Neuropathies: Essential oils show promising results in the fight against symptoms.

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Abstract

Chronic pain is a widespread problem affecting more than one and a half billion people worldwide. Of those, 116 million people suffering from chronic pain reside in the United States of America and four million of those with chronic pain suffer from neuropathic pain. Neuropathic pain is a very complex and hard to manage pain requiring several approaches to medication and treatment. In this paper, the use of essential oils of *Mentha x piperita* (Peppermint), *Pelargonium x asperum* (Geranium Rose)*, Piper nigrum* (Black Pepper) *and Rosmarinus officinalis* ct. cineole (Rosemary ct. cineole) to increase circulation and decrease pain in patients with peripheral neuropathy of the lower extremities is discussed through two case studies, chemical analysis, current research and future considerations.

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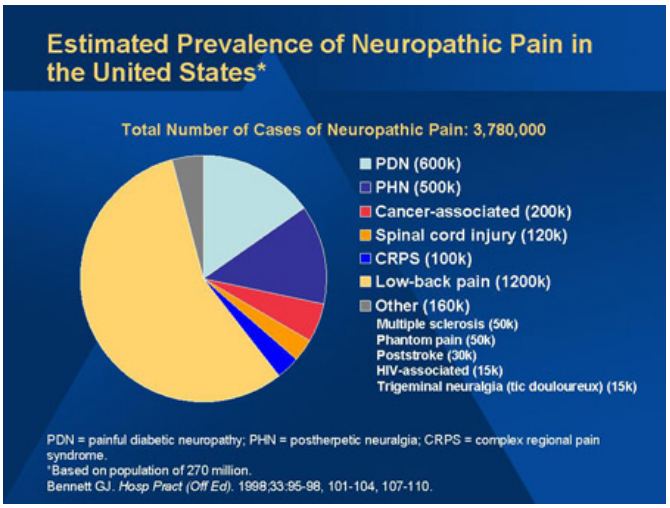
Chronic pain, or pain lasting longer than six months, affects approximately 1.5 billion people worldwide with 116 million of those people residing in the United States of America (American Academy of Pain Medicine [AAPM], 2011). Pain is divided into two categories: nociceptive pain, which includes visceral and somatic pain, and neuropathic pain. In hospice and palliative care settings, bone and cancer pain are also frequently used categories. Of those 116 million people suffering from chronic pain, approximately four million people in the United States of America are currently suffering from neuropathic pain (Dickson, Head, Gitlow, & Osbahr, 2010, p. 1637).



(Bennett, 1998, p. 104)

Neuropathic pain is defined as a pain caused by a lesion or disease of the somatosensory nervous system and can be further divided into central and peripheral neuropathic pain (International Association for the Study of Pain [IASP], 2011). The causes, symptoms, diagnosing, current treatment and ongoing research of neuropathic pain will be discussed in this paper. Two case studies will also be reviewed along with analysis of essential oils used for symptom management and possible future considerations for applied aromatherapy research.

Causes

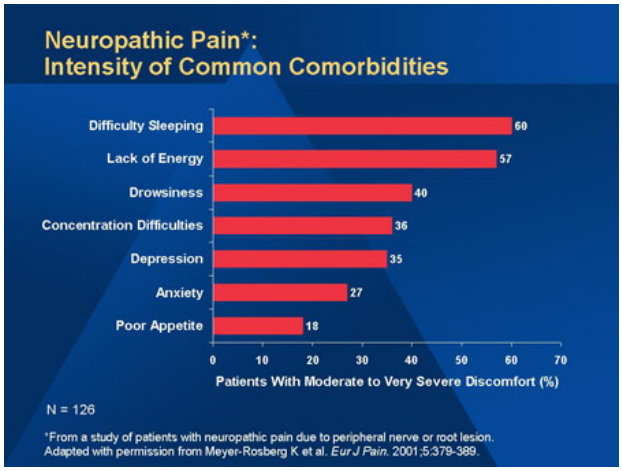
Neuropathic pain has many causes of which most are disease or injury related. According to the National Institute of Neurological Disorders and Stroke (NINDS), neuropathic pain is caused by physical trauma or injury, systemic diseases, autoimmune disorders, infections and can be inherited (NINDS, 2011). Physical trauma or injury causing neuropathic pain includes falls, sports-related injuries, accidents, fractures, phantom limb pain, spinal cord compressions, complex regional pain syndrome and more. Systemic diseases causing neuropathic pain include renal disease, heart and respiratory disease, endocrine diseases such as diabetes and metabolic disorders. Other systemic contributing factors include hormonal imbalances, exposure to toxins, connective tissue and inflammatory disorders, alcoholism, vitamin deficiencies, tumors (malignant and benign) and repetitive stress.

