For infectious cough support

| Barberry, Pelargonium, Licorice, Thyme, Elder Berry. |

This document is for educational purposes only. Any similarity between actual products and the formula described herein is purely coincidental.

Formula Aim: To support the control of respiratory infections by reducing bacterial and viral loading, soothe coughing, reducing viscosity and production of mucous while supporting mucous membrane tissue and boosting the immune system.

The herbs that can assist are;
- reducing microbial loading (Barberry, Pelargonium, Licorice, Thyme, Elderberry)
- reducing allergic and inflammatory responses (Barberry, Pelargonium, Licorice)
- supporting immunity (Barberry, Elderberry)
- mucous production and viscosity (Licorice, Thyme)
- reduces coughing (Licorice, Thyme)
- supporting mucous membrane tissue (Barberry, Licorice)

Barberry Bark (*Berberis vulgaris*)

Barberry is used as a stimulating hepatic; the bitter compounds in Barberry stimulate digestive function improving appetite, digestion and assimilation. It is also used to ease inflammation and infection in respiratory tract conditions such as pharyngitis, sinusitis, rhinitis, bronchitis and traditionally tuberculosis. Its use for removing mucoid accumulations and controlling excess secretion is due to its action on mucoid tissue.

Barberry, like Goldenseal (*Hydrastis canadensis*) and Oregon Grape (*Berberis aquifolium*), contains the chemical berberine (Fournet et al., 2002). Berberine containing herbs have been used medicinally in traditional medical systems dating back at least 3,000 years (Vennerstrom et al., 1990).


Studies have shown berberine to have a number of therapeutic effects:

**Anti-inflammatory**
- The berberine anti-inflammatory effect occurred rapidly (3 h) as a result of reduced COX-2 protein, but not enzyme activity. These anti-inflammatory effects paralleled the in vivo results where berberine pretreatment of Wistar rat inhibited the production of exudates and PGE2 in carrageenan induced air pouch. (Kuoa et al., 2004)
- Ehehalt et al., 2007 conclude that in dermatological disorders berberine exerts its anti-inflammatory effects by inhibiting signal transduction pathways other than the NFκB dependent pathway.

**Immune stimulation**
- Berberine has been shown to activate macrophages (Kumazawa et al., 1984).
- Sabir and Bhide have reported berberine stimulates blood flow to the spleen.
Antibacterial

Berberine has demonstrated significant antimicrobial activity against bacteria, fungi, protozoa, viruses, helminthes and *Chlamydia* (Timothy et al., 1997). This ability supports the use in respiratory tract infection.

The antibacterial activity has been shown against Staphylococcus, Streptococcus, Salmonella, Shigella and Escherichia Coli.

- Berberine blocked the adhesion of *E. coli*, in vitro. The reduction in adherence is related to the loss of the synthesis and expression of fimbriae (hairlike appendages) on the surface of the berberine-treated bacteria. Inhibition of microbial adherence results in termination of infection and may explain the anti-infectious activity of berberine in *E. coli* infections, since the direct antimicrobial activity of berberine against *E. coli* is relatively low (Sun et al., 1988).

Antifungal

- Berberine demonstrated anti-mycotic activity against several fungal species. Concentrations of 10-25 mg/ml inhibited the growth of *Alternaria, Aspergillus flavus, Asp. fumigatus, Candida albicans, Curvularia, Drechslera, Fusarium, Mucor, Penicillium, Rhizopus oryzae* and *Scopulariopsis*. The growth of *Syncephalastrum* was inhibited by a concentration of 50 mg/ml (Mahajan et al., 1982).

