact anxiety. While the Acute Stress Response is necessary for survival, prolonged stress is ultimately damaging. Allostatic load is a term for wear and tear on the body that accumulates when an individual is exposed to repeated or chronic stress. A high allostatic load can result in long-term physiological changes such as atherosclerosis and stroke. A high allostatic load can cause insomnia, depression, and diabetes due to disruption of endocrine function [5, 6].

Chronic stress can cause prolonged elevated levels of Corticotropin (CRF), a peptide hormone and neurotransmitter. This may down-regulate CRF receptors in the pituitary and brain. Decreased adrenocorticotrophic hormone (ACTH) response and decreased CRF receptor concentrations are found in the frontal cortex of depressed individuals who commit suicide, as well as in people suffering from PTSD [7].

Traumatic events can be replayed and re-experienced months to years after the event. Fear-related memories are stored in the cerebral cortex, and when triggered, may also activate neural circuits in the temporal lobe and brain stem, potentiating feelings of panic [6]. Panic, stress and emotional distress are perceived by the hypothalamus, which regulates hunger, thirst, sleep and wakefulness, as well as most involuntary mechanisms, including body temperature. When these signals are disturbed, the body is confused about how to regulate itself [8]. This can contribute to the symptoms of PTSD and exacerbate self-destructive patterns.

Historical Trauma

Beyond the acute presentations of trauma, there are social, political and spiritual contexts that engender ongoing trauma. Dr. Maria Yellow Horse Braveheart defines historical trauma as:

“Cumulative emotional and psychological wounding over the lifespan and across generations, emanating from massive group trauma. Native Americans have, for over 500 years, endured physical, emotional, social, and spiritual genocide from European and American colonialist policy. The effects of historical trauma include: unsettled emotional trauma, depression, high mortality rates, high rates of alcohol abuse, significant problems of child abuse and domestic violence.” [9]

It's hard to heal from trauma when the conditions that created it haven't changed. Repeated on-going traumatic events such as genocide, residential schools, slavery, war, displacement, repeated sexual, emotional and physical abuse, environmental destruction are not only held in an individual's body, but can be carried over to one's descendants [10]. Although healing from trauma is important for the individual, often a community healing process is required. When a person lives in isolation, and is displaced from their community or landbase and home, it's a harder and longer journey towards healing [9].

In Judith Lewis's book "Trauma and Recovery", she says that, "recovery can take place only within the context of relationships; it cannot occur in isolation. The first principle of recovery is the empowerment of the survivor" [11]. There is a lot to be said about the incredible strength and resilience of people who have endured so much. Major factors that encourage healing are support from one's community, positive feelings towards oneself and healthy coping mechanisms like physical exercise and ritual [12].

Therapeutic Practices for PTSD

Therapeutic protocols depend on a person's symptoms, experiences, and constitution. People have found success with alternative therapies such as cranial sacral therapy, acupuncture, and Somatic Experiencing. Other therapies include Eye Movement Desensitization and Reprocessing (EMDR), hypnosis, and Emotional Freedom Technique (EFT) [3].

Somatic Experiencing is a psychobiological method for resolving trauma symptoms and relieving chronic stress. This modality offers a framework to assess where a person is "stuck" in the fight, flight, freeze, or collapse responses, and provides clinical tools to resolve these fixed physiological states.

Acupuncture can be a huge support in being able to cope with trauma and heal from PTSD. When giving treatments for PTSD, acupuncturist Janette Cormier uses North American Detox Acupuncture (NADA) as a basic protocol, combined with specific points for the individual. She also does "grounding" treatments and often sees Kidney Yang deficiency. In the framework of Traditional Chinese Medicine (TCM), Kidney issues are related to fear [13].

Psychotherapy is also used as a healing modality for PTSD. However, according to the anti-child abuse group Generation Five, the pure mental health focus "often individualizes the experience, leaving people isolated with the impact and the concrete circumstances of their specific situation" [10].

Eye Movement Desensitization and Reprocessing (EMDR) is a therapy in which a person moves their eyes rapidly from side to side while recalling a traumatic event. EMDR is sometimes recommended by allopathic medical doctors as an effective treatment.

Biofeedback is a therapy to help clients understand how their bodies react to stress. It involves using a machine, at first, to indicate bodily functions that are normally unconscious and involuntary, like heart rate and temperature. The purpose is to learn to control these reactions, and eventually be able to manage reactions to stress without using a machine.

Hypnosis induces a deep state of relaxation, which may help people with PTSD feel safer and less anxious, decrease intrusive thoughts, and become involved in daily activities again. Emotional Freedom Technique (EFT) helps a person revisit traumatic events while tapping on acupuncture points in order to release the experience [8].

Many cultures have longstanding methods of healing what some now call PTSD. Ceremony encourages spiritual nourishment and release of a traumatic event, especially ceremony that incorporates shaking and crying. Traditional ceremonial practices find a corollary in some recently developed trauma therapies. In Peter Levine's Book "Waking the Tiger" he describes that, when responding to an inescapable or overwhelming threat, humans and animals both use an immobility (or "freeze") response. Levine suggests that humans should

mirror the fluid stress adaptations of wild animals, by physically resolving the immobility response after a stressor is removed. He observed animals shaking violently after a life-threatening encounter, then returning to apparently normal behavior. Using these findings, he developed the Somatic Experiencing techniques mentioned above [14].

To begin the journey to healing a person must be able to look at their trauma and be ready to transform it. Clinical herbalist and acupuncturist Jeanette Cormier explains,

“One of the most difficult things about healing from PTSD is that you need to gently but firmly push people forward out of victimization. This can be really challenging for the practitioner and the patient and must be done with care and integrity. There is also a timing issue regarding a sort of grieving period. Obviously it is not enough, or totally inappropriate, to tell people they must “get over it,” but within the context of treatment and support this is still the ultimate goal - that they leave victimhood behind for a life of freedom from their past demons - whether they be people or experiences. In order for people to move forward in this way they need to be strong, and I often find myself working on strengthening their vitality and spirit, working on their constitution, nourishing them and encouraging them always to move forward and not to stagnate. Ceremony can be huge for this. I feel like acupuncture treatments are like a personal ceremony when done appropriately... and can be massively profound at times” [13].

Herbal Therapeutics for PTSD

Herbal medicine is only one of multiple supportive strategies needed when approaching PTSD. When addressing PTSD it is important support the person’s endocrine function and nervous system and help with adaptation to stress.

From the perspective of Traditional Chinese Medicine, PTSD can be seen as Shen disturbance or insufficient/ blocked Qi. In that case it may be useful to move or build the Blood [11].

Addressing acute anxiety and depression can also be useful in improving quality of life. The lasting effects of PTSD can result in permanent physiological changes such as chronic pain and illness [6, 8, 15]. In this case one will want to support a person’s body by modulating the immune system and supporting neuroendocrine function. With acute symptoms of PTSD such as insomnia, anxiety and panic it may be prudent to address physical pain and emotional turmoil. However, suppressing these symptoms over the long term may potentiate the problem. Sedating someone does not address the underlying question of why the trauma is unresolved [16]. Herbal actions may include nervines, adaptogens, blood builders and movers, anxiolytics, immunomodulants and yin tonics. Herbal protocols differ for each person depending on their constitution, symptoms, barriers to healing, and lifestyle.

Milky Oats (*Avena sativa*) is a restorative nervine for self-induced adrenal exhaustion. The milky tops are used internally as tea or fresh tincture. The fresh tincture is used for acute

nerve injury. More affective when taken sooner after injury, Milky Oats preparation is specifically indicated for concussion, compressed nerves, cut nerves and traumatic brain injury. Helpful in recovery from neurasthenia/chronic fatigue syndrome, insomnia, depression, anxiety, and opiate withdrawal, this herb restores a person's resources and rebuilds and regenerates nerves.

Dose: 3-5 ml 3 times a day for traumatic acute nerve injury recovery, especially brain injury. Lower doses are employed for other maladies. Tea: 6 tbs in a quart of boiled water, preferably infused overnight [17].

Hawthorn (*Crataegus monogyna*) nourishes and calms the heart, helping to settle the Shen. Figuratively, her thorns offer protection from those who would harm you. Hawthorn can potentiate digitalis drugs, and caution should be employed if used with beta-blockers.

Dose: solid extract jam; 1 tsp, 3 times a day [18].

Wood Betony (*Stachys officinalis*) is used for harmonizing the interaction of the gut with the brain, increasing parasympathetic tone, reducing, headaches and for aiding digestion in the presence of stress. It's seen as specifically indicated for grounding through the solar plexus, people who are stuck in negative mental patterns, protection from evil spirits, nightmares, and visions.

Dose: 1 teaspoon, 3 times a day [19].

Anemone pulsatilla is used for underlying anxiety, people who are sad, pale, withdrawn, and who need sleep. Michael Moore writes of its usefulness for "people who have everything bad happening to them, who are fearful and weep easily, when everything that can go wrong has." It is specifically used for panic attacks, insomnia, nervousness, and a generally agitated emotional state with gloom and distress.

Dose: 3-10 drops, up to 4 times a day. Anemone is a low-dose botanical, and should be used with care, ideally under the supervision of an experienced herbalist [2, 20].

Dan Shen (*Salvia miltiorrhiza*) is used in TCM. It brings courage to the heart during disturbance and fright. It is specific in cases of insomnia and dementia, nourishes Blood while moving the Blood and has calming effects. It is a Blood tonic, mild analgesic for pain from stagnation, and moves energy in the body.

Dose: 3-15 g or 4-3 ml, 1-4 times daily [17].

Ashwagandha (*Withania somnifera*) is indicated for the "wired and tired" person. It helps in re-regulating the HPA axis and helping shift a person's perception of stress, and in cognitive decline. It is a Yin tonic and is anabolic, helping a person to store energy rather than use it.

Dose: 2-4 ml three times a day [21].

Skullcap (*Scutellaria lateriflora*) is a calming nervine for depression or anxiety, restless leg syndrome, muscle spasms and obsessive compulsive behavior. It is also for people who feel tired and wired. The Eclectics used it for irritability of the nervous system and restlessness.

Dose: 10g of herb per day. For tincture: 1-5 ml 3 times a day [17].

Frankincense (*Boswellia sacra*) is warm and pungent, and enters the Heart and Lung meridians. It promotes Blood circulation and movement of Qi, and is used following acute physical trauma. It can also relax tendons. Frankincense is especially suitable for conditions where the joints and muscles are very stiff, swollen, and painful [18].

Mimosa (*Albizia julibrissin*) bark and blossoms are also used for disturbed Shen. The blossoms are more calming than the bark. In Chinese tradition, bad dreams, irritability, anger, depression, and poor memory are symptoms of disturbed Shen. Combined with Hawthorn berries and Rose petals the bark is used for broken heartedness, grief and deep sadness. Mimosa blossoms (He Huan Hua) also can be used to calm the Shen and elevate mood, but they are weaker and less effective than the bark [22, 19].

Dose: Tincture 40-80 drops 3 times a day [22].

Passionflower (*Passiflora incarnata*) is a mild anodyne, anxiolytic, hypnotic and nervine, antispasmodic and hypotensive. It's specifically used for circular thinking and people who can't relax or sleep because mind is going around and around. Passionflower is an antispasmodic relaxant and is a warmer alternative to Blue Vervain. It's good for anxiety, irritability, restlessness, stress induced spasm, backache, tension headache, bruxism (grinding teeth), disturbed Shen, convulsions, stress-induced heart symptoms, nerve pain, exhaustion with spasm and twitch, insomnia, restless sleep, sleeplessness from anxious irritability and worry. It combines well with Jamaican dogwood for sleeplessness with pain.

Dose: Fresh plant tincture 3-6 mls 3 times a day. For sleep 5 ml at bedtime. Tea: 1-2 tsp in 8 oz hot water, steeped up to 30 minutes [23].

Rosa rugosa petals are used for grief. Rose is used to astringe and protect the boundaries of the heart. It can help people who feel disempowered to feel more empowered. The combination of Mimosa, Hawthorn and Rose can help people to feel more deeply, and help deal with unresolved issue [16, 17].

Dose: The petals are tinctured in 50% ETOH, 40% water, and 10% glycerin.

For astringency and anti-inflammatory effects: 3-5 ml.

For emotional effects: 1-2 ml a day.

Hips in syrup/jam: 1-2 TBS a day.

Hip tea: 2-5 grams [17].

Ghost Pipe (*Monotropa uniflora*) is used as a nervine to relieve symptoms of neurological chemistry disruption and pain, to stop seizures, convulsions, insomnia, mental disorders, and chronic muscle spasms. Sean Donahue says that Ghost Pipe is specific for: overwhelming physical pain when combined with anodyne herbs, migraines associated with traumatic brain injury, anxiety and panic associated with emotional or sensory overload, triggering of emotional memories that make someone feel "beside herself, with unpleasantly intense mind-altering experiences."

Caution: consumption of 15 ml or more of *Monotropa* tincture can bring deep sleep and ultra-vivid dreams, often bizarre, frequently erotic [24, 25].

Dose: start with three drops of the tincture, but go up to 1ml if the person doesn't respond to a 3 drop dose. In cases of severe panic/agitation give 1ml drop doses at 5 minute intervals [24].

American Ginseng (*Panax quinquefolius*) is an endocrine amphoteric and adaptogen that is useful for mild to moderate depletion of the HPA axis and adrenal glands. Because of its effects on the HPA axis, it can help correct dysfunction of the immune system, including depletion that leads to a person constantly catching colds. It's also a mood regulator, good for regulating blood sugar in recovering junkies, chronic fatigue syndrome and helping to regenerate the body in people with long term amphetamine use.

Dose: Do not use longer than 3 months, 50-80 drops 3 times a day [17].

Holy Basil (*Ocimum tenuiflorum*) is an adaptogen and helps re regulate a person's perception of stress in HPA dysregulation. It is also used specifically in eating disorders, which are a common occurrence in PTSD because of the disassociation and body dysmorphia that may occur.

Dose: Whole plant juice 1-3 ml 3 times a day, Tincture 3-5 ml in a formula 3 times a day, Tea 2-5 g daily [26].

Reishi (*Ganoderma lucidum*) is useful for women who have hyperimmunity (immune system hyper vigilant; see everything outside of itself as a threat) or who are the caregiving type who are more prone to fibromyalgia. It is used for disturbed Shen, anxiety, insomnia, bad dreams, and listlessness.

Dose: 1:2 ml 2 stage extract 5ml two times a day, 2 teaspoons of powder 2-4 times a day, 7 to 10g in decoction daily [27].