Infections causing neuropathic pain include: human immunodeficiency virus, herpes varicella-zoster, herpes simplex virus, cytomegalovirus, Epstein-Barr virus, Lyme disease, diphtheria, leprosy and bacterial and viral infections. 'Some neuropathies are caused by inflammation resulting from immune system activities rather than from direct damage by infectious organisms (NINDS, 2011).' These autoimmune disorders include: fibromyalgia, multiple sclerosis, Guillain-Barre Syndrome, or acute inflammatory demyelinating neuropathy, chronic inflammatory demyelinating neuropathy, trigeminal neuralgia and multifocal motor neuropathy. Neuropathic pain can also be caused by a hereditary genetic abnormality, genetic mutations or by no known cause (idiopathic).

Symptoms

The symptoms of neuropathic pain vary immensely by individuals. Symptoms also vary in intensity from miniscule to mild, to moderate and severe. They can also vary by the particular time of day, exact body location, activity or activity level, emotional upset or stress, body and environmental temperatures and amount of quality rest or lack thereof. Symptoms of neuropathic pain can also be difficult to describe. Some people who suffer from neuropathic pain describe the pain as tingling, throbbing, burning, stabbing, shooting, numbness, pins and needles and electric-shock type sensations. Quite often the pain is also described as radiating from one point of the body in a line to another point in the body.

This can be quite overwhelming and confusing when it occurs. 'Often, nerve pain can be caused by something that is not painful, such as the light touch of bed sheets (The American Chronic Pain Association [ACPA], 2010).' The total effect of chronic neuropathic pain on afflicted individuals can be quite all-consuming. As an individual's level of pain increases, their level of functioning, interaction with others and overall mood usually diminishes. Many patients suffering from peripheral neuropathy speak of how they used to enjoy long walks or hikes with their families, but are now limited in how far they can walk due to pain and increased potential of falling. Chronic pain also impacts loved ones. Chronic pain sufferers frequently suffer from difficulty sleeping, lack of energy and depression and limit themselves from people and activities they used to enjoy.



(Bennett, 1998, p. 108)

Diagnosis

Diagnosing neuropathic pain can be a very arduous and oftentimes frustrating process. The diagnosis must begin with a thorough physical examination by a licensed practitioner. It is very important to rule out all systemic causes of neuropathy, such as diabetes, before any further costly or painful diagnostic testing is pursued. Practitioners can use several neuropathic pain questionnaires to help in diagnosing patients. The following are the most widely used neuropathic pain questionnaires: the Douleur Neuropathique en Questions (DN4), The PainDETECT Questionnaire, the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) and the Neuropathic Pain Questionnaire (NPQ). The DN4 contains seven items related to patient symptoms and two for clinical assessment. The PainDETECT Questionnaire is a self-reporting questionnaire with nine items. The LANSS has five symptom items and two clinical examination items and the NPQ is a twelve item questionnaire for patients to rate their symptoms with percentages. According to a research study of the effectiveness of neuropathic pain questionnaires in diagnosing neuropathic pain, in patients suffering from chronic pain, it was determined the DN4 scale was the most sensitive with confirmation of neuropathic pain in 78.5 percent of affected patients (Bisaga, Dorazil, Dobrogowski, & Wordliczek, 2010, p. 120).

Other mechanisms used to diagnose neuropathic pain include either expensive or potentially painful diagnostic tests. On the expensive end of diagnostic testing, there are computerized tomography scans (CT scans) and magnetic resonance imaging (MRI). The only other diagnostic tests available include biopsies of nerve and/or skin tissue and electrically stimulating muscles and nerves through electromyography (EMG) and nerve conduction velocity (NCV) ("National Institute of Neurological Disorders and Stroke," 2010). This writer has both personally experienced an EMG and cared for patients having EMGs and found the test to be extremely painful.