Anti-protozoal

- Berberine and protoberberine derivatives exhibited a potency comparable to that of quinine in vitro against two clones of human malaria, *Plasmodium berghei* and *P. falciparum*. None of the compounds, however, were active against *P. berghei*-parasitized mice (Vennerstrom et al., 1988).
- Berberine inhibited the growth of *Entamoeba histolytica, Giardia lamblia* and *Trichomonas vaginalis* in vitro and induced morphological changes in the parasites (Kaneda et al., 1991).
- Berberine demonstrated significant activity (greater than 50% suppression of lesion size) against *Leishmania braziliensis* in golden hamsters (Vennerstrom et al., 1990).
- In both the 8-day and long-term models of *Leishmania donovani* infection in hamsters, berberine markedly diminished the parasitic load, rapidly improved the haematological picture and was less toxic than pentamidine. Berberine was found to interact in vitro with nuclear DNA from *L. donovani* promastigotes (Ghosh et al., 1985).
- Berberine demonstrated a high degree of activity against *E. histolytica* in vitro. Oral administration of berberine (100 mg/kg) to rats with experimental amoebiasis (protozoal infection) reduced the infection by 83%. Berberine also reduced the level of infection to 20% in infected hamsters (Dutta and Iyer, 1968).

Antiviral

- Berberine interferes with intracellular events after virus penetration into the host cells and before viral DNA synthesis (Kyoko et al., 2007).
- Berberine had no effect on killing herpes simplex virus type-2 outside cells, it didn't affect absorption and release from cells; or impact on DNA replication, but it could inhibit herpes simplex virus type-2 protein synthesis in a concentration dependent behaviour (Wu et al., 2009).

How it works.

Berberine inhibits bacteria from attaching to cells so helping to prevent infections. Some antimicrobial agents can block the adherence of microorganisms to host cells by altering or suppressing bacterial adhesin (ligand on the bacterial surface that mediates adherence).
Interruption of the adhesive functions of bacteria before host tissue invasion occurs may be an effective prophylactic approach against bacterial infectious diseases.

**Streptococci bacteria**

1. Berberine completely inhibited growth of streptococci, however berberine was not bactericidal, since the streptococci resumed normal growth upon removal of berberine. The bacteriostatic effect of berberine is probably due to its ability to interact with nucleic acids.

2. Berberine caused an increase in release of lipoteichoic acid (LTA) from streptococci. LTA is the major ligand responsible for the adherence of the bacteria to host cells, including host cell receptors (fibronectin). Release of LTA from the streptococcal cells means a loss of LTA and a corresponding reduction in the capacity of the bacteria to adhere to the host. Berberine also interfered with bacterial adherence by directly preventing the complexing of LTA with fibronectin or by dissolving the complexes once they were formed (Sun et al., 1988).

**Staphylococcus aureus bacteria**

Amin et al. 1969 found that bacteriostatic concentrations of Berberine rapidly suppressed synthesis of RNA and proteins in *Staphylococcus aureus* but had little or no effect on DNA synthesis.

Berbamine is another alkaloid found in Barberry, which is believed to help reduce inflammation (Wong et al., 1992) and is an anti-oxidant (Ju et al. 1990). Ren et al., 2008 have shown berbamine to have potent anti-inflammatory properties.

**References**


Pelargonium Root (Pelargonium sidoides)

Pelargonium sidoides root has been used for hundreds of years by ethnic African groups to treat various diseases in man and livestock including diarrhoea, dysentery, coughs, upper respiratory tract irritations, tuberculosis, gastritis and gonorrhoea. (Hutchings 1996, Lewu et al., 2006 and Lewu et al., 2007). Interestingly European use was initiated by Charles Stevens when he went to South Africa in 1897 hoping to find a cure for his tuberculosis infection. A Basotho traditional healer gave him a plant decoction that cured him. Shortly after his recovery, Charles returned to England and sold this decoction as the “Stevens Consumption Cure”. In 1920 Dr Adrien Seche heard of the cure and successfully treated 800 patients in Switzerland over a period of 9 years. The ‘Stevens Consumption Cure’ became forgotten in Western medicine after the introduction of synthetic TB drugs and antibiotics (Maree and Viljoen, 2007).

Several studies have established a clear benefit of Pelargonium sidoides root extract in the management of a range of acute and subacute respiratory infections, including the common cold, influenza, bronchitis, tonsillitis, pharyngitis and sinusitis. Pelargonium is particularly valuable because its safety and efficacy has been established in children, even as young as 1 year (Kamin et al., 2010). It is not unreasonable to extrapolate this for safe use in young animals.

Studies that support its use:

Acute Tonsillopharyngitis

In four controlled trials and three placebo-controlled trials using Pelargonium root tincture (0.27 g/day of dried root) tonsillopharyngitis severity score significantly decreased over the course of treatment. With Pelargonium treatment superior to placebo symptomatically (Kolodziej et al., 2003).