Flower essences help deal with emotional and spiritual trauma. Some flower essences that clinical herbalist Jasmyn Clift recommended for PTSD are:

Star of Bethlehem for shock and trauma. It comes with work. People will need a coping mechanism because they will revisit the trauma to move through it. They need to be up for the work. If they're going through "crazy" times they shouldn't take it. It is ideally to help work with and transform triggers [28, 29].

Mimulus helps a person get over the fear that they know. It is for the person who is shy and retiring and prone to hide their anxiety. For the person who is deterred by chronic fears such as fear of the dark, injury, poverty etc. [28, 29].

Aspen for when you can't explain the fear sympathetic state and worry. For the person with unexplainable fear, who has fears by day or night with no known reason, and fear accompanied by trembling and sweating [28, 29].

Rock Rose is for complete and utter terror and extreme fear caused by facing an unexpected or unfamiliar experience. It is for the person who experiences fear from terrifying sights or nightmares. When their fear and panic is so severe it is projected in the

atmosphere. Rock Rose enables a person to be calm, courageous and be able to look out for the well-being of others [28, 29].

Gentian is for people who are starting to lose faith in ones-self. It is for people who attract negativity because of their negative state of mind and are experiencing a deep depression because of a known cause. Gentian aids a person to find a little bit more faith in their own resources [28, 29].

Gorse is for people with no self- sufficiency who are living with chronic illness and/or in poverty. For people with diminished vision, lack of ambition and interest due to hopelessness. Gorse helps a person realize and have faith in their visions, be able to overcome obstacles and not be overly influenced by others [28, 29].

Clematis is for people who cope by disassociating. They are day dreamers that indulge themselves in drugs and alcohol, TV and other distractions. Clematis helps person live in the present and complete tasks, especially for people with ADD and PTSD [28].

Honeysuckle is for people living in the past who can't be present specifically in cases of PTSD. Honeysuckle is for the people who dwell on thoughts of the past and hold a pessimistic outlook both for the present and future. For the people who are chronically nostalgic and regretful. Honeysuckle helps people not dwell on past experiences and be able to creatively transform trauma and grow from it [28, 29].

Olive is for people who are totally exhausted to the point of tears, drained of energy and can't do daily tasks. It helps people find motivation, depend on their inner-self and attract happiness and pleasure despite their exhaustion [28, 29].

Pine is for people who have immense guilt and self-reproach. This is a common occurrence in PTSD because people internalize their trauma and blame themselves for it. Pine is for people who over work themselves and stress out because they are never good enough. Pine helps resolve remorse and enable people live without useless guilt [28, 29].

Bach Rescue Remedy is for acute trauma situations to help calm and ground a person in times of panic and anxiety [28].

Other flower essences that may be useful in PTSD are: Indian pink for remaining centered and focused even under stress. Bleeding heart in a spirit dose of the whole is for mass hysteria.

Eating the flower of borage will enhance courage [12].

Red clover is used to create a calm and steady presence [12].

Yarrow is useful for boundaries psychic protection [12].

Sunflower is for people who have relationship issues their father. It also helps a person express themselves fully, truly and vibrantly [12].

Additional nutritional and supplementation support may include: Omega 3 fatty acids for supporting mood. Eating kale and other leafy greens are high in magnesium and reduce spasm. Co-Q10 and magnesium support immune and muscular support. It is good to avoid coffee and other stimulants and recommended to look into other food sensitivities [30].

In conclusion, herbs are just one of the supportive strategies needed in the journey towards healing from PTSD. The process of healing is going to look very different for each person. Healing is most effective when done within community; the more supported a person is the quicker and more likely it is for transformation to occur. Displacement and isolation hinder the healing process. Ideally, a person would receive multiple forms of care. Trauma is usually not a singular occurrence and traumatic events may be unavoidable. When addressing PTSD, it is important not to just look at it as an individual issue, but to look at the larger issues and context of why the trauma is occurring.

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Materia Medica Monographs

Blue Vervain

Linden de Voil '14



Blue vervain is beloved by many herbalists – perhaps for the lovely panicles of purple flowers that tower over the lush landscape of late summer gardens and leap brightly to eye from the marshy edge of cool ponds, or for the sense of gravitas it seems to radiate. In Europe, vervain has been used as a sacred plant since at least the time of the Druids, and its long history includes ritual use for purification, visioning, protection, and love magic, as well as healing. The ancient Romans sent out messengers with sprigs of vervain in hand to negotiate peace treaties, a practice that later spread with the empire to be replicated among Germanic and Persian peoples. Ancient Greeks hung protective garlands on home and stable, and vervain water has been used to slake and strengthen swords, and rubbed on armor to make it impenetrable [1]. It has been used by witches, since at least the medieval period, in visioning and dreaming, cleansing and purification, in spells to attract love or lovers, in sabbat ointments to confer invisibility (and thus protection,) for rites of initiation, and for protection while working magic [2].

As a medicinal plant, we can trace its history as far back as Dioscorides, and find it widely used in North and South America, Europe, China, and India. Although vervain is most well known today as a relaxing nervine and bitter tonic, a look at its history shows a much broader range of use and potential for wider application.

Botanical Nomenclature

Verbena officinalis L.

Verbena hastata L.

Order: Lamiales

Family: Verbenaceae [3].

Common Names

V. hastata:

American vervain

Blue vervain

Swamp or marsh vervain

Wild hyssop

V. officinalis:

European vervain

Simpler's joy

Herb of grace

Herb of the cross

Juno's tears

Enchanter's herb

Iron herb

As used in Traditional Chinese Medicine, Ma Bian Cao - “horsewhip herb” [4].

Identification



Many species of verbenas can be found around the globe; while a few herbalists use a wide variety of species [5], the majority seem to agree that *V. officinalis* and *V. hastata* are the primary medicinal species, and can be used interchangeably [6]. *V. officinalis* is the standard species used in Europe and by Chinese Medicine practitioners, while many North American practitioners use the native species, *V. hastata*. In both Western and Chinese medicine, the aerial parts of the plant are traditionally used, although some ethnobotanical sources point to use of roots, as well.

V. hastata and *V. officinalis* are similar in appearance, with notable differences in overall size and flower color. Both are perennial herbs with a square, grooved, rigid stem, loosely branching toward the top and whitish, branching roots. *V. officinalis* typically grows 1-2 feet in height, while the rangier *V. hastata* can grow to 5 feet or more. The dark, dull green opposite leaves are 1-3 inches in length, crenate, wrinkled and finely bristled, ovate to lanceolate on top. *V. officinalis* can be distinguished by paired, deeply lobed lower leaves,

and more delicate flower spikes. The lower leaves of *V. hastata* are often three lobed and arrow shaped or hastate, giving rise to its name. Flowers are small, with a two-lipped corolla, and borne in a loose panicle of slender, elongated spikes; in *V. officinalis*, the corolla is lilac or mauve in color, while the flowers of *V. hastata* are lavender to deep blue. They typically flower July-September, depending on location, and bloom a few at a time, opening along the spike toward the tip [7,8]. In warmer climates, basal leaves may form an evergreen rosette, while in colder climates aerial parts die back entirely.

Native to the Mediterranean basin, *V. officinalis* is now naturalized throughout Europe, including Britain, from Denmark south and east to N. Africa, W. Asia to the Himalayas. In the United States it grows along both coasts as well as parts of the Northern Midwest, where it can be found along roadsides and in disturbed soil. *V. hastata* is native to North America, and now grows in all of the lower 48 states and much of Southern Canada [9], along roadsides, clearing edges, and in marshy areas. *V. officinalis* is slightly less hardy, growing in US zones 4-8; *V. hastata* can be found in Zones 3-7 [10,11].

Commercial Sources and Handling

Both *V. officinalis* and *V. hastata* are widely available in commerce as dried herb and alcohol extracts, although they may need to be sourced from specialist retailers or bulk suppliers. Young plants and seed of *V. hastata* are widely available for garden use; *V. officinalis* seed is available from medicinal plant specialists such as Horizon Herbs. Most *V. officinalis* found in commerce in the US and Europe is cultivated in Eastern Europe [12]; *V. hastata* is often wild-crafted in the US, and as such requires ethical sourcing, although it grows abundantly and is not noted as an at-risk species by United Plant Savers.

Both species can tolerate a wide variety of soils, and prefer full sun; *V. hastata* will tolerate partial shade and can thrive in moist, poorly drained soil. Seeds may benefit from cold treatment prior to sowing, and may take up to a month to germinate. *V. hastata* will spread widely when given good conditions [13].

One study found that concentration of constituents varies throughout the growing season and the plants life cycle; highest total amount of iridoids and phenolic compounds was highest in aerial parts just before flowering. Interestingly, this study also suggests that higher levels of both iridoids and phenolics are found in plants in later years of growth [14].

Improper drying may lead to hydrolytic decomposition of verbenalin [15], which may be one reason fresh extract preparations are sometimes recommended.

Physiological Actions

- Primary actions:
 - Nervine – relaxing and trophorestorative
 - Musculoskeletal relaxant – antispasmodic
 - Anti-inflammatory
 - Hepatic – bitter
 - Diaphoretic – febrifuge – antiperiodic
- Secondary and/or traditional actions:
 - Anti-depressant
 - Emmenagogue
 - Expectorant
 - Galactagogue
 - Anticonvulsant
 - Anti-lithic
- Chinese medicine:
 - Clears heat; dispels obstructions caused by heat (i.e. abdominal masses, throat swellings, breast lump or abscess)
 - Invigorates and cools the Blood; disperses Blood stasis (particularly used in amenorrhea or dysmenorrhea due to Blood stasis)
 - Enters the channels of the Liver and Spleen [16].



Traditional Uses

Documented ethnobotanical use:

V. hastata has been used extensively by indigenous peoples of North America, particularly the Eastern woodland tribes of the US and southern Canada, including Cherokee and Iroquois tribes, but also by others as far away as California. In a few cases, the root and seed are included. Recorded uses can be grouped under the general categories of diaphoretic/febrifuge; anti-inflammatory and analgesic, including topical and internal use, particularly for inflammation of the breast, ear, and head; gastrointestinal remedy, both as an analgesic and anthelmintic; vulnerary and hemostat; expectorant or anti-tussive; and emmenagogue [17].

Use by North American indigenous peoples

<i>Category of action</i>	<i>Specifics of use</i>	<i>People or region</i>
Emmenagogue	- “removes women's obstructions”	Cherokee
Anti-inflammatory/analgesic	- birth afterpains - breast complaints	Cherokee

	- dropsy - poultice to head “to cool off” (root)	Caughnawaga
GI remedy	- antidiarrheal (root) - emetic (root, seed, leaf) - stomach tonic; relieves cramps - anthelmintic (root)	Cherokee Iroquois, Missouri
Respiratory remedy	- relieves coughs - for colds/flu	Cherokee
Vulnerary/hemostat	- snuff for nosebleed (leaf and flower)	Cherokee
Febrifuge	- “complicated stomach fevers” - relieves chills - diaphoretic	California (tribe unlisted) Delaware Cherokee

Select recent ethnobotanical studies

<i>Location</i>	<i>Uses</i>	<i>Source</i>
Central Italy (Latium)	Topical and internal; poulticed with thymus spp. and parietaria diffusa for “thyroid problems,” joint pain; vulnerary	Guarrera, 2005 [18].
Northern Italy (Valvestino, Brescia)	Whole plant used internally for asthma, coughs	Vitalini et al, 2009 [19].
Northern Portugal	Internal use of aerial parts for depression, anxiety, stress, insomnia	Neves et al, 2009 [20].
Southern China (Yao population, Yunnan)	Whole plant, in medicinal baths, to promote circulation and resolve blood stasis	Li, 2006 [21].
India (Allahabad, Uttar)	Root paste used topically for snakebite	Kapoor, 2012 [22].

Pradesh)		
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Uses in the Western herbal tradition:

The pharmacopeia of Dioscorides (c. CE 50-70) describes a plant suggested to be vervain - called peristerion, hierobotane, or sacra herba - and recommends a topical poultice of leaves for inflammation, edema, and ulcerated wounds. It may be taken internally for jaundice, particularly during periods of fasting. A decoction of the whole herb is used to alleviate 'crusts around the tonsils,' and as a gargle for mouth sores. He also refers to use of aerial parts as an anticonvulsant, and describes the use of the infusion "to make guests merrier" - perhaps alluding to use as a relaxant or antidepressant.

In her *Liber Similis Medicinae* (c. 1151-1158), Saint Hildegard of Bingen suggests similar uses, including a repeated warm poultice of macerated herb for ulcerated wounds, and around the neck for sore throat and swellings – perhaps including tumors. She describes its used both internally and topically for infections ("toxic blood") or abscessed teeth ("infections from the brain to the teeth.") She considers its nature as "more cold than warm," though in the case of abscess or infection it is said to draw out the heat [23].

For Culpeper, writing c. 1653, vervain seems something of a panacea, believed to 'cure all wounds, both inward and outward' and used generally as 'a great cleanser, opener, and



healer.' Many of the uses he cites would fall under a general modern heading of anti-inflammatory and vulnerary: serpent bites, scrofula, plague, ague, dropsy, gout; topical application with honey for inflammation of the skin, as well as old ulcers and fistulas, and "swellings and pains of the secret parts;" and perhaps the application of infusion directly to the eyes to "clear them from mists" and strengthen the optic nerve – although some modern writers speculate that the latter could be a conflation with ritual use in visioning. He also gives a clear indication for topical use, applied with rose oil and vinegar to the forehead, to ease chronic headache and "for those who are frantic" - which may refer to its use as a general relaxant, or more specifically as an anticonvulsant.

Culpeper describes the use of vervain to cure “defects in the reins (kidneys) and bladder, expelling gravel and stones,” and as a bitter, digestive tonic, and hepatic, to “help the yellow jaundice, relieve worms in the belly... and strengthen and corrects diseases of the stomach, liver and spleen.” Its use “to strengthen and dispel all cold griefs of the womb” suggests modern use as an emmenagogue, and parallels use in Chinese medicine as a Blood mover [24]. Interestingly, Culpeper describes the energy of vervain as 'hot and dry,' although many of the actions he outlines would more typically be considered cooling.

Vervain appears to be dismissed as a remedy or unmentioned entirely in the majority of the Eclectic and physiomedicalist texts, although it was certainly used by at least a few. Both Thompson and Coffin used it as a diaphoretic and in large doses as an emetic or laxative, and as such it may have been among their more frequently used remedies; Coffin cites it as an emetic “second only to lobelia in efficacy,” particularly in use for fevers, as was common at that time [25,26]. Coffin also used it as a key part of combination formulas for asthma and for acute spasmodic disorders; working in Britain, he used *V. officinalis* as a substitute for another indigenous North American plant then commonly used as an antispasmodic nervine, Lady's slipper (*Cypripedium acaule* and other species) [27].