Current Treatment

The Cleveland Clinic describes neuropathic pain as, ‘a complex, chronic pain state that usually is accompanied by tissue injury. With neuropathic pain, the nerve fibers themselves might be damaged, dysfunctional, or injured. These damaged nerve fibers send incorrect signals to other pain centers. The impact of a nerve fiber injury includes a change in nerve function both at the site of injury and areas around the injury (Cleveland Clinic, 2011).’ With such a description, it is understandable why it would be hard to manage neuropathic pain.

Once a patient is diagnosed with neuropathic pain and its cause has been determined, or deemed idiopathic, he or she is primarily given tricyclic antidepressants such as Nortriptyline or Amitriptyline. Over the counter pain relievers like Tylenol, Advil and Neuragen PN are often used in addition to prescription medications. From there, patients are placed on anticonvulsants such as Lyrica, Gabepentin and Tegretol. When these medications are no longer effective, patients are prescribed Serotonin-norepinephrine reuptake inhibitors such as Cymbalta and Effexor XR (Lindsay, Rodgers, Savath, & Hettinger, 2010, figure 1). When those medications are no longer sufficient, or when adjuvant pain medications are required, opiates are prescribed. Opiates often used are Oxycontin, Oxycodone, Morphine Sulfate –quick acting and extended

release, Tramadal, etc. Topical Lidocaine patches and capsaicin are also often used in conjunction with the aforementioned medications to help achieve pain control. Transcutaneous electrical nerve stimulation otherwise known as a TENS unit, offers great reduction in pain without the grogginess of narcotics, but it effect is often of a shorter duration. According to the Northern California Chapter of the Neuropathy Association, 'Although the placebo effect must be taken in consideration, there are many complementary and alternative treatments recommended by our members which are showing fair to good results in diminishing neuropathic pain. Such treatments as acupuncture, aromatherapy, biofeedback, hand and foot baths, diet therapy, exercise, guided imagery, herbal remedies, infrared light therapy, massage, physical therapy, reflexology, Reiki, Yoga and more (The Northern California Chapter of the Neuropathy Association, 2008, p. 1-8).'

Upcoming treatments for neuropathic pain currently being researched include the use of TRP channel agonists - Capsaicin, and endocannabinoid receptor agonists – marijuana (Peppin, 2011, p. 1-4). The latter, unfortunately, lends to heavy debate in the United States and although it shows quite promising pain relief, it will probably continue to be controversial for some time.

Case Study 1

Mrs. A. is a twenty-six year old Caucasian female with uncontrolled diabetes mellitus and resultant peripheral neuropathy. She was scheduled for an amputation of her left foot in a few weeks and agreed to try aromatherapy as a last resort. Her physician was in agreement with her participation in this case study. Explained case study to Mrs. A., her husband and father who all verbalized understanding of information given and Mrs. A. signed consent. Medications and patient history were reviewed and no contraindications found. Upon assessment, she had no sensation in her left foot and a small stage III, diabetic ulcer on her posterior left great toe. There was moderate discoloration of the left great toe, through the metatarsal phalangeal joint, indicative of poor perfusion. She had no complaints of pain due to no sensation in her entire foot. [Mrs. A. had recently met with a nutritionist and was on track to regaining control of her disease. She had no medical insurance, but had been given diabetic testing supplies, insulin and instructions at the diabetic clinic at a local teaching hospital. Unfortunately, she loved to walk around her house bare-footed, and her home was filthy and ridden with pet excrement. Teaching was done regarding cleanliness of her home and diabetic foot care. A case study was performed with her diabetic ulcer which showed great improvement and healing, but will not be discussed further in the text of this paper.] The goal of treatment in this case study was to achieve sensation in Mrs. A.'s left foot.