Acute Bronchitis


The key findings were:

- All trials found Pelargonium beneficial in the treatment of acute bronchitis.
- Four placebo-controlled trials indicated that the liquid preparation of Pelargonium sidoides root significantly reduced bronchitis symptom scores by day 7.
Patients noticed an earlier treatment effect under Pelargonium than the placebo. A study performed using Pelargonium extract, involving 641 patients with infections, demonstrated that 85% of the patients experienced significant clinical improvement after a fourteen-day course of treatment (Heil, Reitermann, 1994 and Alonso, 2004). Several clinical studies (Chuchalin et al., 2005; Matthys et al., 2003; Matthys et al., 2007a; Matthys, Hereg, 2007b) have also proven the efficacy of Pelargonium for treating bronchitis.

Three recent studies have been published further investigating the clinical value of Pelargonium in acute bronchitis.

- Kamin et al., 2010 examined the effects of a Pelargonium tincture in 200 children with acute bronchitis, aged between 1 to 18. From Day 0 to Day 7 the average symptom score fell significantly more for Pelargonium than placebo. The Pelargonium groups onset of effect was significantly faster and bed rest time was shorter compared to placebo.
- A dose–finding study by Kamin et al., 2010 included 400 children with acute bronchitis aged between 6 and 18 years. They were given Pelargonium at various doses randomly assigned. A dose dependant response was observed with the higher doses being better than the lower doses and all were significantly better than placebo. Other symptoms such as loss of appetite, headache and vomiting were also significantly improved.
- Matthys et al., 2010 also conducted a dose–finding study for Pelargonium including 406 adults with acute bronchitis. They also demonstrated a dose dependant response.

Common Cold/Acute Rhinitis/Rhino sinusitis.

The common cold is a viral infection that typically causes mucosal swelling and subsequent obstruction of the sinuses. A secondary bacterial sinus infection may ensue (Bachert et al. 2009). Early resolution before a bacterial infection can take a substantial hold would be beneficial, given that the efficacy of antibiotics is limited or controversial for this condition.

- Pelargonium extract demonstrated an action in relieving flu symptoms (Noldner, Schotz, 2007).
- Pelargonium root tincture (0.4 g/day of dried root) produced a significant reduction in the severity of symptoms and shortened the duration of common cold compared to placebo, in a randomised, double blind, placebo-controlled trial by Lizogub et al., 2007.
- Pelargonium sidoides was found to be effective for acute rhinitis in a randomised, double blind, placebo-controlled trial. In this trial patients received either 1.6 to 2.0 mL of a 1:2 extract or a matching placebo and were followed for 21 days. By day 7 there was a significant reduction in symptoms in the Pelargonium group, compared to placebo. The authors concluded that the Pelargonium was well tolerated and superior in efficacy to placebo in the treatment of AR of presumably bacterial origin (Bachert et al. 2009).
- According to Neugebauer et al. (2005), Pelargonium causes an increase in the frequency of the beating movement of the nasal epithelium. This beating movement is an important mechanism of physical defence against infections.

Acute Sinusitis

- Bachert et al., 2006 in a randomised, double blind, placebo-controlled trial using Pelargonium root tincture (0.8 g/day of dried root) found a highly significant reduction in mean sinusitis severity score compared to placebo. State of health, activity level and general well-being was also better in Pelargonium group.
- Pelargonium root tincture equivalent to about 0.13 g of dried root per hour, up to 1.6 g/day for the first two days, and thereafter about 0.4 g/day of dried root. In this study by Schapowal and Heger 2007, 80.9% of patients became symptom-free or experienced a clear improvement in their symptoms on the last day of treatment (within 4 weeks).
Antimicrobial Activity

- Several authors have found Pelargonium root extract has antimicrobial activity inhibiting gram-positive (*Staphylococcus aureus, Streptococcus pneumoniae, S. beta-hemolitico 1451*), gram-negative bacteria (*Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis*), virus (*Haemophilus influenzae, Moraxella catarrhalis*), and fungus (*Aspergillus niger, Fusarium oxysporum, Rhizopus stolonifer*). (Alonso, 2004; Lewu et al., 2006; Mativandelra et al., 2006; Conrad et al., 2007; Matthys, Heger, 2007; Kolodziej, Kiderlen, 2007) thus confirming its potential for use as a broad-spectrum antimicrobial.