Cook's Physiomedical Dispensary of 1869 comments that “it is nearly overlooked by the profession, but deserves decided attention.” He recommends both aerial parts and roots as a relaxant tonic, akin to boneset. (This comparison suggests he may be referring here to a true, restorative tonic, rather than a relaxing or nervine tonic.) He suggests it as a febrifuge, both via diaphoretic action and by way of “opening the liver and gall-ducts so effectually as to cure intermittent fever,” as well as an emmenagogue and anthelmintic [28].

Although he was known and trained primarily as a homeopath, William Boericke's 1901 *Materia Medica* includes a section on use of tinctures, in which he suggests that vervain affects primarily the skin and nervous system, and may be used to help relieve pain and bruising, as well as in “nervous depression, weakness, irritation and spasms.” The latter category includes epilepsy, in which it “brightens the patient's mental powers.” Generally he suggests a single dose of the tincture, except in the case of epilepsy, when it is to be used regularly over time [29].

A number of more contemporary sources refer to non-specific traditional use of vervain as an anti-lithic. It's possible that the majority of these may derive either from Culpeper's brief citation, as above, or from Maud Grieve's claim, published in 1931, that “the name vervain is derived from the Celtic *fer* and *faen*, meaning *to drive away the stone*, as the plant was much used for affections of the bladder, especially calculus” [30]. (Although she may indeed be referring back to Culpeper, Grieve offers no authentication or citation; she conveniently lumps together the six separate Celtic languages, in some of which both words

have multiple meanings – so the name 'farfaen,' even if accurate, could perhaps also be translated as 'one who travels across the earth,' and ascribed to its traditional magical uses for visioning, dreaming and protection.) Unfortunately, she mentions little beyond this, other than casual mention of its use as a poultice for headache, earache, and neuralgia, and the history of magical use.

Modern clinical uses:

- Nervous system
 - Stress, anxiety, and depression [31]
 - general improvement of the stress response [32,33]
 - postoperative depression [34]
 - perimenopausal or premenstrual irritability and anxiety [35]
 - postpartum depression [36]
 - mental/emotional exhaustion [37]
 - Insomnia [38]
 - particularly in excess or “sthenic” types [39]
 - Epilepsy [40]
 - Restless leg
 - Trigeminal neuralgia [41]
 - Headache [42,43]
- Respiratory system
 - Colds, pulmonary catarrh
 - Bronchitis, pertussis, pleurisy [44]
 - Asthma
 - Sinusitis [45]
- Acute febrile illness and convalescence
 - Fever [46]
 - dry fever with deep aching pain
 - periodic chills and fever
 - malaria
 - in infants, agitated, with pain on palpation of epigastric region
 - Postfebrile debility and depression [47]
- Digestive system
 - Stomach or intestinal cramps, colic [48]
 - nervous stomach [49]
 - Gallbladder inflammation and spasm
 - Hepatic torpor or inflammation
 - jaundice
 - viral hepatitis
 - Intestinal parasites[50]
- Musculoskeletal system
 - Tension or stiffness in the neck and shoulders [51]
- Reproductive system

- Dysmenorrhea
 - premenstrual symptoms of irritability and anxiety
- Menstrual migraine
- PCOS
 - regulation of hormone metabolism via liver stimulation
- Endometriosis, benign breast disorders
 - stress relief to reduce severity of symptoms
- Insufficient lactation
 - via nervous system relaxation, disinhibiting milk release



Specific Indications and Patterns:

American herbalist Kiva Rose offers an excellent and thorough description of the “vervain person”:

“The individuals most prone to Vervain’s effects tend to be those who hold enormous amounts of tension and stress in their shoulders and neck. They are usually very intense, adrenally dominated, driven people who are highly critical and have a tendency to project their issues on other people. They are prone to blood sugar lability, and they are, as Michael Moore so aptly puts it, “metabolically brittle.” Their anxiety, while usually based in fear, mostly manifests as an aggravated, edgy attitude and an over-talkative brain that keeps them from restful sleep, good sex and general satisfaction with themselves or their lives. They may seem initially growly and unhappy, but in many cases it is simply the tremendous pressure of their internal tension that makes them so unapproachable and even haughty. It’s not unusual for some level of alcoholism or addiction issues to be present” [52].

Vervain is also used as a flower essence; Dr. Bach's foundational text suggests the use of vervain for “those with fixed principles and ideas, which they are confident are right, and which they very rarely change....They are strong of will and have much courage when they

are convinced of those things that they wish to teach. In illness they struggle on long after many would have given up their duties” [53].



Constituents

- Triterpenoids
 - ursolic acid
 - oleanolic acid
- Phytosterols
 - beta-sitosterol
- Volatile oils
 - citral
 - linalool
 - verbenone
 - geranial
- PolyphenolicsIridoid glycosides
 - verbenalin (cornin)
 - hastatosides
 - verbenosides
 - verbeofflin [54,55]
 - aucubin [56]
- Caffeic acid derivatives
 - verbascoside
 - eucovoside [57]
- Flavonoids
 - Scutellareins [58]
- Flavones
 - apigenin
 - kaempferol
 - luteolin
 - hydroxywogonin [59]

Anti-inflammatory actions

Generally speaking, flavonoids are known for anti-inflammatory, anti-allergenic (via inhibition of histamine release), and antioxidant effects [60]. A wide body of research evidence upholds existing theories about their possible actions; the brief explanation below comes from Hyun Pyo Kim's review, Anti-inflammatory Plant Flavonoids and Cellular Action Mechanisms. Research suggests that a number of the actions described here can be attributed either to whole plant preparations of vervain or to one of its constituents.

Although not fully understood, several action mechanisms are proposed to explain in vivo anti-inflammatory action. One of the important mechanisms is an inhibition of eicosanoid generating enzymes including phospholipase A2, cyclooxygenases, and lipoxygenases, thereby reducing the concentrations of prostanoids and leukotrienes. Recent studies have also shown that certain flavonoids, especially flavone derivatives, express their anti-inflammatory activity at least in part by modulation of proinflammatory gene expression such as cyclooxygenase-2, inducible nitric oxide synthase, and several pivotal cytokines [61].

Multiple in vitro and in vivo animal studies using *V. officinalis* extracts demonstrate these anti-inflammatory effects:

- Multiple studies have demonstrated the effectiveness of topical use of vervain in reducing induced paw edema in rats; in one case, topical administration of 50% methanolic extract was as effective as the NSAID piroxicam an NSAID [62,63].
- Oral administration of aqueous, methanolic, and CO2 extracts in vitro and in vivo (rats) showed significant gastric anti-inflammatory and wound healing properties [64].
- Whole plant methanol extract, applied in vitro to mouse cells, depressed production of nitric oxide, inducible nitric oxide synthase, and expression of COX-2 [65]. As discussed above, excessive NO production, mediated by iNOS, is correlated with pathological inflammatory conditions, including allergies, asthma, and autoimmune disorders; this suggests vervain could have additional use in these areas.
- Whole plant aqueous extract, in vitro, demonstrated protective effects on human neuronal tissue, decreasing the damaging effect of beta-amyloid protein formation. This suggests potential neuroprotective effect via prevention of beta-amyloid plaques associated with Alzheimer's [66].

The flavonoid wogonin and its glycosides – collectively known as wogonosides, and more commonly known as constituents of *Scutellaria baicalensis* – have been researched for its anti-inflammatory effects. Wogonin has been shown to inhibit production of

proinflammatory eicosanoids by interfering in the lipoxygenase pathway [67] and minimizing prostaglandin production by limiting genetic expression of COX-2 [68].

One animal study examined the use of vervain for urolithiasis, showing only very limited relevant use as a solvent and almost no diuretic effect [69]. However, vervain's usefulness as an anti-inflammatory may contribute some effect here.

Digestive and hepatic effects

Iridoid glycosides in vervain, including verbenalin and aucubin, stimulate the T2R bitter taste receptors, inducing a cascade of chemical messaging that produces increased secretion of digestive enzymes, gallbladder motility and bile flow [70], and affects metabolic function, including maintenance of glucose homeostasis [71].

An in vitro murine study showed that oral administration of the iridoid verbenalin had a significant hepatoprotective effect [72]. It is speculated that the anti-inflammatory and antioxidant qualities of some plant compounds, including flavonoids, may be responsible for their hepatoprotective effect [73]; given the noted presence of such compounds in *V. officinalis* and *V. hastata*, this may be a potential mechanism of action.

Respiratory effects

Aqueous extract of aerial parts of *V. officinalis* showed anti-tussive and expectorant effects in vitro on mice and guinea pigs; this effect has been attributed to the iridoid verbenalin [74,75]. There is some evidence that T2R stimulation, eg by iridoid constituents, causes bronchodilation and airway relaxation [76].

Caffeic acids and the flavone kaempferol inhibit the activation of NFκ-beta, limiting the expression of proinflammatory genes that are associated with inflammatory respiratory pathologies such as chronic bronchitis and asthma [77].

Relaxant and sedative effects

Both apigenin and wogonin are benzodiazepine receptor agonists with noted anxiolytic activity [78,79]. Research focused on *Matricaria* and *Scutellaria* species shows that these constituents are orally available. It hasn't been demonstrated that concentration level of these chemicals as found in vervain have the same effect as in more well known anxiolytic plants, though their presence may contribute to its use as a relaxing nervine and sleep aid, and to the traditional use of vervain as anticonvulsant.

An in vivo murine study showed that hastatoside and verbenalin promoted sleep and restfulness, using the parameters of increased duration of REM cycles and increased delta

wave activity during non-REM cycles [80]. These same constituents are also known to have mild parasympathomimetic effects [81,82].

Potential uses extrapolated from pharmacological data:

Anti-oncogenic

Multiple constituents of vervain have demonstrated a range of anti-cancer activities:

- Wogonoside has been shown to inhibit angiogenesis both in vitro, on human cells, and in vivo in mice [83].
- Lymphocytes from patients diagnosed with chronic lymphocytic leukemia showed significantly increased apoptotic activity, likely due to caspase 3 activation, when exposed to both the essential oil of *V. officinalis* and its main component, citral [84].
- An in vitro study showed that the flavonoid scutellarein had selective cytotoxic activity on human breast cancer cells, without damage to normal cells [85].
- The flavonoids luteolin and apigenin have demonstrated numerous anti-inflammatory and anticancer activities, including inhibition of angiogenesis, induction of apoptosis, reduction of tumor formation and growth, and chemosensitization. Possible mechanisms of action involve modulation of reactive oxygen species, reduction of NFkappaB activity, and stabilization of oncogenes such as p53, which regulate apoptosis in damaged cells [86,87].

Additionally, freeze dried powder from aqueous extract of *V. officinalis* showed anti-tumorigenic activity on tumor-bearing mice. Vervain extract showed an average tumor inhibition rate of 30%, with no damage to immune organs or function; in comparison, the control of cisplatin had an inhibition rate of 42%, with significant toxic side effects [88].

Anti-microbial

In vitro, scutellarein showed a potent inhibitory effect on the SARS coronavirus [89].

Flavonoids from *V. officinalis* showed in vitro antimicrobial effect on both gram positive and gram negative bacteria, including *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis* [90].

Clinical Research

No data is available for human clinical trials on single plant preparations of vervain.

Safety Issues

Vervain appears on the AHPA list of herbs contraindicated in pregnancy as a category 2b herb, meaning it is not to be used during pregnancy except as directed by an expert [91]. According to researcher Kerry Bone, this caution stems from older research on a sole constituent, verbenalin, which is a weak promoter of uterine contraction, and comes particularly from a Chinese study in which vervain in vitro synergized with prostaglandin E2 to induce uterine contraction [92]. The contradiction is not carried into many standard reference sources, including the Physician's Desk Reference for Herbal Medicines, the German commission E monograph, Bone's *Clinical Guide* or David Winston's *Medical Herbalism* [93,94], all of which state that no adverse effects are expected when used at appropriate doses.

A clinical trial of the German botanical medicine Sinupret included 762 pregnant women, and reported no adverse events [95]; however, this preparation includes only 18 mg of dried powdered vervain, a fairly low dose, and relative quantities of verbenalin could be higher in fresh hydroethanolic extracts.

No data is available on safety in lactation, although vervain has historically been used to promote lactation [96].

Occasional references can be found listing vervain as anti-thyrotropic; however, a study that compared freeze dried aqueous extract of *V. officinalis* to known or suspected TSH inhibitors (*Lycopus europeae* and *Melissa officinalis*) found that vervain had no inhibitory effect on cells exposed to bovine TSH, either in vitro using human cells or in vivo on mice [97].

Some Chinese materia medica cite a traditional contraindication with spleen yin deficiency or stomach qi weakness, even when heat in the blood or a damp heat pattern is present [98].

One case of contact dermatitis was reported, after an oil-based poultice of vervain flowers was applied for an extended period of time. Patch testing with fresh plant on 10 controls failed to replicate this result, suggesting that the individual may have had atypical sensitivity, exacerbated by heat and oil in the preparation [99].



Clinical research has shown that due to its high polyphenol content, vervain can reduce the absorption of nonhaem iron (iron not derived from animal sources) when taken simultaneously with meals or supplements [100]. As a reference point, vervain's inhibitory effect on iron absorption is approximately two-thirds that of black tea.

Dosage and Preparation

Vervain has historically been used as a tea as well as a tincture, though some modern palates may not find its somewhat bitter taste appealing as a beverage. A range of dosages and preparations have been recommended; using any of the unique frames of reference, these preparations are generally in the low-standard range. Although certainly not a low dose botanical, vervain does not require high dosing to show effect, and excessively high dose may induce nausea in sensitive people.

British Herbal Pharmacopeia [101]:

2-4 g dried herb daily in tea or capsules

2-4 mL of 1:1 extract, or 4-10 mL of 1:5 tincture per day

Kerry Bone [102]:

3-6 mL of 1:2 extract daily

Larken Bunce [103]:

As a single remedy, 1-3 mL up to TID; 1 mL in formula up to TID.

Tincture to be prepared 1:2 with 35-45% alcohol if using fresh plant material, or 1:3-:15 with 60-80% alcohol if using dried plant.

Michael Moore [104]:

2-5 oz of infusion up to TID. Infusion to be prepared with 1 oz herb: 32 oz water.