Essential oils of *Piper nigrum* (Black Pepper), *Pelargonium x asperum* (Geranium, Rose), *Mentha x piperita* (Peppermint) and *Rosmarinus officinalis cineole* (Rosemary cineol) were chosen and mixed together into a synergy. Directions for Mrs. A. were to use ten drops of her synergy with one cup of Epsom salts in a warm water foot bath and soak her left foot for 20 minutes twice a day. After her foot soak, she was to pat her foot dry, apply wound care to her left great toe, then put on a soft seamless sock and a comfortably fitting shoe. After her very first foot bath, she stated she had a feeling of mild tingling and was excited about the possibility of regaining sensation in her foot. She continued to use the synergy and foot bath twice daily for the next two weeks. At day seven, she had mild sensation in her left foot and was having to use Tylenol and Ibuprofen for discomfort due to her wound. At day fourteen, she had moderate

sensation in her left foot and moderate to severe intermittent wound pain requiring prescription pain medication. At this point, the case study was stopped to prevent Mrs. A. from experiencing any severe pain as her physician was unwilling to prescribe increased analgesic medications. Her left toe was amputated approximately six days later as previously scheduled. Case study results showed the use of *Piper nigrum, Pelargonium x asperum, Mentha x piperita and Rosmarinus officinalis cineole* affective in increasing peripheral sensation and circulation and should be included in further research studies for this diagnosis.

Case Study 2

Mr. B is a seventy-two year old Caucasian male with onset of bilateral lower extremity peripheral neuropathy up to mid chins. He stated his pain began approximately six months earlier and his physicians could not figure out why. His pain was becoming unbearable. He was not sleeping well. He was having difficulty with ambulation and had fallen four times in the past month. He reports no lack of sensation in his lower extremities and no history of injury or diabetes. Medications and patient history were reviewed and no contraindications found. Upon assessment, bilateral lower extremities appeared to be of normal size, muscle tone and movement. His skin was assessed and found to be very warm to touch, although the client was not febrile, with mild reddish discoloration on bilateral feet and toes with fair turgor. Explained case study to Mr. B., his wife and daughter who all verbalized understanding of information given and Mr. B. signed consents. The goal of treatment in this case study was to minimize pain in Mr. B.'s bilateral lower extremities.

Again, essential oils of *Piper nigrum*, *Pelargonium x asperum*, *Mentha x piperita* and *Rosmarinus officinalis cineole* were chosen and mixed together into a synergy. Directions for Mr. B. were to use five drops of the synergy and one cup of Epsom salts in a warm water foot bath and soak his feet for 20 minutes twice a day. After his foot soak, he was to pat his feet dry and wear soft seamless socks and comfortable shoes. Mr. B. was started at five drops of synergy per foot bath until effects on his pain level were established. After seven days of treatment, Mr. B. confirmed a reduction in his pain and his synergy was increased to ten drops per foot bath. After fourteen days of treatment, Mr. B. voiced great satisfaction with his results. The temperature of his lower extremities was similar to the rest of his body, his discoloration had improved and his pain was significantly reduced. Mr. B. was rating his pain at an eight, on a zero to ten pain scale, prior to each foot bath. After each foot bath, his pain rating was a three. He said it helped him be able to sleep at night. He was no longer waking up during the middle of the night in pain. He also confessed to occasionally using a foot bath a third time during the day if his pain recurred.

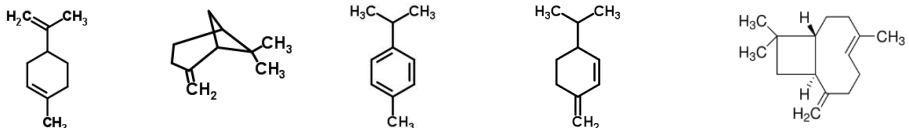
Case study results showed the use of *Piper nigrum, Pelargonium x asperum, Mentha x piperita and Rosmarinus officinalis cineole* affective in increasing circulation and decreasing pain from peripheral neuropathy and should be included in further research studies for this diagnosis.

Analysis of Essential Oils Used in Case Studies

Piper nigrum

According to (Shutes, n.d., p. 3-13), *Piper nigrum,* black pepper essential oil, belongs to the botanical family Piperaceae and originated in India, Malaysis, Madagascar, China and India. It is steam distilled from the black pepper plant's berries, peppercorns, and unripe dried fruit.