- Also according to traditional use, Pelargonium has activity in the treatment of tuberculosis (Kolodziej et al., 2003). Mantivandelra et al. (2006) reported antimycobacterial activity of the Pelargonium roots, in vitro, against *M. tuberculosis*.

- Kolodziej and Kiderlen (2007) verified that Pelargonium has immunomodulating activity. The immuno-stimulating activity occurs due to the presence of coumarins and other polifenolic compounds which promote the formation of cytokines that intervene defending against anaerobic microorganisms infections (Alonso, 2004).

- According to Schnitzler et al. (2008), an aqueous extract of Pelargonium sidoides, in which coumarins were identified as major constituents, showed efficacy against herpes virus.

- In the in vitro model of fibroblasts infected with the virus of brain-miocarditis, the extract of *P. sidoides* was shown to produce alpha and beta interferons, which have recognized antiviral effect, where the umckalin and the gaelic acid are the main components responsible for these effects (Alonso, 2004).

References


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Licorice Root (Glycyrrhiza glabra)

Licorice is steeped in history as a plant of ancient origin. It has been used for more than 4000 years. It was used to treat inflammatory conditions of the respiratory tract, irritable dry cough or hoarseness, sore throats, laryngitis, bronchitis, wheezing or shortness of breath, chest and lung diseases such as consumption (tuberculosis).

It is a popular ingredient in cough medicines, lozenges and pastilles, due to its soothing effect.

Actions:

Antitussive, Expectorant, Demulcent, Spasmolytic, Anti-allergic, Anti-inflammatory, Antiviral, Antibacterial and Anti-pyretic.

Antitussive, Expectorant Demulcent and Activity

- While the mechanism of action remains unknown Glycyrrhizin and its derivatives are believed to be responsible for Licorice’s function in the respiratory system helping to prevent and ease coughing.
- Licorice has been shown to work as effectively as codeine in the throat, decreasing irritations and producing expectorant effects.
- A proposed explanation for its demulcent activity is that as licorice is able to stimulate gastric mucus secretion, it is also able to stimulate tracheal mucus secretions and therefore produce demulcent and expectorant effects. (Murray, 1998)

Spasmolytic Activity

- Liquiritin in Licorice is inactive as an anti-spasmodic. However when hydrolysed by heat and converted to isoliquiritigenin, it was shown to exhibit strong spasmylosytic activity. (Mills et al 2000)

Anti-Allergic and Anti-inflammatory Activity

Glycyrrhizin and its derivatives exhibit steroid-like anti-inflammatory activity, similar to the action of hydrocortisone. Glycyrrhizin also gives an anti-allergenic effect, especially when treating asthma. Its anti-allergenic effect helps to counter the signs and symptoms of hay fever, allergic rhinitis, conjunctivitis and bronchial asthma. (Murray, 1998)

This is due, in part, to inhibition of phospholipase A2 activity, an enzyme critical to numerous inflammatory processes. In vitro research has also demonstrated glycyrrhizic acid inhibits cyclooxygenase activity and prostaglandin formation (specifically prostaglandin E2), as well as indirectly inhibiting platelet aggregation, all factors in the inflammatory process (Okimasu et al., 1983; Ohuchi and Tsurufuji 1982).
In the human body, glycyrrhizin is hydrolysed to glycyrrhetinic acid. Research has shown that glycyrrhetinic acid inhibits the enzyme 11-beta-hydroxy steroid dehydrogenase, which is responsible for converting cortisol, the active form into its inactive metabolites. Thus inhibition of the enzyme by glycyrrhetinic acid significantly increases the levels of cortisol and also stimulation of the glucocorticoid receptors. This in turn potentiates the action of hydrocortisone, the main glucocorticoid secreted by the adrenal cortex.

Hydrocortisone is associated with, and accounts for glycyrrhizin and glycyrrhetinic acid’s anti-inflammatory, anti-allergic and anti-arthritis effects, and also its role in stimulating the adrenal cortex after steroid therapy. Moreover, while its actions resemble those of cortisol and hydrocortisone, Licorice does not cause ulcers in the digestive tract or suppress the production of blood cells like standard steroid therapy does (Chopra et al 2000, Mills 1991, Mills et al 2000, Murray 1998, Weiss et al 2000).