30-90 drops (approximately 1-3 mL) tincture up to QID. Tincture to be prepared 1:5, using 60% alcohol.

David Winston:

2-3 cups of tea, prepared using 1 tsp herb per 8oz water

30-40 drops (approximately 1-1.5 mL) QID

David Hoffman:

2.5-5 mL TID. Tincture to be prepared 1:5 with 40% alcohol.

Chinese Herbal Medicine Materia Medica:

4.5-30 g qd in decoction; up to 60 g qd to treat malaria

Matthew Wood:

30-90 drops (approximately 1-3 mL) tincture daily.

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Polygonatum biflorum - Solomon's Seal

Netta Mae Walsh '15

Botanical nomenclature:

As of June 2014, the World Checklist of Selected Plant Families accepts 75 species and hybrids in the *Polygonatum* genus [1]. This monograph is primarily limited to:

Polygonatum biflorum (including 5 varieties incl. var. *commutatum* = "giant") - native to N. America (can have 2+ flowers - hard to distinguish between species)

Polygonatum multiflorum (native to Europe and Asia botanically and medicinally considered by many to be interchangeable with *P. biflorum*)

Polygonatum odoratum - scented (yuzhu - Chinese)

"False Solomon's Seal / Fairy Wand" - *Smilacina racemosa* - flowers in a raceme on the tip = wand

Botanical Family:

Asparagaceae

(formerly Lily of the Valley Family – Convallariaceae)

Common names:

Solomon's Seal, Sealwort [9], Sealroot [9], David's harp [32], Ladder to Heaven [32], Eurasian Solomon's Seal [32], Lady's Seals [15], St. Mary's Seal [15], Sow's Tits/Teats [3], Dropberry [9], He Shou Wu [9], Mahmeda [9], Meda [9], Sigillum Sanctae Mariae [9], Yu Zhu [9], Wolf's Milk [4]

Part Used:

Root, rhizome

Identification:

Polygonatum spp. is a rhizomatous, upright, arching, perennial herb, growing up to 1 m (3 ft 3 inches) by 0.3 m (1ft in). It is hardy to USDA zone: 3-8 (UK zone 3). *P. biflorum* is native to North America and grows in the areas indicated on the United States Department of Agriculture map to the left. Due to the large size of the genus *Polygonatum*, there species native to many places around the world.

The various species of the genus are widely distributed in the temperate regions of the East Asia. Specifically in China and Japan, approximately 40 different species of *Polygonatum* have been reported [5,6,7]. Additionally it is also found in India, Korea, Nepal, Afghanistan, Bhutan, Nepal and Russia. Along with Asia, *Polygonatum* also grows in the moderate climate zones of North America and Europe. Flora of Pakistan indicates the presence of four different species of *Polygonatum*. These include *P. multiflorum*, *P. geminiflorum*, *P. cirrhifolium* and *P. verticillatum*. *Polygonatum* species are widely distributed in various

part of the country like Hazara, Chitral, Swat and Kurram agency [5,8,9].

Small, bell-shaped, greenish yellow flowers (usually in pairs) on short pedicels dangle in spring from the leaf axils along and underneath the arching stems. Flowers are followed by blue-black berries in autumn. *P. biflorum* flowers in April to May and the seeds ripen in October. The flowers are hermaphrodite (have both male and female organs) and are primarily pollinated by bees. The plant is self-fertile. The flowers are small and delicate. They are white-green bell/tubular flowers which turn into blue to purple/red berries. The leaves have prominent parallel-veins, are alternate and up to 4" long. They are smooth on both sides and turn an attractive yellow in fall [10,11,12].

The leaves clasp the stem. Which according to the Doctrine of Signatures, is just like how the tendons or ligaments clasp the bones. The stalk has a slight zig-zag quality between leaves but not excessively or constantly so, as it can look almost straight as well. The root grows very shallow in the ground and is light brown. The root resembles that of a dandelion, but the inside of the root is bright white (like jerusalem artichoke or jicama)! The rhizome itself has a knobbly, angled look, that resembles knuckles or joints - bone white on inside [1,10,11,12].

It is suitable for light (sandy), medium (loamy) and heavy (clay) soils but prefers well-drained soil and can grow in heavy clay soil. It prefers moist soil. It grows in acidic, neutral and basic (alkaline) soils.

It can grow in full shade (deep woodland) or semi-shade (light woodland). It thrives in woodland or garden habitats. It prefers dappled shade or shady edges; not deep shade [15]. According to Discordes, the earliest description is: "*Polygonatum grows on hills, a shrub*



higher than a foot, with leaves similar to laurel but broader and smoother, somewhat similar in taste to a quince or pomegranate, for it tastes astringent. At every emerging of the leaves are white flowers in a larger quantity than the leaves, the number to be reckoned from the root. It has a white root - soft, long, with many thick joints, strongly scented, the thickness of a finger" [13].

False Solomon's Seal has wider leaves that are more rigid with pleated veins. It is often more stiff - wand like (hence the alternate common

name: fairy wand). The most obvious difference is that the flowers are at a terminal, i.e., at the ends of the stems, rather than dangling beneath the stems. These are white or yellowish-white flowers that will persist for two or three weeks, and then toward the end of fall, will develop into nice, mottled red fruit [12].

Commercial Sources and Handling:

Bulk root is available - but limited. It is often out of stock and difficult to find. Mountain

Rose does sell it when in stock. If you have bulk root -- make sure to store it in a cool, dry place. Dried root should last on the shelf for a few months - always take note of the characteristic white-ness and smell [1].

Tincture is available on the market and through the internet - it is very important that all sources be organically grown - not wildcrafted. Tinctures typically have a shelf life of 3-5 years [1]. This plant is very easy to cultivate [1,16].

Cook says the roots “yield their qualities to water and diluted alcohol; are much impaired by heat; and undergo deterioration by long keeping” [4,14].

Growing and Harvesting:

According to Larken Bunce, wildcrafting in Vermont should only be done with caution. It is very easy to over harvest and is not plentiful [1].

Fortunately, it is a very hardy plant and easy to cultivate from seed or root division. If grown in suitable soil and habitat, it will thrive and multiply very rapidly by the creeping rootstocks. Seeds, sown as soon as gathered in the autumn, germinate in early spring, or the roots may be divided to any extent (new shoots will often sprout from places where the root has been broken). The best time to transplant or divide the roots is in autumn, after the stalks decay. They should also have room to spread. To give Solomon's Seal a good start when planting, the soil should be well broken up with a fork and have a little mild manure worked in, as with most plants [9,15].

Michigan Herbalist, Jim McDonald gives detailed harvesting instructions:

“Find a plant and trace down the stem till you feel the root in the soil. Very often the roots are quite close to the surface, and if this is the case, and there's not a lot of clay to deal with, you can harvest with your fingers - if not, hope you've got a small trowel... The front of the root will have the bud of the next year's growth, while the back can reach upwards of a foot behind the stem. Trace back two to three inches from the stem and sever the rear portion of the rhizome with a knife or trowel (or break it with your fingers), and pull that portion up from the ground. I find that if I run a finger underneath the roots as I'm pulling it up, I can collect it more effectively. It will be a creamy white color, and appear to have knobby knuckles indicating the previous year's stalks (I've collected plants over 13 years old). Because the growing portion of the plant is never removed from the ground, plants harvested in this manner show no signs of impact or distress, and will continue to grow unimpeded by harvesting. Very often, new shoots will grow from where the root was cut, which means more above ground plants, more flowers, more berries, and so more seeds. Also, any pieces of the back of the root that break off will likely, as well, continue to grow into new plants. Collected in this manner, you'll have more plants growing where you harvest than were there when you started, and that is indeed a good feeling” [16].

Taste:

Sweet, juicy - polysaccharide rich (similar to shatavari) - with a spicy after-taste (almost like a very mild radish) [1]; slightly acrid [1,17].

Energetics:

moist, cool - sweet neutral yin tonic [1,17]

Tissue State:

Atrophic [17]

Actions:

Antidiabetic [18a, 18c]

Anti-inflammatory [1, 18e]

Astringent [18a, 18f, 18g]

Cardiotonic - cousin to lily of the valley [1]

Demulcent [18f, 18g]

Diuretic [18a, 18c, 18g]

Expectorant [1]

Hypoglycemic [1, 18c, 18e 18g]

Prebiotic [1]

Tissue Tonic - connective tissue tonic [1, 18e 18g]

Vulnerary [1]

Yin Tonic / Nutritive [1,4]

Discortes: "Polygonatum multiflorum is tonic, mildly astringent, and mucilaginous." [13]

Secondary metabolites with well-defined analgesic, antipyretic and anti-inflammatory properties have been isolated from Polygonatum [5]



Specific Indication:

Joint pain w/ dryness, degradation of meniscus/connective tissue, hyper flexibility or high tension - regulates tendon/ligament attachments; general nutritive/yin tonic for weak dry atrophic tissues, Vata - yin deficient, maybe heat but maybe just dryness in general [1].

Matthew Wood: stretched, stiff, tight or loose tendons and ligaments; nutritive food for weak and prostrated persons; tuberculosis; irritation of the mucosa of the intestines, lungs, vagina [17].

Traditional Use:

Dioscorides (between 50 and 70 AD): said that Solomon's Seal is "*good applied on wounds and to take away spots from the face*" [13].

In A.D. 130-200, the most famous physician of his day, Galen, did not recommend the use of Solomon's Seal internally, and thought it to be poisonous [17].

In the sixteenth century, the herbalist, John Gerard, is largely responsible for bringing Solomon's Seal into modern literature. In his Herball (1597), he claimed that Solomon's Seal was an effective treatment for cuts, wounds and bruises of all kinds (when used in a poultice). The herbalist also said that when taken internally, the roots were excellent for

"broken bones to knit." So enamored by Solomon's Seal's diverse healing qualities, he pronounced: "*Common experience teacheth, that in the world there is not to be found another herbe comparable to it*" [4,19].

William Cullen (1781), advocate of exotic and toxic drugs, recommended it for hemorrhoids [4,20].

Dr. William Cook (1869) notes on its affinity for internal organs and tissues. "*The fresh roots, bruised and boiled in milk, make a fair external application to bruises, light burns, lingering sores of an erysipelatous character, and other affections of the skin where there is a stinging sensation.*" He also recommended it for leucorrhea, vaginitis, pelvic weakness, and painful menstruation. He used it primarily as a moistening mucilaginous agent to coat and soothe the mucosa [4,14].

In his publication, *Theatrum Botanicum*, of 1640, John Parkinson, a renowned British apothecary, noted that Italian women used the root to improve their complexions and retain their beauty and agelessness [12,15].

In North America, early native tribes made a tea of the rootstock as a cure for women's complaints and general internal pains. In some countries, Solomon's Seal is boiled and eaten as a vegetable similar to asparagus, and it has also been used in snuffs to induce sneezing and relieve head congestion [4,15,17].

For centuries the powdered roots have been shown to make an excellent poultice for bruises, piles, inflammations and tumours. The fresh root, pounded and applied topically helps fade bruising. The bruised roots were much used as a popular cure for black eyes, mixed with cream. The bruised leaves made into a stiff ointment with lard served the same purpose [4,15,17].

Eclectic Manual Number 6: The Essentials of Modern Materia Medica and Therapeutics by John William Fyfe, M.D. Solomon's Seal is indicated for: "*Irritated and relaxed mucous membranes; leucorrhea and menorrhagia; debility, especially in females. Irritable conditions of the intestine, especially when attended with burning sensations, congestion of the liver, spleen, or intestines; inactive portal circulation, hemorrhoids. This agent exerts a direct action upon the circulation, and especially upon that of the venous system*" [22].

According to Duke's Handbook of Medicinal Herbs: Solomon's Seal's indications are [18a-18g]:

Abscess (18a, 18g); Bleeding (18a, 18g); Boil (18a, 18e); Bruise (18a, 18b, 18e, 18f); Cancer (18a, 18d, 18g); Carbuncle (18a, 18g); Debility (18a, 18f); Dermatitis (18a, 18e); Diabetes (1, 18c, 18g); Dyspepsia (18a, 18e); Edema (18a, 18e); Enteritis (18a, 18e); Furuncle (18a, 18e); Gastritis (18a, 18e); Hematoma (18a, 18e); Hemoptysis (18a, 18g); Hemorrhoid (18a, 18b, 18e, 18f); Hyperglycemia (1, 18c, 18e, 18g); Inflammation (1, 18e, 18f, 18g); Leukorrhea (18a, 18b, 18f); Mastitis (18a, 18g); Pulmonitis (18a, 18e, 18g); Respiritis (18a, 18e); Swelling (18a, 18e); Tuberculosis (18a, 18g); Tumor (18a, 18g); Ulcer (18a, 18e); Water Retention (18a,

18c, 18g); Wound (18a,183).

The American species *P. biflorum* has a starchy root that was eaten like the potato and used as flour for bread [11,23].

Doctrine of Signatures:

Wood: *"The roots or rhizomes resemble bones. In fact, the dried root separates into an inner and outer layer like the periosteum covering the bone - a signature for dried out, brittle bones and bone healing... The leaves join around the stems, like muscles attaching to the bone and the flowers - later the berries - also arise from these joints. The stalk rises up at a ninety-degree angle the signature of Wolf Medicine (agrimony, werewolf root, st. john's wort) - thus, an example of a "spirit signature." The stalk leans over, which is a signature indicating that this is a plant for debility and nutrition... The resemblance to the socket of the hip joint is a very significant matter. Ancient people - we see this in the Hebrew Bible - placed their hand under the thigh or hip joint when they made oaths or swore to tell the truth. They considered the joint of the hip to be the place where covenants, magical agreements, or "spiritual documents" are "stored." [4]*

Clinical Uses:

Respiratory

Pulmonary problems and hemorrhages [17,24]; Dry cough, cough w/ blood, soothing expectorant, tuberculosis [1]

Cardiovascular

Affinity to the heart; relaxes, increases the space between the beats [17,24]; high blood pressure [17]; Chinese species have been used to regulate of heart muscle and its contractility - strengthening so that it doesn't have to work so hard - specifically for hypertension (cousin to lily of the valley) [1]

Digestive

Intestinal upset; tension [17, 24]; Hemorrhoids [17, 24]; Mucus membrane issues from mouth to anus, GERD, leaky gut, dysbiosis, spleen-qi tonic, [1]; Asian species: steatohepatitis = fatty liver disease (helpful to liver – hepatic) [1]

Reproductive

Profuse menstrual flow, vaginal irritation. [17, 24]; Restores hormonal glow to the face, tonifies the ovaries, strengthens the estrogen side of the cycle [17, 24]; Ovarian pain [17, 24]; Premature ejaculation [17, 24]; Affinity for some aspect of fertility (will create space for more production of testosterone and estrogen versus cortisol), pelvic weakness, vaginitis, leukorrhea, dysmenorrhea, low libido, bladder issues where bladder is sitting on uterus [1, 17]

Muscular and Skeletal

Muscular and skeletal tensions, bones spurs resulting from such tensions [4, 17, 24]; Repetitive use injury; carpal-tunnel syndrome; arthritis associated with old injuries, calcifications and muscular and skeletal tensions [4,17, 24]. Over-stretchy or inflexible

tendons or ligaments, unstable or damaged joints, osteo and rheumatoid arthritis, tendonitis, bursitis, repetitive use injury, sports injuries like sprains or strains, can be used as a preventative for folks who are very active, will strengthen and prevent further injury, broken bones, post surgery (esp. for joint or connective tissue) , bone spurs (excessive tendon tension applied to bone - causes over calcification due to the tension) [4, 17]; can be used alongside chiropractors - will help keep spine stable, good w/ massage - for folks who will get a massage and 3 days later feel bad again, good for folks who do a lot of yoga or are very stretchy but aren't able to stabilize, good to think about for teeny tiny breaks that can't be cast or don't show up on x-rays, reduce synovial fluid [1].