Piper nigrum is rich in monoterpenes and supported by sequiterpenes. The percentage of **monoterpenes** (70-90%) in *Piper nigrum* is: limonene (to 20%), β-pinene (to 20%), *p*-cymene (to 28%) and β-phellandrene (to 20%). The percentage of sequiterpenes in *Piper nigrum* is: β-caryophyllene (9-33%).



limonene β-pinene cymene β-phellandrene β-caryophyllene

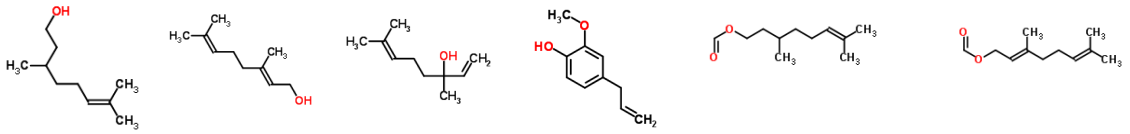
(www.chemspider.com)

One of the core aromatic applications, for which *Piper nigrum* was chosen for these case studies, is nervous system support - peripheral neuropathy. One of its therapeutic actions is as a tonic to the nervous system. It also has therapeutic actions as an analgesic, circulatory stimulant, antiviral, rubefacient, carminative and digestive - just to name a few (Haas, 2004).

Pelargonium x asperum

According to (Shutes, n.d., p. 2-54), *Pelargonium x asperum,* Geranium Rose essential oil, belongs to the botanical family Geraniaceae and originated in Reunion Islands, Egypt, Madagascar and China. It is steam distilled from the leaves and stems of the Geranium Rose plant.

Pelargonium x asperum is rich in alcohols and esters. Its chemical makeup is quite complex with the percentage of monoterpenes (trace to 7%), sesquiterpenes (8-9.5%), aldehydes (0-1.9%), ketones (0.6-8.4%), **alcohols** (32.36-94.3%) and **esters** (10.92-34.4%). Its percentages of alcohols are: citronellol (20.89-40.23%), geraniol (8.7-24.97%), linalool (1.89-9.9%), nerol (0.88-1.2%), α-terpinol (0.7%) and eugenol (17.3%). Its percentages of esters are: citronellyl formates (8-18%), geranyl formates (1-6%), citronellyl propriontates (1-3%), geranyl proprionates (0-1%), geranyl acetate (0.4-5.1%), citronellyl butyrate (0.52-1.3%) and phenyl ethyl isobutyrate (trace).



citronellol geraniol linalool eugenol citronellyl formate geranyl formate

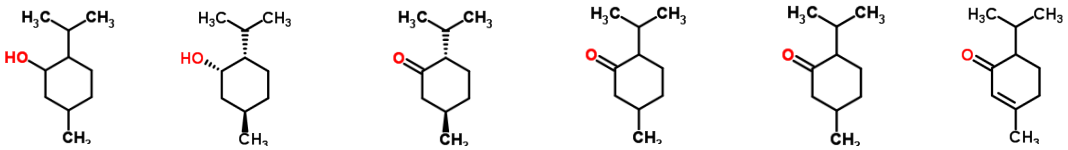
(www.chemspider.com)

One of the core aromatic applications, for which *Pelarganium x asperum* was chosen for these case studies, is circulatory system support - poor circulation. One of its therapeutic actions is as an analgesic. It also has therapeutic actions as an antimicrobial, astringent, hormone balancer and styptic - just to name a few (Haas, 2004).

Mentha x piperita

According to (Shutes, n.d., p. 7-35), *Mentha x piperita*, peppermint essential oil, belongs to the botanical family Lamiaceae syn. Labiatae and originated in France, England and the United States of America. It is steam distilled from the leaves and flowering tops of the peppermint plant.

Mentha x piperita is rich in the alcohol, menthol, and the ketone, menthone. Its chemical makeup is quite complex with the percentage of monoterpenes (9.62-31%), sesquiterpenes (trace-6%), **alcohols** (42.48-55.5%), **ketones** (22.35-53.67%) and esters (3.5-6.66%). Its percentages of alcohols are: **menthol** (38-46.2%), isomenthol, neo-menthol (2-3.25%), piperitol, piperitenol, isopiperitenol, α-terpineol (0.1-2%), linalol (<1%), terpinen-4-ol (2.5%), viridiflorol (0.13-1.5%), myrtenol (0.05%) and nerolidol (trace). Its percentages of ketones are: menthone (16-40%), iso-menthone (4-6.86%), neomenthone (2-3%), piperitone (0.35-3.1%), caryophyllene oxide (trace – 0.5%) and pulegone.



