Aiding Acute and Chronic Pain, Inflammation and Acidity

With *Salix alba*, *Prunus cerasus*, *Boswellia serrata*, *Curcuma longa*, *Apium graveolens* and *Zingiber officinale*

*Pain*, as a symptom, is often accompanied by two defining underlying clinical features: *inflammation* and *acidity*. When devising strategies for pain management it is essential to target pain, inflammation and acidity as a triad to accomplish an analgesic effect. This is important when managing both acute pain episodes, as well as long-standing chronic pain. Acute and chronic pain require varying clinical approaches. **Acute pain**, experienced in conditions such as headaches, gout attacks and menstrual pain, calls for a band-aid approach that provides fast-acting relief.

Meanwhile, chronic pain, experienced in conditions such as fibromyalgia and rheumatoid arthritis, requires the regulation of underlying causative factors that promote long-term pain relief and discomfort. Several key botanicals and nutrients play a multi-targeting role in harnessing powerful acute and chronic analgesic properties. These include *Salix alba*, *Boswellia serrata*, *Curcuma longa*, *Zingiber officinale*, *Prunus cerasus* and *Apium graveolens* as well as the co-factor nutrients Magnesium, Potassium and Vitamin C.

**Figure 1: Conditions Requiring Acute and Chronic Pain Management**

- **Allergies**
- **Fever / Colds / Flu**
- **Recovery from intense physical exercise**
- **Lower back pain**
- **Menstrual pain**
- **Fibroids**
- **Acidity**
- **Rheumatoid arthritis / Osteoarthritis**
- **Headaches / Migraines**
- **Reflux, Nausea and Indigestion**
- **Neuralgic pain**
- **Fibromyalgia**
- **IBD-Ulcerative colitis, Crohn’s disease**
- **Fluid retention**
- **Gout**

*This information is for healthcare professionals only*

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Acute vs Chronic Pain: Clinical Differentiation
Acute pain is generally caused by infection, soft tissue damage and/or inflammation. Commonly treated with short-term analgesics, acute pain serves as the initial signal of a malfunction or injury in the body. Failure to treat acute pain correctly can ultimately lead to chronic pain. Chronic pain can develop due to an underlying diagnosed condition or can present itself with no apparent origin. Chronic pain is oftentimes defined as pain that lasts for six months or longer, however its intensity can vary. Several botanicals and nutrients work for both acute and chronic clinical presentations.

Salix alba (Willow Bark)
Salix alba is a species of willow native to Europe and western and central Asia, and gets its name from the white underside of its leaves. This herb has been used as a therapeutic agent since ancient times, with some reports of its use around 400 BC by Hippocrates, who recommended the bark be chewed for relief of fever and pain. (1) The most researched ingredient is salicin which is converted to salicylic acid by the liver and considered to have fewer side effects than aspirin. (2) Because of the gastric side effects of aspirin, there has been a resurgence in the use of Salix alba for the treatment of inflammatory syndromes. The mechanism of action of Salix alba is similar to that of aspirin, which is a nonselective inhibitor of cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2), used to block inflammatory prostaglandins. (2)

A clinical trial has found Salix alba to be superior to placebo in the treatment of pain in patients with osteoarthritis of the hip and the knee, and in patients with exacerbations of chronic lower back pain. In one study of 210 patients with chronic lower back pain, 39% of those treated with salicin became pain-free after four weeks compared to 6% on placebo. (23) Another study of 451 people found 40% of those taking 240mg of salicin were pain-free after 4 weeks, compared to 19% who were taking 120mg. (24)

Boswellia serrata (Boswellia)
Boswellia serrata, also known as frankincense, is an Ayurvedic herb grown in the dry mountainous regions of India. Gum-resin extracts of Boswellia serrata have been traditionally used to treat various chronic inflammatory diseases, such as rheumatoid arthritis. Boswellia serrata can inhibit leukotriene biosynthesis in neutrophilic granulocytes by inhibiting 5-lipoxygenase (5-LOX), thus affecting various inflammatory diseases that are perpetuated by leukotrienes. (5)