External

Bruises [17, 24]; External on poison ivy [17, 24]; Great for bruises, places w/ congealed blood / complex injuries, ulcerations, wounds, itchy or irritated skin, poison ivy, age-spots (liver spots) [1]

Chemical Constituents

- Ent-Epicatechin [25, 35]
- L-alpha, gamma-diaminobutyric-acid [25, 35]
- L-azetidine-2-carboxylic-acid [25, 35]
- Alkaloids: Polygonatine A and B [26]
- Allantoin [1, 9]
- Tetrahydroxystilbene glucoside [27]
- Asparagine [9]
- Emodin [9]
- Lectins, Steroidal Saponins, Polysaccharides/Mucilage, Alkaloids, Anthraquinones, Flavonoids, Convallarin [1,9]

Pharmacology:

- Ent-Epicatechin: antibacterial [33], pesticide [28,35].
- L-alpha, gamma-diaminobutyric-acid (located in plant): convulsant and hepatotoxic [28,35].
- L-azetidine-2-carboxylic-acid: mutagenic [34,35].
- Vitamin A, Starch, Pectin, Sugar, Gum [36].
- Lectins: proteins that bind cell membranes. They offer a way for molecules to stick together without getting the immune system involved = immune stimulants [1]; promote cancer cell death (mistletoe - cancer treatment for cancer cell autophagy) [1].
- Steroidal Saponins: expectorant, anti-inflammatory, yin tonifying, controlling of blood cholesterol levels, bone health, cancer, and building up of the immune system [1,2,37].
- Polysaccharides/ Mucilage (sinistrin): demulcent, traps/slows sugar and cholesterol entry, prebiotic, yin tonic, nutritive, anti-inflammatory, connective tissue tonic, vulnerary [1,2,5,37].
- Alkaloids: wide range of actions; in SS they are specifically protective against parasitic bacteria and fungi, as a neurotransmitter, and as a regulator for cell growth and metabolism. connect tissue, vulnerary (also found in comfrey and plantain)

[1,2,37].

- Anthraquinones: antiseptic properties (particularly deadly to pathogens: shigella dysenteriae and staphylococcus), bitter, digestive support, cholagogue/choleretic, antibacterial, anti-tumor effects [1,2,37].
- Flavonoids, also referred to as bioflavonoids, are polyphenol antioxidants; generally protect against cancers. Most effective as cocktails (whole plant). Generally reduce inflammation (esp. in CV system), encourage longevity of tissue (age related degenerative diseases), and suppress cancer. May have mood-energy effects. Crucially reliant on metabolism when given orally [2,9,37].
- Asparagine is a non-essential amino acid. component of those proteins that are concerned with neuronal development and signaling transmission across nerve endings. Asparagine is essential to all living cells for the production of many proteins) [2, 9, 37].
- Allantoin is a skin healing cell proliferant (stimulates the growth of healthy tissue in wound healing), anti-scarring agent, and helps protect the skin from irritants or allergens by forming insoluble complexes with those agents. The richest common source is from comfrey root. It is slightly soluble in water and hydroethanolic solutions, but can be made to dissolve in oily solvents with the use of an emulsifier (in plants, saponins and phospholipids act as emulsifiers). Allantoin is extracted or synthesized and used in many creams, lotions, gels, and cosmetics [1, 9, 37].
- Small amounts of Convallarin which is a cardioactive glycoside are found in SS. Cardiac glycosides are powerful, potentially toxic molecules with a limited botanical distribution. They are broadly used in medicine as heart regulators. Convallarin is a white, crystalline glucoside, of an irritating taste, extracted mostly from the convallaria or Lily-of-the-Valley plant, a relative of Solomon's Seal. It has a low level of risk and should be monitored (lily of the valley). It may potentiate the effects of pharmaceuticals (calcium, quinidine, glucocorticoids (long term), laxatives, and saluretics) Theoretical concern based on the deliberations of German Commission E (pharmacology of constituents) [1, 9, 4,17, 37, 38].

Clinical Trials:

There are no clinical trials or animal studies specifically on *Polygonatum biflorum*.

Polygonatum multiflorum

- Study found that THG improves memory ability, lifespan, and a positive effect on proteins related to neural insulin/IGF-1 signaling. (Zhou, Xuanxuan, et al. "Tetrahydroxystilbene glucoside extends mouse life span via upregulating neural klotho and downregulating neural insulin or insulin-like growth factor 1." *Neurobiology of aging* 36.3 (2015): 1462-1470.)
 - Zhou X, et al. Tetrahydroxystilbene glucoside extends mouse life span via upregulating neural klotho and downregulating neural insulin or insulin-like growth factor 1.
- Ameliorating effect of emodin, a constituent of *Polygonatum multiflorum*, on cycloheximide-induced impairment of memory consolidation in rats.
 - Lu MC, Hsieh MT, Wu CR, Cheng HY, Hsieh CC, Lin YT, Peng WH. J Ethnopharmacol. 2007 Jul 25;112(3):552-6. Epub 2007 May 6.

PMID:17572029

- Studies on the use of "slimax", a chinese herbal mixture, in the treatment of human obesity. This study showed a significant decrease in parameters such as body weight, waist and hip circumference, and Body Mass Index (BMI), in all subjects tested. The basis of action was shown to be through modification of lipid metabolism, with significant effects on both the accumulation and the release of lipid from adipose tissue.
 - Ignjatovic, Vera, et al. "Studies On The Use Of "Slimax”, A Chinese Herbal Mixture, In The Treatment Of Human Obesity." *Pharmaceutical biology* 38.1 (2000): 30-35.
- Molecular cloning of the lectin and a lectin-related protein from common Solomon's seal (*Polygonatum multiflorum*).
 - Van Damme EJ, Barre A, Rougé P, Van Leuven F, Balzarini J, Peumans WJ. *Plant Mol Biol*. 1996 Jun;31(3):657-72.PMID:8790297
- Structure-Function Relationship of Monocot Mannose-Binding Lectins in *P. multiflorum*
 - Barre, Annick, et al. "Structure-function relationship of monocot mannose-binding lectins." *Plant physiology* 112.4 (1996): 1531-1540.
- Purification of lectin from *Paris quadrifolia* L. and comparison of its carbohydrate-binding specificity with other lectins of the Liliaceae family.
 - Antoniuk, V. O. "[Purification of lectin from *Paris quadrifolia* L. and comparison of its carbohydrate-binding specificity with other lectins of the Liliaceae family]." *Ukrainskii biokhimicheskii zhurnal* 68.6 (1995): 86-91.

Polygonatum odoratum

- A formulation of trametes (not versicolor - but cousin of turkey tail), goji berry and *P. odoratum* has been researched for autoimmune induced nephron/kidney damage - nephropathy.
 - Li, Lei-Ting, et al. "Huai Qi Huang ameliorates proteinuria and hematuria in mild IgA nephropathy patients: A prospective randomized controlled study." *Journal of the Formosan Medical Association* 112.12 (2013): 766-772.
- Animal studies have shown that *P. odoratum* may modify glucose regulation.
 - Miura, T., and A. Kato. "The difference in hypoglycemic action between polygonati rhizoma and polygonati officinalis rhizoma." *Biological & pharmaceutical bulletin* 18.11 (1995): 1605-1606.
 - Huang-Lian-Jie-Du-Tang supplemented with *Schisandra chinensis* Baill. and *P. odoratum* improved glucose tolerance by potentiating insulinotropic actions in islets in 90% pancreatectomized diabetic rats. Formulation effective as anti-diabetic prescription by enhancing insulinotropic actions in diabetic rats.
- Homoisoflavonoids, triterpenoids and steroidal saponins were isolated from the rhizomes of *P. odoratum*. These compounds showed outstanding antimicrobial activity against the tested bacteria and fungi
 - Wang D, Li D, Zhu W, Peng P. A new C-methylated homoisoflavonoids and triterpenoid from the rhizomes of *Polygonatum odoratum*. *Natural Product Research* 2009;23:580.

- Wang D, Li D, Zhu W, Zhang J, Peng P. Steroidal saponins from the rhizomes of *Polygonatum odoratum* Natural Product Research 2009;23:940.
- The secondary metabolite, 8-methyl-dihydrobenzopyrone has been isolated from *P. odoratum*. The compound exhibited prominent anticancer activity in breast cancers by inducing the phosphorylation of Bcl-2.
 - Rafi MM, Vastano BC. Identification of a structure specific Bcl-2 phosphorylating homoisoflavone molecule from Vietnamese coriander (*Polygonatum odoratum*) that induces apoptosis and G2/M cell cycle arrest in breast cancer cell lines. Food Chemistry 2007;104:332.

Other Polygonatum Research:

- *P. sibiricum* - there is some relevant research that looks into a combination of *P. sibiricum* and other plants for hepatitis B.
 - Chen, Z. "[Clinical study of 96 cases with chronic hepatitis B treated with jiedu yanggan gao by a double-blind method]." *Zhong xi yi jie he za zhi= Chinese journal of modern developments in traditional medicine/Zhongguo Zhong xi yi jie he yan jiu hui (chou), Zhong yi yan jiu yuan, zhu ban* 10.2 (1990): 71-4.
- The aqueous extract of *Polygonatum* was found effective against various human pathogenic bacteria. The bacteria were *S. typhi*, *S. aureus* and *M. tuberculosis*
 - Hou JP, Jin Y. The healing power of Chinese herbs and medicinal recipes. New York: The Haworth integrative Healing press, 2005
- Studies support the role of *Polygonatum* in the activation of apoptosis
 - Liu B, Peng H, Yao Q, Li J, Van Damme E, Balzarini J, Bao Jk. Bioinformatics analyses of the mannose-binding lectins from *Polygonatum cyrtonema*, *Ophiopogon japonicus* and *Liparis novversa* with antiproliferative and apoptosis-inducing activities. *Phytomedicine* 2009;16:601.
 - Liu B, Zhang B, Min Mw, Bian Hj, Chen L, Liu Q, Bao Jk. Induction of apoptosis by *Polygonatum odoratum* lectin and its molecular mechanisms in murine fibrosarcoma L929 cells. *Biochimica et Biophysica Acta (BBA) - General Subjects* 2009;1790:840
- The saponins isolated from the rhizomes of *P. sibiricum* were tested for cytotoxic potential against human breast cancer cells. The result showed moderate activities of the compounds
 - Ahn M, Kim C, Yoon K, Ryu M, Cheong J, Chin Y, Kim J. Steroidal Saponins from the Rhizomes of *Polygonatum sibiricum*. *Journal of natural products* 2006;69:360.
- The isolation of a very potent antioxidant like quercetin from *P. altelobatum* providing a strong evidence of the antioxidant potential of *Polygonatum*
 - Pao-Lin H, Kim-Hong G, Ru-Rong W, Chun-Nan L. Benzoquinones, a homoisoflavanone and other constituents from *Polygonatum alte-lobatum*. *Phytochemistry* 1997;44:1369
- Many steroidal saponins have been isolated from *Polygonatum* including diosgenin and related compounds. Research on diosgenin and related steroidal saponins showed significant anti-inflammatory activity. These compounds nonspecifically

inhibited both cyclooxygenase (cyclooxygenase 1 and 2). However, cyclooxygenase-2 was more prominent

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- P. verticillatum possesses tracheorelaxant, mediated possibly through a Ca²⁺ channel blockade mechanism, and anti-inflammatory activities, which may explain the medicinal use of this plant in airway disorders and inflammation.
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Uses Extrapolated from Pharmacology:

We might be able to use P. biflorum for liver disease, hypertension, overall cardiac weakness, and solid tumor cancers (like mistletoe) [1].

It might also have anti-aging properties, lower overall cholesterol levels, and reduce bone density loss, improve immune function, improve mood (nervine effects), and improve digestion by stimulating excretion. We might also want to consider P. biflorum for airway issues and inflammation. It may also be a great ally for people with diabetes who need to modify their glucose regulation.

Safety:

Safety class: 1

Interaction class: A

No known precautions, interactions, side effects, or adverse events.

No information on the safety of Polygonatum in pregnancy and lactation was identified in scientific or traditional literature - safety has not been conclusively established [39].

Toxicity Study: The aqueous extract of the crude herb and steam processed herb were given orally to mice at a dose corresponding to 450g/kg. All mice who were given the crude herb extract died, while none died who were given the steam-processed herb extract. This study suggests that steam processing reduces the toxicity of the crude herb [40].

Seeds are considered toxic [17]. Aerial parts and berries contain L-alpha, gamma-diaminobutyric-acid which is hepatotoxic and convulsant [28,35]. "Hazards and/or side effects not known for proper therapeutic dosages" [18e]. Overdoses may lead to diarrhea, gastroenteritis, nausea, and queasiness [35].

Preparation and dosage:

Powder - can be a little irritating, but combines well in decoctions. Decoction dose: 1-5 grams [1].

Tincture: fresh root in fairly high alcohol % - gets sticky and weird if you don't use enough alcohol. Tincture dose: 3-5 ml per day as part of formula (½ to 1 teaspoon by itself) [1].

Wood: 1-5 drops [4].

Poultice out of fresh root or reconstitute the dry.

Makes a great oil - for chronic injury/ over stretchy or tight - dry it just till the day it is dry and then add oil in the sun to extract [1].