Menthol neo-menthol menthone iso-menthone neomenthone piperitone

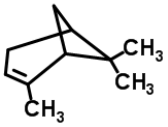
(www.chemspider.com)

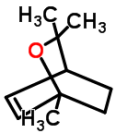
Two of the core aromatic applications, for which *Mentha x piperita* was chosen for these case studies, are nervous system support - neuralgia and circulatory system support – sluggish circulation. One of its therapeutic actions is as an analgesic. It also has therapeutic actions as an antispasmodic, carminative, expectorant and stomachic - just to name a few (Haas, 2004).

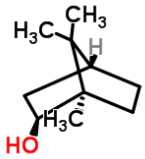
Rosmarinus officinalis cineole

According to (Shutes, n.d., p. 1-96), *Rosmarinus officinalis* cineole, Rosemary cineole essential oil, belongs to the botanical family Lamiaceae syn. Labiatae and originated in Morocco, Spain. It is steam distilled from the leaves and flowering tops of the Rosemary plant. Rosemary cineole is a chemo-type (CT2) of *Rosmarinus officinalis* with high levels of 1,8 cineole. Rosemary cineole is grown primarily in Tunisia.

Rosmarinus officinalis cineole is rich in the **oxide** 1,8 cineole (20-50%) and is supported by esters, ketones, monoterpines and monoterpinoids. Most prevalent is the monoterpine α-pinene (10%) and the monoterpinoid borneol (10%) ("Rosemary ct. 1,8 cineole," n.d.).







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α-pinene 1,8 cineole borneol

Two of the core aromatic applications, for which *Rosmarinus officinalis cineole* was chosen for these case studies, are circulatory system support – muscle fiber relaxant and lactic acid remover and as a mild analgesic. It also has therapeutic actions as an antimicrobial, antifungal, anti-rheumatic, antispasmodic, expectorant and mucolytic – just to name a few (Haas, 2004).

Ongoing Research

Research on essential oils and their chemical components has been occurring for well over fifty years. Scientists and physicians have had a need to know exactly what chemical compounds have what functions within essential oils. They use that information to extract components from essential oils and study them further…perhaps to emulate in pharmaceutical endeavors. However, clinical aromatherapists respect the essential oil as a whole and use it for its dynamic healing properties as nature intended. Several research studies of essential oils or chemical components of essential oils, used in the case studies in this text are discussed below.

Research on Chemical Constituents in Essential Oils

In experiments using animal models, analgesia effect in menthol has been shown to occur via an opiod receptor. Essential oil constituents, terpines (monoterpines and sequiterpines), alcohols and esters have been shown to have antinociceptive properties as well (Pergintino de Sousa, 2011, p. 2235). Terpines, alcohols and esters are constituents found in all essential oils used in the case studies reviewed in this text:

Mentha x piperita, Pipern nigrum, Pelargonium x asperum and *Rosmarinus officialis cineole*.

Research on *Piper nigrum*

Piper nigrum has shown to be an effective anti-inflammatory agent especially in conditions where moderate to severe pain also exist such as rheumatoid arthritis (Aggarwal et al.).

Piper nigrum has also been shown to enhance digestion and improve circulation. In a 2010 study conducted in Thailand, piperine – the main alkaloid in Thai black pepper – was found to have profound effects on the central nervous system, protect against cognitive loss and neurodegenerative changes like those found in Alzheimer's disease (Chonpathompikunlert, Whattanathorn, & Muchimapura, 2010, p. 278).

In a 2009 British study, the alkaloid *Piperine* in black pepper was shown to be an agonist to the human vanilloid receptor and with greater intensity than using capsaicin (McNamara, Randall, & Gunthorpe, 2009, p. 783).

In a 2011 article describing spice-derived neutraceuticals, or nutrients from foods with pharmaceutical properties, *Piper nigrum* was discussed as having benefits of anti-depressants, anticonvulsants, muscle relaxants, as well as a cell regenerator in the hippocampus and as a neural cytotoxin (Kannappan, Gupta, Kim, Reuter, & Aggarwall, 2011, p. 146- 8).

Research on *Rosmarinus officinalis*

In 2011, a research study was conducted on rats using *Rosmarinus officinalis* to reduce inflammation of carrageenan-induced paw edema and decreased Indomethacin-induced gastric ulcers. It was also beneficial in diminishing pain induced by formalin injections, but of a more peripheral pain reduction similar to that of NSAIDs (Dipe de Faria, Lima, Perazzo, & Carvalho, 2011, p. 6-7).