Boswellia serrata was found to temporarily relieve swollen, aching joints and improve mobility for those with mild arthritis. In one study, patients with arthritis taking a Boswellia serrata extract experienced a significant decrease in pain and swelling and increase in range of motion compared to those taking placebo (p < 0.001). (6)

Boswellia serrata’s main pharmacologically active ingredients are α- and β-boswellic acid and other pentacyclic triterpenic acids, shown to inhibit pro-inflammatory processes by their effects on 5-LOX, COX and the complement system. (5)

Clinical trials have also found that Boswellia serrata improves pain and functionality scores in osteoarthritis sufferers. Pain scores were reduced by 32% to 65%, and patients experienced a significant improvement within 7 days of treatment with either 100mg or 250mg of Boswellia serrata. (6)

Curcuma longa (Turmeric)
Curcuma longa was the principle healing agent in Ayurvedic medicine, and was recognised as an important spice well before it became popular as a supplement. It was traditionally used as a liver protecting agent and as an anti-inflammatory for conditions such as asthma, allergies, rheumatism, osteoarthritis and muscle pain. One of the major curcuminoids responsible for much of Curcuma longa’s activity is curcumin.

There are numerous mechanisms by which curcumin mediates its anti-inflammatory activity. It is known to suppress nuclear factor-kappa B (NF-kB), reduce various activators of NF-κB and reduce the release of interleukins. (2) In addition, it regulates the activity of several enzymes and cytokines by inhibiting both COX-1 and COX-2. It may be considered a viable natural alternative to nonsteroidal agents for the treatment of inflammation. (1)

It has also been suggested that curcumin alleviates oxidative stress and inflammation in chronic diseases through the Nrf2-Keap1 pathway. Curcumin can suppress pro-inflammatory pathways related to most chronic diseases and block both the production of TNF-α and the cell signalling mediated by TNF-α in various types of cells. Due to its chemical structure, curcumin may also act as a natural free radical scavenger. (7)

Curcuma longa has been compared to conventional anti-inflammatory treatments. Some clinical evidence shows that taking a non-commercial 500mg Curcuma longa extract four times daily for 6 weeks is comparable to ibuprofen 400mg twice daily for reducing knee pain in patients with osteoarthritis. (8) Many studies have looked at the effectiveness of curcumin in Inflammatory Bowel Disease, and have shown that oral curcumin treatment decreases colon injury and is associated with decreased inflammatory reactions, lipid peroxidation and apoptotic cell death. (7)

Zingiber officinale (Ginger)
Zingiber officinale has traditionally been used for the relief of rheumatism, a use which has been backed by modern research into its anti-inflammatory actions. (1) One of the proposed mechanisms is the ability of Zingiber officinale to inhibit COX and LOX, preventing the production of prostaglandins.
One study involved 70 students suffering with premenstrual syndrome. Half received 250mg of Zingiber officinale twice daily while the rest received placebo. In the study, abdominal and back pain were reduced in the Zingiber officinale group. Women can also experience severe headaches during the luteal phase. Zingiber officinale was found to be effective in relieving headaches.\(^\text{(11)}\)

One trial of 247 patients with knee osteoarthritis were randomised to receive either 255mg of Zingiber officinale capsules twice daily or an identical number of placebo capsules. Sixty-three per cent of patients who were treated with Zingiber officinale had a significant reduction in knee pain compared to 50 per cent of the placebo group. The severity of pain and overall improvement of osteoarthritis-related symptoms were also significantly reduced in the group taking Zingiber officinale compared to the placebo group.\(^\text{(10)}\)