Combinations / Similar:

Suits nicely to shatavari - kidney tropism, musculoskeletal focus (they like each other a lot) [1].

It is very similar to comfrey (can be used interchangeably - but comfrey should mostly be used externally due to PAs) [1].

Pairs nicely w/ gotu kola if someone is dry [1].

Miscellaneous:

Planet:

Saturn [29,30]

Element:

Water [29], Fire [30]

Wolf Medicine:

Wood says, “wolf medicines usually have a ninety-degree angle in their construction, indicating an affinity to making profound changes or turns in life. They help bring a person to a transformative place, or help them go through the change, or help them adapt to a change that has already occurred. The ninety-degree angle represents joints in the organism, and key-joints in the path of life” [4].

Magical Uses:

In African American herbalism it is known as “High John the Conqueror”, in reference to magic or “conquering”. It is worn as a mojo or chewed for “conquering” [17, 24]. Solomon’s Seal’s powers are for protection and exorcism. The root is placed in the four quadrants of the house to guard it; it is used in protection spells and exorcisms of all kinds, and an infusion of roots, sprinkled about clears the area of evil. Solomon’s seal is also used in offertory incenses [29]. Add to healing incenses and burn as a good purifying agent in any room. Also used in making healing oils and incenses [30].

In magickal practice, Solomon's seal is used to ward off evil and protect magicians from any harm directed unto them. True to its name, it is usually burnt as incense during ceremonial invocations, not only to grant the magician protection, but to confer unto them power over those beings that they attempt to summon. Like the legendary Solomon's seal of occult lore, the plant itself is ascribed similar powers and properties found in the Seal itself, going so far as being more than a warding herb, but a grounding, and empowering article as well, making it indispensable for magickal purposes [31].

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Pulsatilla vulgaris

Lroy Meryhew '15



Introduction:

Pulsatilla vulgaris, also known as Anemone, was once a common wildflower found across Europe, especially in the Alpine region. Due to livestock, overgrazing of animals and a growth in human population, it is less common to find it in its natural habitat. Anemone can thrive in gardens, however, and has been a magical and common folk remedy for ages. Because it flowers in the Springtime, it is associated with the Spring Equinox and is associated with Easter (another name for Pasque is Easter).

It is a natural nerve relaxant, sedative, antibacterial, analgesic and anti-spasmodic herb. Historically, it has been used to treat anxiety, hyperactivity, insomnia, hypochondria, mental problems and inflammatory conditions such as UTIs, rheumatism, indigestion, heartburn, among many others that I will discuss later on in this monograph. It has been used as a liver stimulant, uterine tonic and a vaso-tonic. Its specific indication is for people who are having a bad life trip and need to get back into their body. I think of using anemone in situations where someone is experiencing bad hallucinations, anxiety, PTSD and a large amount of stress in their life. It can be supplemented for someone who is trying to get off of benzodiazepines, acting as a natural muscle relaxer. According to folklore, the flowers, when picked in early Spring and wrapped in a red cloth, can prevent disease when carried on the person. The plant is used in spells for health, protection and healing.

The plant is commonly associated with the element of air (also called Wind flower). According to Frazer's "The Golden Bough", the herb was first created from droplets of Adonis's blood, when he was gored by a wild boar on Mount Lebanon, a highly significant event in the mythic cycles of the Phoenicians. A similar myth exists that the flower sprang from the tears of Aphrodite, when she learned of the death of her lover. A lot of times the flower is lly close to old stone ruins or in graveyards of fallen warriors between the Danes and the native British took place. The herb is ruled by Mercury and has a long association with fairy folk.

By providing the extensive and hopefully informative information below on *Pulsatilla vulgaris*, I hope to provide the readers with an in-depth look on how to use this low dose plant as a tool for self-empowerment around all aspects of health but primarily focusing on mental health. People from all over the world have been using herbs from the beginning of time as their only form of health care. It was only up until the last 200 years or so that medicine was overtaken by people in lab coats. Herbalism is rooted in not only being connected directly to the plants themselves but being the primary care provider of your own mind and body. It is the medicine of empowering people to seek health and happiness beyond the patriarchal, sexist, white supremacist, classist, ableist pharmaceutical industrial complex. Instead of numbing and disconnecting like so many other mental health medications, I believe *Pulsatilla vulgaris* can help one come back tenderly into their body to heal from particular traumas and mental health issues. To contact the author of this monograph please email Lroym@vtherbcenter.org or RedUmbrellaHerbals@gmail.com.

Botanical Nomenclature:

Latin name: *Pulsatilla vulgaris* and other related species such as *Pulsatilla occidentalis*, *Pulsatilla patens*, and *Pulsatilla tuberosa*.

Family: Ranunculaceae or buttercup family [1]

Common Names:

Pulsatilla, Anemone, Pasque flower, Wind flower, Meadow Anemone, Prairie crocus, Passe flower, Easter flower [1].

Part Used/Definition:

Use above flowering parts at a low dose, some people use roots [2]. The whole herb is collected soon after flowering and should be carefully preserved when dried; it deteriorates if kept longer than one year [3]. Culpepper mentions that 'they are sown usually in the gardens of the curious, and flower in the spring time.'

Identification:

Pulsatilla vulgaris is a low growing plant, basal leaves, very soft and furry. The flowers can be purple or red color. It isn't a very strong plant particularly in gardens here so not technically a perennial (prefers a more Alpine area). It is a low growing perennial herb with rich purple to burgundy colored flowers with golden anthers, hairy stems and finely divided leaves.

Basque flower in its natural habitat (alpine area in Europe), courtesy of hootershall.co.uk

The seed heads have a feathery appearance, and slightly resemble those of Old Man's Beard, a common hedgerow plant [4]. The name Pulsatilla is derived from the Latin pulsare meaning 'to knock' or 'to hit' referring to the hairy appendages of the fruits that are constantly in motion.

Commercial Sources & Handling:

It breaks down quickly, so you need to make a tincture every year, three years at the most. In general when you are processing it, have good ventilation and mask on. Chop it up instead of blending it to avoid getting the acidity in your eyes/mouth. Not seen a lot in commercial sources because of the poisonous quality to it. You can usually get homeopathic Pulsatilla [2]. The Pasque flower is in peril with a halving in the number of sites where it can be found since the mid 20th century. A new report by Plantlife and the Botanical Society of the British Isles reveals the extent of the decline [21].

A long lived perennial with an extensive rootstock it reproduces mainly vegetatively; germination of seed in the wild is a rare event requiring specific conditions. The Pasque flower is also very choosy with regards to its habitat. It occurs on calcareous soils, usually on steep slopes (south or west facing), on the escarpment of chalk or Jurassic limestone, in old quarries or ancient earthworks [5].

Growing & Harvesting Information:

You need to plant a few new plants in your garden every year - it is a short lived perennial that will disappear after a couple of years [2]. If you want to grow Pasque flowers in your garden the easiest way is to grow in pots from seed. Although in the wild propagation from seed is difficult in the controlled environment of the home garden growing seed is easier than propagating from root cuttings. Seed must be sown immediately as it ripens though and seedlings pricked out at an early stage to minimize root disturbance [5]. Pasque flower grows well in alpine regions and meadowland, but can be easily crowded out by other plants when grown with other herbs in tubs. The plant prefers chalk or limestone soil [4]. Across all of Europe the pasque flower is a species of sunny sites on calcareous soils with the exception of the Mediterranean. It grows in pastures, dry grasslands and on hills up to 800 m. As it flowers early, it is one of the early plants visited by bees. If it is warm enough during the flowering period it produces abundant nectar and pollen [6].

Taste/Odor:

Tingly, burn-like sensation that should be slightly acrid. Slightly sweet and astringent. Some plants can be bitter [2].

Energetics:

Cold, dry (but use such a tiny dose it won't have much of a drying effect to it) [2].

Physiological Actions:

Magick (tiny low dose, toxic plant, crazy presentation, works pretty immediately), Sedating nervine, Analgesic (affinity to reproductive pain, uterine spasms), Antispasmodic, Grounding of the spirit/psyche into the body, protection of the spirit/psyche for people who are too easily influenced by outside forces —> having a bad life trip [2].

Specific Indications/Patterns:

Larken Bunce: For people who are having a bad life trip (learned helplessness, depression/anxiety, PTSD, ease in crying), helps people get back into their body when they are outside of it (spirit realm/heady stuff), great for the metal type of person, great for people who have been scared out of their body by the spirit realm, quick acting for immediate anxiety and panic, people who are easy to cry and fearful (psychic barrier or dreams that are really intense, cutting cords of connection, haunting, flashbacks), thoughts taking over when nothing is happening, melancholy (visionary but dark type), darkness and weepiness before bleeding [2].

Julia Graves: Windflower is one of the earliest spring flowers and has as its keynote symptoms easily changing emotions, “Like an April Day.” It is hence “the weather cock remedy”. In this way, it embodies the quality of the weather of the season of its bloom. Its fuzz provides us a signature for conditions where mucus is present. The drooping flowers indicate it for uterine prolapse [7].

Felter and Matthew Wood: “Blue-eyed fair haired” [2].

Culpepper: The leaves provoke the terms, being boiled, and the decoction drank. The body bathed with the decoction cures the leprosy. The leaves stamped, and the juice snuffed up the nose, purgeth the head mightily, so doth the root, chewed in the mouth for it procureth much spitting and bringeth away watery and phlegmatic humors and is therefore excellent for the lethargy. Made into an ointment and the eyelids anointed with it, it helps inflammations of the eyes. The same ointment is excellent to cleanse malignant and corroding ulcers [8].

David Winston: Pulsatilla was a popular remedy of the Eclectic physicians. It is used in very small amounts for hormonal depression, anxiety, irritability, moodiness and “fly off the handle” anger [9].

N Richardson: It is a wonderful remedy to be used as a female nerve relaxant, mild sedative, alterative, antibacterial, analgesic and antispasmodic, as well as for inflammatory conditions of the reproductive organs “male and female” and to treat menstrual problems, PMS, menopausal hot flushes, amenorrhea relating to emotional problems, dysmenorrhea and related reproductive disorders of both the male and female tracts [4].

King’s American Dispensatory 1898 (eclectic): Pulsatilla is a remedy of wide applicability, but more particularly for those conditions in which the mind is a prominent factor. A gloomy mentality, a state of nerve depression and unrest, a disposition to brood over real or imagined trouble, a tendency to look on the dark side of life, sadness, mild restlessness, and a state of mental unrest generally denominated in broad terms “nervousness,” are factors in the condition of the patient requiring pulsatilla. A pulsatilla patient weeps easily, and the mind is inclined to wander - to be unsettled. The pulse requiring pulsatilla is weak, soft, and open, and the tissues have a tendency to dryness (except when the mucus tissues are discharging a thick, bland material), and, about the

orbits the parts appear contracted, sunken and dark in color. The whole countenance and movements of the body depict sadness, moroseness, despondency and lack of tone. Hysteria of the mild and weeping form may be a symptom. The whole condition is one of nervous depression, the nutrition of the nerve centers are at fault [10].

Caroline Gagnon: “Anemone teaches about openness in a soft and protected way. Its flower can open in a very cold and windy alpine meadow because it is enveloped by a downy coat. When I give *Anemone pulsatilla* to a client, I can immediately see a flow of energy emerging from the heart, a reconnection of the heart to the head and usually a smile appears. I particularly appreciate this herb for depressions that occur after a breakup or any emotional blow to the heart. It eases anxiety and just helps the joyfulness of the heart move more freely” [15].

The downward, drooping flowers are a signature for the “weepy” and “morose” individual that would be indicated for this plant. I like to think of Pulsatilla’s hairs serving as an energetic fleece blanket drooping around a person.

Traditional/Clinic uses:

Mental and Emotional Health

Larken Bunce indicates Pulsatilla to treat anxiety, acute panic attacks, obsessions, depression, sensitivity, fear of falling asleep and PTSD. She said it is super helpful in the event of an alarming or worrisome occurrence (life emergency, helpful not developing trauma/adding more layers of trauma). It helps prevent the continuation of trauma. It is helpful in bad hallucinogenic experiences (life is overwhelming and difficult, scary etc). It is great for neuralgia, fibromyalgia and nerve pain after surgery related to the reproductive organs). It can be used to treat migraines, especially ones where there is an aura and for tension headaches [2]. A closely related Korean species of Pulsatilla has been found to have neuroprotective and cognitive-enhancing effects in animal studies [11].

Respiratory system

Bunce indicates Pulsatilla for Laryngitis and Bronchitis [2]. It can also be used as an expectorant for spasmodic coughs in asthma, whooping cough and bronchitis [12].

Reproductive system

Bunce indicates Pulsatilla for sexual trauma, amenorrhea, dysmenorrhea, PMS (melancholic and weepy coupled with anxiety), prostate pain, urinary tract pain and testicular pain [2]. It can be used for any inflammation or pain of any kind in the reproductive area [12].

External Use

Externally, Pulsatilla can be used to treat eye conditions such as disease of the retina, senile cataract and glaucoma. It can be used in the treatment of measles and nettle rash or for toothaches and earaches [13]. Culpepper used it topically for the cure of Leprosy [8]. A green dye can be obtained from the flowers of the plant [12]. According to webmd.com, Pulsatilla can be applied directly to the skin for boils, bacterial skin infections, and inflammatory diseases [14]. It is prescribed as central-acting analgesic [17].

Gastrointestinal Uses

Pulsatilla can be used in small amounts for gastrointestinal spasming and cramping, acting as an antispasmodic [14].

Homeopathic and Flower Essence

Apparently people who benefit from Pulsatilla, both the homeopathic preparation and the flower essence are emotionally changeable, with the deep fear of being alone and forsaken hiding behind the laughter and tears. The flower essence provides grounding, stabilising influences as well as encouraging the emergence of the more emotional side of the personality. Anemone encourages and nurtures inner strength and allows a person to better express the inner self emotionally and spiritually, whilst bringing balance to the vital energy [4]. In homeopathy Pulsatilla 6X is used against migraine disorders, vertigo, neuralgic pain, venous stasis [18].

Key Constituents:

Pasque flower is considered by herbalists to be of highly valuable modern curative use as a simple or homeopathic. The plant contains the glycoside ranunculin, this is converted to anemonine when the plant is dried and is the medicinally active principle in the plant, mainly as a homeopathic [13]. Not a lot is known about the constituents but it also contains: Ranunculin (fresh), protoanemonine (crushed, very caustic), anemonine (terpenes and derivative of triterpene lactones) [2]. It may also contain triterpenoid saponins, tannins, volatile oil and flavonoids which would contribute to its sedative and antispasmodic qualities [15].