Separate in vitro studies have shown that glycyrrhizin is a thrombin inhibitor, and that it inhibits the production of reactive oxygen species by neutrophils. Glycyrrhizin has also been shown to inhibit phospholipase A2. In doing so, it inhibits the conversion of phospholipids to arachidonic acid which in turn inhibits the formation of leukotrienes, which are derived from arachidonic acid. Leukotrienes are very potent broncho-constricting agents; by limiting their synthesis, Licorice has been shown to reduce hypersensitive reactions in asthmatics. (Mills et al 2000, Myers 1987)

However, inhibiting the metabolism of corticosteroids also results in greater stimulation of the mineralocorticoid effect in the kidney. Glycyrrhetinic acid also potentiates ACTH activity by causing aldosterone-like kidney retention of sodium and water, and consequently hypokalaemia, raised blood pressure, oedema and decreased haemoglobin levels. (Mills 1991, Mills et al 2000, Murray 1998, Weiss et al 2000)

Antiviral and Anti-microbial Activity

Glycyrrhizin and glycyrrhizic acid have been shown to inhibit growth and cytopathology of numerous RNA and DNA viruses, including hepatitis A (Crance et al., 1990) and C (Van Rossum et al, 1999 and Su et al., 1984), Herpes zoster (Baba and Shigeta, 1987), HIV (Hattori et al.,1989; Ito et al.,1988), Herpes simplex (Pompei et al., 1979; Partridge and Poswillo, 1984) and CMV (Numazaki et al., 1994).

Licorice inhibits virus growth and inactivates virus particles. In vivo studies have found that it induces interferon production and is able to promote the activity of key immune cells. (Chopra et al 2000, Mills et al 2000)

In one study, the antibacterial activity of compounds obtained from Licorice was measured against upper airway respiratory tract bacteria such as Streptococcus pyogenes, Haemophilus influenzae and Moraxella catarrhalis. Among the tested compounds, licoricidin exhibited the highest activity against all tested microorganisms. Three coumarin derivatives, glycyrol, glycyrin and glycycomarin also showed antibacterial activity. (Tanaka et al 2001)

In vitro studies also showed that isoflavonoids isolated from Glycyrrhiza exhibit considerable antimicrobial activity. Licochalcone A stopped the growth of both chloroquine-susceptible and chloroquine-resistant Plasmodium falciparum strains. Oral administration to mice also protected them from yoelii infection. In addition, Licochalcone A also inhibited the growth of Leishmania major and L. donovani promastigotes and amastigotes. (Mills et al 2000)

In a 2010 study Nitalikar et al., concluded that Licorice exhibits good antimicrobial activity against various bacterial strains.
Anti-pyretic Activity

Glycyrrhiza’s anti-pyretic activity is due to glycyrrhetinic acid’s aspirin-like effects.

Precautions:

Prolonged high dose use causes sodium and water retention and potassium loss, accompanied by hypertension, oedema, and hypokalaemia, and, in rare cases, myoglobinuria.

Contraindications:


References

Thyme Leaf (*Thymus vulgaris*)

Thyme is another herb steeped in history. Pliny recommended that sniffing or sleeping on thyme leaves as a remedy to loosen tightness of the chest and lungs (Krutch, 1965); with one ounce of the pounded herb infused in one pint of water with honey being useful to cure whooping cough. Dioscorides also prescribed drinking the herb infused with honey to soothe asthma (Freeman, 1943).

The primary chemical constituents of Thyme include essential oils (borneol, carvacrol, cymol, linalool, thymol), bitter principle, tannin, flavonoids (apigenin, luteolin), saponins, and triterpenic acids (Lee et al., 2005; Goodner et al., 2006). Thyme contains about 2.5% but not less than 1.0% of volatile oil (WHO, 2002). The main active constituent of Thyme is thymol which makes up 20-54% of the plant’s essential oil.