In a 2007 study with 153 Fibromyalgia patients, an over the counter medication (labeled Topical 024 Essential Oils) showed moderate reduction in pain in all study participants. Half received the topical 024 essential oils which contained essential oils of rosemary, peppermint, camphor, eucalyptus, aloe vera and lemon/orange while the other half received the placebo which was peppermint oil (Ko, Hum, Traitses, & Berbrayer, 2007, p. 12-13).

Research on *Mentha x piperita*

In August 2006, McKay and Blumberg (2006, p.619) found *Mentha x piperita* to have analgesic and anesthetic effects on the central and peripheral nervous systems as well as relaxing the gastrointestinal tract and having anti-tumoral, antiviral and antibacterial properties.

In 2010, Iranian researchers found *Mentha x piperita* to be effective against *E. Coli, S. aureus, Pseudomonas aeruginose, S. faecalis* and *Klebsiella* pneumonia in addition to being a potent anti-oxidant and cytotoxic to the human tumor cell line. It was also found to lower cholesterol, low density lipoproteins and uric acid (Sharafi, Rasooli, Owila, Tachizadeh, & Astaneh, 2010, p. 147).

Mentha piperita has shown anti-nociceptive effects against induced writhing and thermal stimulation in laboratory rats as well as anti-inflammatory properties for induced ear edema and granulomas in study rats (Aggarwal et al.).

Menthol, the primary alcohol in *Mentha x piperita*, is the active ingredient in the over the counter product Eucalyptamint. A research study on Eucalyptamint, was conducted in 1991 and found up to four times an increase in cutaneous blood flow and skin and muscle temperatures along with diminished pain at the site of application which lasted upwards of forty-five minutes (Hong & Shellock, 1991, p. 29).

Research on *Pelargonium x asperum*

A research study of an over the counter homeopathic remedy approved by the United States Food and Drug Administration (FDA), Neuragen PN, showed a reduction of at least fifty percent of pain reported by fifty-six percent of those study participants diagnosed with diabetic peripheral neuropathy ("Neuragen PN," 2010, p. 5). Neuragen PN contains a blend of six homeopathic substances and five essential oils: St. John's Wort (*Hypericum perforatum*), Wolfsbane (*Aconitum napellus*), Club Moss (*Lycopodium clavatum*), phosphorus, Poison Ivy (*Rhus toxicodendron*), Rye ergot (*Secale cornutum*), geranium oil (*Pelargonium graveolens*), lavender oil (*Lavandula angustifolia*), bergamot oil (*Citrus aurantium*), tea tree oil (*Melaleuca alternifolia*) and eucalyptus oil (*Eucalyptus globulus*) ("Neuragen PN," 2010, p. 2).

In 2006, a Japanese research study was conducted to show the effectiveness of geranium essential oil on both acute and chronic inflammatory processes. The study used rats injected with carrageenan to induce edema in the paw for acute inflammation and two injections of collagen II to induce chronic inflammation or arthritis. The rats were subsequently injected with a two and a half percent dilution of geranium oil and significant reduction of inflammation and prevention of arthritis was found (Maruyama et al., 2006, p. 4-7).

A somewhat weaker Korean study, due to participant loss and non-randomization, was conducted in 2011 using an aromatherapy blend with massage for pain relief of menstrual cramping. The study used a five percent dilution of the essential oils of cinnamon, clary sage, geranium, ginger and marjoram in a base of almond oil. Female high school students with complaints of menstrual pain at or above a six on the Visual Analogue Scale (VAS) were placed in either a control group which received oral acetaminophen or the study group which received one ten minute aromatherapy massage of the abdomen. Pain was evaluated using the VAS both before the massage, and twenty-four hours afterwards. The study group showed great reduction in pain without re-dosing unlike the needed re-dosing of the control group participants who received acetaminophen (Hur, Lee, Seong, & Lee, 2011, p. 2).