Pharmacology:

Pulsatilla chinensis water soluble polysaccharide has anti-tumor, immune stimulating properties. Possible useful in BPH and inflammation [2].

“Fresh rabbit jejunum was mounted under 1 gram of tension in a 30 ml bath filled with Krebs's solution which was aerated and temperature controlled at 37 degrees Celsius. A Grass 7D model Polygraph was used to isometrically measure spontaneous contractions of the jejunum. This was a cumulative dose-response study and 100 µl of *Pulsatilla vulgaris* ethanol extract was added to the bath on six consecutive occasions. The spontaneous contractions were reduced with each dose and after three doses a reduction of approximately 80% was recorded. After six doses, or a total of 600 µl of the extract, 100% inhibition of spontaneous activity was recorded. This study would appear to support the traditional use of *Pulsatilla vulgaris* as an antispasmodic. However, the time between each addition of the *Pulsatilla vulgaris* extract to the bath was not stated, and more importantly, there was no mention of comparison with a control in this study” [19].

Uses Potentially Extracted from Pharmacology:

Anti-spasmodic properties [19].

Anti-tumor and immune stimulating properties [2].

Clinical Trials:

- Pulsatilla pretenses study in 2008, “Eviprostata” for BPH in Japan. They discovered that they were relatively useful and the treatment was successful and reduced peeing at night [2].
- Most clinical trials on Pulsatilla are homeopathic effects of the plant or on the plant itself (not its medicinal effects):

Appl Plant Sci. 2015 Jul 7;3(7). pii: apps.1500031. doi: 10.3732/apps.1500031. eCollection 2015. Highly polymorphic microsatellite markers in Pulsatilla vulgaris (Ranunculaceae) using next-generation sequencing. DiLeo MF¹, Graf R², Holderegger R², Rico Y³, Wagner HH¹ [20].

Safety Issues:

Pulsatilla is a drop dose plant. It is poisonous in large doses (vomiting, gastric bleeding, irritate kidneys, gastric irritation, nausea). Use 1-5 drops in 8 oz of water. Repeat that dosing. For pregnancy use 1 drop ONLY in a large glass of water (same in lactation) as it has uterine stimulating properties. If someone has gastric/bladder irritation, use caution [2].

Preparation & Dosage:

You can buy Pulsatilla as a homeopathic. Use the fresh plant tincture (works best but you can use dry plant/not as irritating —> recently dried plant). Use 1:10 ratio 1-2ml or 1/3 to 1ml 3x a day of a 1:10 ratio (Percentage of alcohol is 100% with fresh plant). 1:2 100% alcohol, EtOH 5-30 drops in H2O, 1 teaspoon of the diluted water every 2-3 hours (10). Bunce uses 5 drops per dose up to 6 doses per day = 1ml per day MAX. Daily dose = up to a ml 1X a day (no more than 5 drops per dose, perfectly adequate for the migraine aura) [2].

Combinations/Similar Herbs:

Can be used in conjunction with rescue remedy (get back in your body, stay here) [2]. I personally like to add a little bit of anemone (.5p to a 15p formula, for example) in the treatment of acute anxiety attacks. I love anemone with skullcap, passionflower, rose and/or lavender. I also enjoy it as a simple or added into a 1oz. flower essence blend (5-10 drops).

Miscellaneous/Fun Facts:

Pulsatilla is associated with the deities Adonis, Venus, Aphrodite, Anemos, probably also the four winds and any Gods relating to them. May also be associated with Spring deities [4].

According to Grieves, “the Egyptians held the Anemone as the emblem of sickness, perhaps from the flush of colour upon the backs of the white sepals. The Chinese call it the 'Flower of Death.' In some European countries it is looked on by the peasants as a flower of ill-omen, though the reason of the superstition is obscure. The Romans plucked the first Anemones as a charm against fever, and in some remote districts this practice long survived, it being considered a certain cure to gather an Anemone saying, 'I gather this against all diseases,' and to tie it round the invalid's neck.

Greek legends say that Anemos, the Wind, sends his namesakes the Anemones, in the earliest spring days as the heralds of his coming. Pliny affirmed that they only open when the wind blows, hence their name of Windflower, and the unfolding of the blossoms in the rough, windy days of March has been the theme of many poets:

'Coy anemone that ne'er uncloses
Her lips until they're blown on by the wind.'

Culpepper also uses the word 'windflower.' In Greek mythology it sprang from the tears of Venus, as she wandered through the woodlands weeping for the death of Adonis -

'Where streams his blood there blushing springs a rose
And where a tear has dropped, a wind-flower blows.'

The old herbalists called the Wood Anemone the Wood Crowfoot, because its leaves resemble in shape those of some species of Crowfoot. We also find it called Smell Fox. The specific name of *nemorosa* refers to its woodland habits" [3].

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Jujube

Kenzie McDonald '16

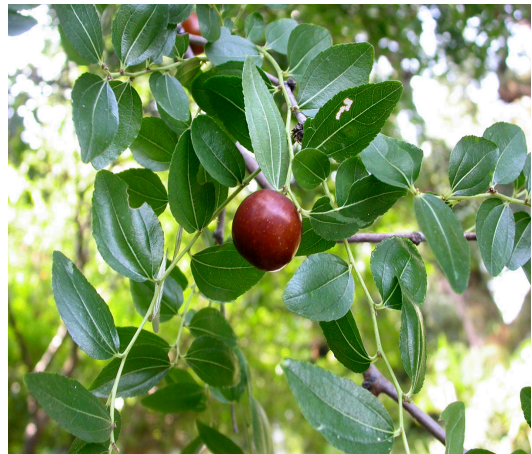
Botanical Nomenclature:

Ziziphus jujuba

Rhamnaceae (Buckthorn family)

Common Name:

- Jujube, Jujuba
- Bor- variety Mill
- Red date
- Chinese date- *suanzaoren* (*suan* = sour; *zao* = date; *ren* = seed; hence, seed of the sour date), or just *zaoren* [1]
- Korean date
- Indian date
- *Hinap* or *finab* in Eastern Bulgaria
- *Dumps* or *dums* in Antigua and Barbuda
- *Pomme surete* on French Islands of the Caribbean



There are over 4,000 species in this genus. Some other medicinal species include:

- *Zizyphus jaozeiro*
- *Z. nummularia*
- *Z. spina-christi*
- *Z. mauritiana* (Indian jujube- seed used)
- *Z. suanzaoren*
- *Z. jujuba spinosa* refers to the seed of jujube
- *Z. jujuba mill* refers to a fruiting variety

Part Used/Definition:

Whole plant:

- Most commonly the fruit of shade tree (of *Z. jujuba*)
- Seeds (of variety *spinosa*)
- In TCM and Ayurveda the bark, roots and leaves

Identification:

The species has a wide range of morphologies from shrubs to small or medium sized trees which might be erect, semi-erect or spreading. Height can vary from 3-4 to 10-16 m or more, although trees of 20 m are rare. Trees are semi-deciduous and much branched. The bark has deep longitudinal furrows and is grayish brown or reddish in color. Usually the shrub or tree is spinous, but occasionally unarmed.

Fruiting branches are not deciduous. Leaf laminae are elliptic to ovate or nearly orbicular. The apex is rounded, obtuse or sub acute to emarginated, the base rounded, sometimes cuneate, mostly symmetrical or nearly so. Margins are minutely seriate. Leaves are petiolate 1.1-5.8 mm long and stipules are mostly spines, in each pair one hooked and one straight, or both hooked, or more rarely not developed into a spine.

Flowers have sepals, a disk about 3 mm in diameter and a 2-celled ovary, immersed in the disk. Flowers tend to have an acrid smell. Fruit is a glabrous globose or oval edible drupe varying greatly in size from (1-) 1.5 (-2) cm diameter but some oval varieties can reach 5 x 3 cm. The pulp is acidic and sweet, the fruit greenish, yellow or sometimes reddish [2].

It is distributed in the warm temperate and subtropical regions throughout the world. Some species are deciduous while others evergreen. The fruits are edible, drupe, yellow-brown, red or black, globule or oblong often sweet and sugary [3].

Jujube originated in China more than 4,000 years ago. Then traded, cultivated and naturalized throughout Eurasia and the world [4]. Different species are native of different region like *Zizyphus mauritiana* which is found from western Africa to India. Other species also found in Asia, Brazil, Nepal and Java [5].

Commercial Sources & Handling:

Forty cultivars are grown in Beijing and four over provinces of China. Annual fruit production in China is 450,000 long tons produced on 290,000 hectares, equivalent to the hectarage of Florida [6]. There is some cultivation in southern California, but most will be a product of China.

Growing & Harvesting Information:

Fruits are picked in autumn.

The trees are tolerant to different soils, resistant to alkalinity and salinity [7]. It tolerates a wide range of temperatures and rainfall, though it requires hot summers and sufficient water for acceptable fruiting. Unlike most of the other species in the genus, it tolerates fairly cold winters, surviving temperatures down to about 5 °F. This enables the jujube to

grow in mountain or desert habitats, provided there is access to underground water throughout the summer. The species *Ziziphus jujuba* grows in cooler regions of Asia. Five or more other species of *Ziziphus* are widely distributed in milder climates to hot deserts of Asia and Africa. Natural distribution is from southeastern Europe to China. Cultivated in China for 4,000 years. Propagation by seeds, cuttings, root cuttings, graft cutting [8].

Taste/Odor:

Sweet!

Energetics:

Moist and cooling (to neutral).

Physiological Actions:

Antioxidant [9]

Tonic

Aphrodisiac

Hypnotic-sedative

Anxiolytic

Anti-carcinogenic (melanoma cells)

Antimicrobial (antifungal and antibacterial)

Anti-ulcer

Anti-inflammatory

Anti-pyretic [10]

Cognitive enhancer

Antispasmodic

Heart tonic [11]

Hypotensive

Immunostimulant

Vulnerary [12]

Demulcent

Nutritive [13]

Yin tonic

Specific Indications/Patterns:

- Treats heart and abdominal cold, and heat and pain in the limbs.
- Reduce damp conditions and lightens the body [14].
- Yin/heart blood deficiency
- Nourishes the heart, benefits the liver and tranquilizes the mind [15]
 - “The liver- and heart-nourishing zizyphus seed, with its astringent quality that helps prevent the heart spirit from wandering too far, is an ideal remedy for this type of disorder.” [16]

Traditional uses:

- Insomnia due to Yin/heart blood deficiency, accompanied by night sweats, restlessness, and over-thinking. Associated with menopause or prolonged feverish diseases or anemia.

- Drains the liver, spleen and gallbladder.
- In Ayurveda and TCM it's a Heart blood tonic - directly calming to the heart to provide emotional stability [17].
- Korean and Chinese traditional medicine state its stress-relieving quality.
- In Chinese Medicine, the fried herb is said to be especially useful for nourishing the liver blood, calming the spirit, and stopping sweating; the raw herb may be used to drain the liver and gallbladder; it also calms the spirit, but is less nourishing. [18]
- The *Shennong Bencao Jing* (ca. 100 A.D.) includes a description of raw zizyphus seed:
 - "Zizyphus is sour and balanced (in nature; being neither too warming or cooling, but combining both warming and cooling effects). It mainly treats heart and abdominal cold and heat and evil binding qi, aching, pain in the limbs, and damp impediment. Protracted taking may quiet the five viscera, make the body light, and prolong life. It grows in rivers and swamps" [19].
- "The reference to "protracted taking" and the resulting beneficial effects refers to the practices of the Taoists seeking immortality, and is a formulaic presentation rather than providing any specific information about the herb" [20].
- Zizyphus is used to help assure that the yang has a home to return to by nourishing the yin and blood of the heart and liver (essentially, making them soft and comforting).
- According to Xu Dachun, a Qing Dynasty physician (18): "Everyone knows that one employs zizyphus and fu-shen if one can not sleep." Fu-shen is part of the herb known as hoelen, one of the ingredients of Zizyphus Combination, *Suanzaoren Tang*.

Clinical uses:

- Ayurveda:
 - **Fruit:** The fruit is cooling, digestible, tonic, aphrodisiac, laxative and removes biliousness, burning sensations, thirst, vomiting and is also good in treating tuberculosis and blood diseases.
 - The fruit is employed as an antidote to aconite poisoning, abdominal pain in pregnancy and externally in poultice and applications for wounds.
 - **Root:** *Z. nummularia* is bitter and cooling, and cures coughs, biliousness and headache.
 - Roots are used to treat dysentery; they are given with cow's milk until the patient is cured.
 - To treat hoarseness of the throat, traditional healers advise patients to keep the fresh roots of this plant inside their mouth.
 - **Bark:** cures boils and is good for the treatment of dysentery and diarrhea
 - **Seed:** cures eye diseases and are also useful in leucorrhoea.
 - The traditional workers of Chhattisgarh, India use fruit to treat common fevers and for vomiting use the seeds with bar sprouts (*Ficus benghalensis*) and sugar.
 - The kernels increase flesh and strength and are sedative in activity.
 - Pharmacology evaluations indicate that both the raw and fried seed have similar sedative actions.
 - **Leaf:** Senior citizens used the fresh leaf juice with buffalo's milk to reduce the

intensity of smallpox.

- The leaves are antipyretic and reduce obesity.
- Fresh leaves of this plant with cumin to treat urinary infections.
- The traditional healers of Bastar region use the dried leaves and powdered bark to dress wounds.
- Aqueous paste of the leaves (fresh or dried) is applied externally to relieve a burning sensation [21].

Key Constituents:

- Phenolic compounds
 - Triterpenoids (2.5%) - betulinic acid, betulin, oleanolic acid, colubrinic acid.
 - Ascorbic acid
 - Cyanidin 3-glucoside
 - Gallic Acid
 - Quercitin
 - Butylhydroquinone [22]
- Fatty acids [23]
 - Lauric acid
 - Myristic acid
 - Palmitic acid
 - Stearic acid
 - Oleic acid
 - Linoleic acid
 - Arachidic acid
- Flavanoids – swertish, spinosin.
- Saponins
- Polysaccharides
- Alkaloids - sanjoinine A (in Zizyphi Spinosi Semen).
- Thiamine (B1)
- Riboflavin (B2)
- Vitamin A, B2, C [24]
- Iron
- Pectin-A
- Calcium
- Phosphorous
- Glycosides
- Triperpenes (2.5%) – jujubosides, acetyljujuboside, protojujubosides.
- Dietary fiber (1.9%)

Pharmacology:

- **Vitamin C, B1 and B2** one fruit per day would meet the diet requirements for Vitamin C and Vitamin B complex for an adult man as recommended by FAO/WHO.
- **Vitamin P** (354 to 888 mg per 100 gm pulp) (bioflavonoid) content. It enhances the action of Vitamin C. Antibacterial, anti inflammatory and antioxidant are some of its medicinal properties [25].
 - Stimulates bile production, promote circulation and prevent allergies.