Thymol, an antiseptic, is the main active ingredient in Listerine mouthwash (Pierce, 1999). Before the advent of modern antibiotics, it was used to medicate bandages (Grieve, 1931). It has also been shown to be effective against the fungus that commonly infects toenails (Ramsewak et al., 2003). It can also be found as the active ingredient in all-natural, alcohol-free hand sanitisers.

Because of its broncho-spasmolytic properties, Thyme is traditionally used in cough medicines including for whooping cough and is a standard remedy for bronchitis, asthma, sore throat, catarrh or inflammation of the upper respiratory tract; applications that are covered in modern herbal medicine by a positive Commission E monograph.

**Actions:**

Antitussive, expectorant, spasmolytic, secretomotoric activity, antiseptic, antimicrobial; antibacterial, antiviral, antifungal.

**Antitussive and expectorant:**

- Thyme has traditionally been used in cough medicines for whooping cough, bronchitis, asthma, sore throat, catarrh or inflammation of the upper respiratory tract.
- Grieve (1931) considered Thyme effective in cough drop recipes.
- Thyme warms and stimulates the lungs, expels mucus, and relieves congestion. The thymol content of thyme works as an expectorant and cough suppressant and is frequently used in cough syrups (Van Den Broucke, 1981).
- Thyme expels phlegm and relieves congestion (Melchior et al. 1997)
- In vitro studies have shown that flavones and thyme extracts inhibit responses to agonists of specific receptors such as acetylcholine, histamine and L-norepinephrine, as well as agents whose actions do not require specific receptors, such as barium chloride (Van den Broucke and Lemli 1983). The flavones of thyme were found to act as non-competitive and non-specific antagonists (Van den Broucke and Lemli 1983); they were also shown to be Ca2+ antagonists and musculotropic agents that act directly on smooth muscle (Van den Broucke and Lemli 1983).

**Spasmolytic**

- Most often attributed to thymol and carvacrol (Reiter and Brandt, 1985), but experimental evidence suggests that the in vitro spasmolytic activity of thyme preparations is due to the presence of the flavones (Van den Broucke and Lemli 1983).

**Secretomotor activities**

- Thyme has the ability to increase the production of fluid and reduce the viscosity of mucous. It also increases the removal of mucous. These actions help expel phlegm, even in
previously unproductive coughs.

- Experimental evidence suggests that thyme oil has secretomotoric activity (Gordonoff et al., 1931). This activity has been associated with a saponin in Thyme (Vollmer, 1932). Stimulation of ciliary movements in the pharynx mucosa of frogs treated with diluted solutions of thyme oil, thymol or carvacrol has also been reported (Freytag, 1933). Furthermore, an increase in mucus secretion of the bronchi after treatment with thyme extracts has been observed (Schilf, 1932).

**Antiseptic, antimicrobial antifungal and antibacterial activities**

- Thyme is antiseptic and antimicrobial through deterring bacterial, fungal, and viral infections (Van Den Broucke, 1981).
- In vitro studies have shown that both thyme essential oil and thymol have antifungal activity against a number of fungi, including *Cryptococcus neoformans*, *Aspergillus*, *Saprolegnia*, and *Zygorhynchus* species (Vollon and Chaumont, 1994; WHO 2002; Perrucci et al., 1995; Pasteur et al., 1995; Tantaouielaraki and Errifi, 1994).
- Both the essential oil and thymol have antibacterial activity against *Salmonella typhimurium*, *Staphylococcus aureus*, *Escherichia coli*, and a number of other bacterial species (Janssen et al., 1987; Juven et al., 1994).
- As an antibiotic, thymol is 25 times as effective as phenol, but less toxic (Czygan, 1989).

**References**

23. Juven BJ, Kanner J, Schved F, Weisslowicz H. Factors that interact with the antibacterial action of thyme
Elder Berry (Sambucus nigra)

Elder has long been used in traditional medicine. Currently, berry extracts are used as antiviral agents for colds, influenza, and herpes virus infection. Research has demonstrated a viral transmission-modulating, antioxidant, and insulin-stimulating properties.

Elder berries contain several pharmacological active constituents; flavonoids (quercetin and rutin), anthocyanins (cyanidin-3-glucoside and cyanidin-3-sambubioside) (Wu and Cao, 2002), hemagglutinin protein Sambucus nigra agglutinin III (SNA-III) (Mach et al. 1991), cyanogenic glycosides including sambunigrin (Jensen and Nielsen 1973, Buhrmester et al., 2000), viburnic acid, and vitamins A and C (Duke 1985).