Research on Other Essential and Carrier Oils for Neuropathic Pain Reduction

Turpentine, whose major constituents are the t*erpines pinene* and *camphene* (*Terpines*, n.d., p. 5), has been at the center of Russian research on neuropathic pain, carbohydrate metabolism, platelet aggregation and hyperlipidemia. One such study, in 1998, used both yellow and white turpentine baths diabetic patients. Study participants soaked in turpentine baths beginning with five minutes and slowly progressing upwards of fifteen minutes as tolerated. Study participants, of both white and yellow turpentine baths, showed an increase in peripheral blood circulation, increased pulse-blood filling and decreased peripheral resistance of large vessels and distal polyneuropathy. Study participants showed reduced blood viscosity in only white turpentine baths (Davydova, Turova, & Golavach, p. 2).

Turpentine baths also showed a reduction in lumbosacral radiculitis patients in a 1978 study by a Russian researcher (Pushkareva, 1978, p. 81). Johns Hopkins medical data base even lists a research study on the use of turpentine baths for improved penile blood flow for patients with chronic prostatitis complicated by excretory pathospermia (Karpukhin, Li, & Gusev, 2009, p. 82). Unfortunately turpentine baths are seldom seen used in the United States at this time.

A 1990 study of dietary effects on diabetic peripheral neuropathy studied the effects of oral dosing of gamma-linolenic acid. Study participants were given either a placebo or a 360mg capsule of gamma-linolenic acid for a period of six months. Study participants were tested before beginning treatment and after six months of treatment. The gamma-linolenic group showed significant improvements in nerve conduction, muscle reactivity and peripheral neuropathy symptoms. This study hypothesizes that gamma-linolenic may actually prevent distal peripheral neuropathy in diabetic patients (Jamal & Carmichael, 1990, p. 320).

Gamma-linolenic acid (GLA) is an essential fatty acid in the family of Omega-6 fatty acids. “It can help play an important role in treatment of inflammatory conditions including exzema, psoriasis and rheumatoid arthritis (Shutes, n.d., p. 2-91).” Main sources of GLA are human breast milk, black currant seed oil, hemp seed oil, borage seed oil and evening primrose oil. Evening Primrose oil in addition to alpha-linolenic acids (ALA), main source is flax seed oil, and capsaicin have been shown to ease the pain of diabetic peripheral neuropathy as well (Halat & Dennehy, 2003, p. 47).

Current Clinical Use by Well Known Clinical Aromatherapists

Dr. Jane Buckle, PhD. recommends, amongst many, the use of essential oils of *Piper nigrum, Mentha x piperita* and *Rosmarinus officinalis* and for children – *Pelargonium graveolens* (Buckle, 1999, table 4).

Jeanne Rose recommends the use of essential oils *Mentha x piperita* for analgesic use for headaches and a blend of *Pelargonium graveolens, Citrus limon* and *Juniperus communis* for an allover massage oil for pain (Rose, 2006, p. 54-5).

Jade Shutes recommends the use of *Piper nigrum* and *Rosmarinous officialis* to increase circulation in those suffering from Raynaud’s Disease (Shutes, n.d., p. 7-86). She also

recommends blends with any of the following oils for pain reduction in patients with Fibromyalgia: *Piper nigrum, Betula lenta, Matricaria recutita, Chamaemelum nobile, Metha x piperita, Rosmarinus officinalis* and more (Shutes, n.d., p. 7-28).

Valerie Ann Worwood recommends *Lavendula agustifolia, Chamaemelum nobile*, *Eugenia carophyllata* and *Mentha x piperita* for neuralgia (Worwood, 1991, p. 39).

Future Considerations

The use of essential oils to supplement or eventually replace current medical treatment of peripheral neuropathy has proven to be quite beneficial through both scientific research and multiple aromatherapy case studies. The potential use of *Piper nigrum*, *Pelargonium x asperum*, *Mentha x piperita* and *Rosmarinus officinalis cineole* in not only baths, but blends with evening primrose oil for topical application could greatly reduce pain caused by peripheral neuropathy in more than four million chronic pain sufferers in the United States alone. Additional research on the use of turpentine baths may also prove noteworthy in the pain management of peripheral neuropathy. By combining the best of traditional Eastern and Western medicines, the potential for more effective, less costly treatment options is limitless.

"In this respect aromatherapy is the future of healing. Essential oils, representatives of the plant world, communicate with all planes of human consciousness. This is a privilege of plant intelligence over synthetic drugs and the exclusive fixation on the corresponding material plane (Schnaubelt, 1999, p. 123)."

[Although data from research studies using animal models was referenced in this paper, this author is against animal testing.]

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