- **Pectin-A** Pectin has a number of pharmaceutical properties such as binding bile acid, lowering plasma cholesterol and anti diarrheal properties [25].
- **Alkaloids**- found highest in the stem bark and the seeds, seeds used in TCM as a sedative.
- **Glycosides**- cancer prevention and cholesterol control [26].
- **Saponins**- adjuvant, hemolytic, sedative, anxiolytic and sweetness-inhibiting properties.
- **Flavanoids**- Swertish and spinosin in fruit and seed have a sedative effect
- **Terpenoids**- some have anti-cancer and anti-HIV properties [27].
- **Betulinic acid**- throughout all plant parts, increase natural killer cells, anti-inflammatory and antibacterial qualities; inhibits growth of *Staphylococcus aureus* and *Escherichia coli*.
- **Triterpenes**- observed to protect the damage of neuronal cell damage and prevent impairment of the hippocampal memory [28].
- **Alkaloids**- sanjoinine A (in *Zizyphi Spinosi Semen*) prolonged sleeping time and reduced the sleeping latency by agonizing the GABA receptor and enhancing expression of glutamic acid decarboxylase (GAD) [29].

Potential Uses Extrapolated from Pharmacology:

Vahedi, Fatemeh, Mohsen Fathi Najafi, and Kazem Bozari. "Evaluation of inhibitory effect and apoptosis induction of *Zyzyphus Jujube* on tumor cell lines, an in vitro preliminary study." *Cytotechnology* 56.2 (2008): 105-111.

Analyzes the cytotoxic effect of water extract of *Zyzyphus jujube* on the in vitro growth of human tumor cell lines, HeLA, HEp-2 and Jurkat cell lines, representing different tumor types. The most inhibitory activity of *Zyzyphus jujube* was found on Jurkat leukemia cell line indicating the strong anti proliferative activity of the extract against this type of tumor cells.

In Koo Hwang, et al. "Zizyphus Enhances Cell Proliferation and Neuroblast Differentiation in the Subgranular Zone of the Dentate Gyrus in Middle-Aged Mice" *Journal of Medicinal Food*. 2011; 3:195-200.

We obtained a *Z. jujuba* methanol extract (ZJE) and observed its effects on neurogenesis in middle-aged mice. These results suggest that the repeated supplement of ZJE may increase the hippocampal plasticity in middle-aged mice.

Ki-Yeon Yoo, et al. "Zizyphus Attenuates Ischemic Damage in the Gerbil Hippocampus via Its Antioxidant Effect", *Journal of Medicinal Food*. 2010: 557-563.

Research suggests jujube fruit has nootropic and neuroprotective properties.

Kandimalla, Raghuram, et al. "Protective effect of bioactivity guided fractions of *Zizyphus jujuba* Mill. root bark against hepatic injury and chronic inflammation via inhibiting inflammatory markers and oxidative stress." *Frontiers in Pharmacology* 7 (2016).

The present study was aimed to describe the protective ability of *Z. jujuba* root bark (ZJRB) against hepatic injury and chronic inflammation.

Hemmati, Mina, et al. "Hypoglycemic effects of three Iranian edible plants; jujube, barberry and saffron: Correlation with serum adiponectin level." *Pakistan journal of pharmaceutical sciences* 1.28 (2015): 2095-2099.

Jujube in particular showed an effect on cholesterol (could increase HDL-C), decreased levels of triglyceride, decreased fasting blood glucose levels, which led to the rats reaching normoglycemia. Also caused an increase in adiponectin level. Therefore, jujuba could have beneficial effects on diabetes.

Xu, Mei-Ying, et al. "Antitumor activity of jujuboside B and the underlying mechanism via induction of apoptosis and autophagy." *Journal of natural products* 77.2 (2014): 370-376.

Jujube increased apoptosis and autophagy in AGS and HCT 116 human cancer cells. Suppressed tumor growth in mice.

Awad, Dalal S., et al. "Zizyphus jujuba protects against ibuprofen-induced nephrotoxicity in rats." *Pharmaceutical biology* 52.2 (2014): 182-186.

This study evaluated the therapeutic effect of *Z. jujuba* fruit aqueous extract (ZE) on nephrotoxicity induced by ibuprofen (IBP) in rats. Administration of ZE with IBP significantly decreased serum urea and creatinine and reduced the severity of kidney damage. There was also a significant increase in the activities of catalase and glutathione S-transferase.

COX-1 and 2 inhibition leading to associated stress minimizing properties [30].

Long term use of seed oil and extracts could reduce incidence of fatty liver disease [31].

Clinical Trials:

Liu, Shwu-Huey, and Yung-Chi Cheng. "Old formula, new Rx: the journey of PHY906 as cancer adjuvant therapy." *Journal of ethnopharmacology* 140.3 (2012): 614-623.

Study of licorice, baikal, peony, jujube (decoction) for cancer of GI and pancreas.

Shi, Yuan, et al. "Herbal insomnia medications that target GABAergic systems: a review of the psychopharmacological evidence." *Current neuropharmacology* 12.3 (2014): 289-302.

One of the major alkaloid compounds, sanjoinine A, enhances pentobarbital-induced sleeping behaviors, which are more commonly referred to as hypnotic effects. ZSS is one of the ingredients in *Suan Zao Ren Tang*, which exhibits binding affinity for the serotonin (5-hydroxytryptamine, 5-HT) 5-HT_{1A} and 5-HT₂ receptors and GABA receptors.

Mehreen, Arifa, et al. "Phytochemical, Antimicrobial And Toxicological Evaluation Of Traditional Herbs Used To Treat Sore Throat." *Z. Jujuba* showed significant antibacterial activity.

"*Z. Jujuba* showed significant antibacterial activity."

Tahergorabi, Zoya, et al. "*Zizyphus jujuba*": A red fruit with promising anticancer

activities." *Pharmacognosy reviews* 9.18 (2015): 99.

Improved outcome of cancer patients treated with Chemotherapy, such as with cis-diamminedichloroplatinum (CDDP, cisplatin).

Yi, Pei-Lu, et al. "The involvement of serotonin receptors in suanzaorentang-induced sleep alteration." *Journal of biomedical science* 14.6 (2007): 829-840.

Jujube exhibits binding affinity for serotonin (5-hydroxytryptamine, 5-HT) receptors, 5-HT(1A) and 5-HT(2), and for GABA receptors leading to the induction of sleep alteration. The formula increased NREM (Non-Rapid Eye Movement), but did not show significant changes in REM. The formula was called suanzaorentang: Zizyphus suanzaoren 18g, Anemarrhena zhimu 10g, Hoelen fuling 10 g, Cnidium chuanxiong 5 g, licorice ganacao 3 g.

Safety Issues:

In laboratory animals (mice and rats), a huge single dose of 50 grams herb per kilogram of body weight produced no toxic symptoms and a daily dose of 20 grams per kilogram for 30 days did not produce toxic reactions. Furthermore, long term use has shown to reduce serum triglycerides and cholesterol (mainly LDL), and reduce fatty degeneration of the liver [32].

A modern Chinese physician, identified only as Liu, expressed some specific reservations, as relayed by translator C.S. Cheung:

"Liu is reluctant to use zizyphus indiscriminately. Although it is a good agent for nurturing the heart and calming the spirit and is excellent for the treatment of restless heart insomnia with palpitations [due to anxiety and fright], yin deficiency, and profuse perspiration, it is not indicated for insomnia of wet phlegm evil heat or for liver stagnation and qi stagnation. This is because it possesses a sour, astringing property, which may prevent the dissipation of evil [phlegm accumulation and stagnated qi] and therefore delay the recovery from the illness" [33].

**This is specific to the use of the raw seed only. The fruit is sweet, not sour, nor is the fried seed, which is identified as sweet, even though it is rather bland. Therefore this is only a concern with raw seed medicinally.

Preparation & Dosage:

Zizyphus seeds are usually stir-fried prior to use; the seeds are turned rapidly in a hot wok and then allowed to cool in straw baskets [34].

According to one analysis, the triterpene level in zizyphus is 2.5% [8], so that an 18 gram dose, as used in Zizyphus Combination, would yield about 360 mg of triterpenes, a level typically relied upon for most triterpenes. The simple powder of zizyphus, consumed orally, appears to be effective in relatively low dosage. One report indicates that good effects were obtained using 0.8-1.2 grams of the powder before bed [35].

- Dried Fruit: 10-30 g of Jujube daily depending on need.

- Decoction of fruit: In TCM, range is 6-15g QD, mostly taken in formula with other herbs.
- Tincture: 20- 45% EtOH, 1:3 – 1:5 [36]
 - Dose: 1-4 mL QD
 - Also found in glycerate form.

Combinations/Similar Herbs:

- PHY906: licorice, baikal, peony, jujube (decoction) for cancer of GI and pancreas.
- Yin/heart blood deficiency - rehmannia, dong quai, jujube, hawthorn, goji.
- Traditional TCM formula, *Suanzaoren Tang* (Zizyphus Combination) from the text *Jingui Yaolue* (220 A.D.). In that text, the formula is described: "Zizyphus Combination treats weakness fatigue, and distress due to weakness, which causes insomnia." [36]
- For deficiency and insomnia:
 - Zizyphus suanzaoren 18g, Anemarrhena zhimu 10g, Hoelen fuling 10 g, Cnidium chuanxiong 5 g, Liquorice ganacao 3 g [25].
- Reduce excessive perspiration and night sweating combined with tonic astringents-schizandra, cornus, and dragon bone [38].
- TCM Insomnia remedy, *Tianwang Buxin Dan*: Zizyphus, ginseng, platycodon and polygala.
- In Ayurveda, traditional healers use the fresh leaves of this plant with cumin to treat urinary infections [39].
- TCM remedy for Improving spleen and stomach function, and heart and blood nourishment leading to treatment busy mind, insomnia, and spasm - *Ganmai Dazao Tang* (Wheat and Jujube Combination):
 - Wheat (fuxiaomai) 15 g, Jujube (dazao) 14 g, Licorice (gancao) 9 g.

Miscellaneous:

Religious significance:

- In Arabic-speaking regions the jujube and alternatively the Zizyphus lotus are closely related to the lote-trees ("sing. "sidrah", pl. "sidr") which are mentioned in the Quran, while in Palestine it is rather the Zizyphus spina-christi that is called *sidr* [40].
- Jujube witches' broom is a plant disease that caused by phytoplasma that is highly fatal in Chinese jujube [42].
- Ber has been recognized as a useful edible fruit since mythology of Ram and Shabari in India and depicted in Ramayana [43].
- Associated with the rice culture in the *Book of Songs*, the famous poem of the 10th century B.C. [44].

Explanations of TCM connection of liver and fatigue:

- As relayed by the modern physician Jiao Shu De: According to ancient teaching, the liver is the root of extreme fatigue. A high degree of exhaustion causes serious overnight insomnia, irascibility, dizziness of head and eyes: all indicating the extreme glowing of liver yang, imbalance of yin and yang, and an inability of yang to

return to yin. Also, inability of blood to nourish the heart with exhaustion of the heart (mental fatigue) leads to wandering of the heart spirit from its shelter, causing insomnia with heart palpitations [45].

Explanation of TCM Insomnia:

- Provided by the physician Lu Yong Chang: According to the ancient teachings: “The day is yang; the night is yin. The wei qi circulates in the yang [the body surface] during the day and circulates in the yin [the central viscera] at night. In other words, the yang enters the yin in the night. The meeting of yin and yang creates a peaceful serene state, which is sleep. If the yin is deficient and unable to receive the yang, or the yang is in excess and unable to enter the yin, this causes disconnection of yin and yang with resultant insomnia.’...As stressed by Zhang Jingyue [famous physician of the Ming Dynasty]: ‘The insufficiency of genuine yin, essence, and blood will cause disconnection of yin and yang, thus disturbing the peace of the spirit and generating insomnia. The heart shelters the spirit and is the house of the yang....Sleep occurs when the wei qi enters the yin and creates a quiet environment. In the words of the ancients, when the yang has a home to return to, the sleep will ensue. When the heart is disturbed by worry and shakes the spirit, restlessness occurs, which generates insomnia” [46].

Preparations from around the world:

- The freshly harvested as well as the candied dried fruit are often eaten as a snack, or with coffee.
- Vietnam: Smoked jujubes are consumed and are called black jujubes.
- China and Korea: A sweetened tea syrup containing jujube fruit is produced. It is also canned or made into a tea in the form of teabags.
- West Bengal and Bangladesh: Used for making pickles.
- China: a wine made from jujube fruit is called *hong zao jiu*.
- Sometimes pieces of jujube fruit are preserved by storing them in a jar filled with baijiu (Chinese liquor), which allows them to be kept fresh for a long time, especially through the winter. Such jujubes are called *jiu zao* (literally "alcohol jujube").
- The fruit is also a significant ingredient in a wide variety of Chinese delicacies.
- Vietnam and Taiwan: The dried fruit is used in desserts in China and Vietnam, such as *ching bo leung*, a cold beverage that includes the dried jujube, longan, fresh seaweed, barley, and lotus seeds
- Korea: jujubes are called *daechu*, and are used in daechucha teas and samgyetang.
- Croatia: jujubes are used in marmalades, juices, and rakija (fruit brandy).
- Lebanon, Jordan, and other Middle Eastern countries: the fruit is eaten as snacks or alongside a dessert after a meal.
- The bedouin valued the fruit, calling it *nabk*. It could be dried and kept for winter or made into a paste.
- Persian cuisine: the dried drupes are known as *annab*.
- Azerbaijan: It is commonly eaten as a snack, and is known as *innab*.
- India: the fruit is dried in the sun and the hard nuts are removed. Then, it is pounded with tamarind, red chillies, salt, and jaggery. In some parts of the Indian

state of Tamil Nadu, fresh whole ripe fruit is crushed with the above ingredients and dried under the sun to make cakes called *ilanthai vadai* or *regi vadiyalu*.

- Madagascar: jujube fruit is eaten fresh or dried. People also use it to make jam.
- Morocco: a jujube honey is produced.
- Italy: has an alcoholic syrup called *brodo di giuggiole* [45].

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- *Additional references are found in the clinical trials and extrapolations from pharmacology sections.