Antiviral Action

- Elder berry neutralizes the activity of the hemagglutinin spikes found on the surface of various viruses. The deactivation of hemagglutinin spikes renders viruses incapable of piercing cell walls to gain cell entry and replication. (Mumcuoglu, 1995)
- Several studies using a syrup containing 38% of a standardized Elder berry extract have shown a neutralization and reduction of transmission of influenza viruses A and B (Zakay-Rones et al., 1995; Zakay-Rones et al., 2004), HIV strains and clinical isolates (Saphira-Nahor et al., 1995), and Herpes simplex virus type 1 (HSV-1) strains and clinical isolates (Morag et al., 1997).
- A study of 27 patients, 23 had laboratory confirmation of influenza B. The results showed 93.3 percent of the treated patients exhibiting a significant improvement in flu symptoms within two days after initial dosing, while in the control group 91.7 percent exhibited improvement after six days. Complete resolution in 90 percent of the treated group occurred after 2-3 days, with the placebo group resolving after six days (Zakay-Rones et al., 1995).
- Another study involving 60 patients experiencing early flu symptoms were administered Elderberry extract. The result showed the majority of the treatment group reporting "pronounced improvement" after an average of 3-4 days, while the placebo group required 7-8 days to reach the same level (Zakay-Rones et al., 2004).
- The results suggest that Elderberry liquid extract blocks factors on the cell surface needed by influenza virus for efficient infection (Krawitz et al., 2011).

Antibacterial

- In a study by Krawitz et al., (2011) Elderberry extract was shown to have an inhibitory activity against clinically relevant human respiratory bacterial pathogens and influenza A and B viruses.
- Elderberry (minimum of 3.2 percent anthocyanins) inhibited the growth of two bacterial strains often found in association with upper respiratory tract infections, Branhamella catarrhalis and Streptococcus pyogenes, by 70 percent.
- The study showed a dose dependant effect. 70 percent inhibition of all the bacteria at the 10 percent concentration level, when used at the highest concentration a growth inhibition of 99 percent was recorded.

Immune Modulation

- Elderberry extract has shown immune-modulating activity in healthy, viral infected and immunosuppressed individuals. Specific cytokine production leads to phagocyte activation and facilitates their movement to inflamed tissues (Janeway et al., 2001).
- The ability of Elderberry preparations to significantly increase production of the cytokines,
tumour necrosis factor-alpha (TNFα), and interleukins; IL-1β, -6, and -8 was shown in two studies using healthy donors (Barak et al., 2001).

- In another study different Elderberry preparations were used and the monocyte production of IL-10 was measured. Compared to control there was a 1.3- to 6.2 fold increase in cytokine production observed, with a 2.3-fold increase in IL-10 (Barak et al., 2002).

**Antioxidant**

- Elderberries contain several anthocyanin flavonoids known to possess significant antioxidant properties.
- Elderberry anthocyanins at low concentration levels (4 mcg/mL) are able to regenerate alpha-tocopherol from alpha-tocopheryl radicals in models of LDL oxidation (Abuja et al., 1998).
- Elderberry extracts provide significant antioxidant benefit when supplemented because Elderberry anthocyanin glycosides are readily absorbed in humans. (Wu and Cao, 2002; Mulleder et al., 2002; Bitsch et al., 2004; Cao and Prior, 1999; Milbury et al., 2002).

**Herpes simplex**

- Morag et al., (1997) examined the effects of Elderberry extract against four strains of HSV-1. They found viral replication was completely inhibited in all four strains.

**HIV**

- The potential of Elderberry at two different dilutions to inhibit the infectivity of HIV isolates was studied by Sahpira-Nahor et al., (1995). They found a significant reduction in the infectivity of all HIV strains. In the treated patient HIV isolates, no HIV antigen was detected at either five or nine days post-incubation.
- Anecdotal evidence (six case studies) reports a combination of Elderberry extract and a thymus extract resulted in a reduction in viral load in people with HIV (No authors 1998).

**References**