**Magnesium**

Magnesium has been found to be lower in fibromyalgia patients and as such can be used to treat pain associated with the condition. Sixty menopausal women with fibromyalgia and 20 healthy women were divided into three groups, and given treatment for 8 weeks. Magnesium citrate (300 mg/day) was given to the first group (n = 20), amitriptyline (10 mg/day) was given to the second group (n = 20), and magnesium citrate (300 mg/day) + amitriptyline (10 mg/day) was given to the third group (n = 20). The serum and erythrocyte magnesium levels were significantly lower in patients with fibromyalgia than in the controls. Also there was a negative correlation between the magnesium levels and fibromyalgia symptoms. The magnesium citrate treatment reduced the tender points and intensity of fibromyalgia.\(^\text{(12)}\)

Research has also found low levels of magnesium in those who suffer from cluster headaches and migraines.\(^\text{(13)}\) In one study magnesium was found to reduce the frequency of migraines by 41.6% versus just 15.8% in those given placebo.\(^\text{(14)}\) Magnesium is effective for the relief of leg cramps and lower back pain. Research has found a significant reduction in pain and increased range of spinal motion in patients treated with magnesium.\(^\text{(15)}\)

**Acidity Neutraliser**

Excess acid in the body from consuming too much meat, seafood and alcohol, or from impaired kidney function, can lead to gout—swelling in the joints around the smaller bones of the feet in particular, and the formation of uric acid crystals. All of this leads to episodic pain, more commonly known as gout attacks.

**Prunus cerasus (Sour Cherry)**

The decrease in plasma urate after cherry consumption supports the reputed anti-gout effects of cherries. The trend toward decreased inflammatory indices C-reactive protein and nitric oxide adds to in vitro evidence that compounds in cherries may inhibit inflammatory pathways.\(^\text{(16)}\)

A study that included 633 participants showed that cherry intake over a two-day period was associated with a 35% lower risk of gout attacks compared with placebo. The risk of gout attacks tended to decrease with increasing cherry consumption, up to three servings over two days.\(^\text{(17)}\)

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**Figure 2: Nutrients Involved in the Anti-Inflammatory Pathway**

- **Mechanical or chemical injury** leads to the initiation of the inflammatory response through the action of Phospholipase A\(_2\), which liberates Arachidonic Acid.
- **NF-κB** activation facilitates the production of Proinflammatory cytokines (TNF-α, IL-6, IL-1β, IL-8).
- **Turmeric** and **White Willowbark** are inhibitors of these processes.
- **Cyclooxygenase-1 (COX-1)** and **Cyclooxygenase-2 (COX-2)** enzymes convert Arachidonic Acid to Cyclic Endoperoxides, which are further metabolised to Prostaglandins (PGD\(_2\), PGE\(_2\), PGF\(_2\)) and Thromboxane A\(_2\) (TXA\(_2\)).
- **Prostaglandins** and **Thromboxane A\(_2\)** contribute to vasoconstriction, platelet aggregation, and increased permeability.
- **Turmeric** and **Ginger** inhibit the action of these enzymes.
- **5-Lipoxygenase (LOX)** produces Hydroperoxides, which are metabolised to Leukotrienes, responsible for vasoconstriction, bronchospasm, and increased permeability.
- **White Willowbark** and **Boswellia** are inhibitors of 5-Lipoxygenase.

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**Potassium**

A high potassium intake was demonstrated to have protective effects against several pathological states affecting the cardiovascular system, kidneys and bones. Potassium exerts alkalinising effects which serve to neutralise fixed acidity in urine. Low-grade metabolic acidosis, when not properly controlled, may exacerbate various catabolic processes.(21)

**Ascorbic acid**

Population research shows that increased intake of vitamin C is associated with a significantly decreased risk of gout in men. Taking 500-1500mg of vitamin C daily from the diet and/or supplements is associated with a 17% to 34% reduced risk of gout. Higher vitamin C intake is also associated with lower levels of serum uric acid in men. Men who consume more than 500mg of vitamin C daily have serum uric acid levels that are 0.5-0.6mg/dL lower than men who consume less than 90mg daily.(22)

References available upon request.

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**Apium graveolens (Celery Seed)**

Ayurvedic medicine has traditionally used *Apium graveolens* as a diuretic, and to improve appetite and digestion. It has also been used for the symptomatic relief of rheumatic conditions and gout. The British Herbal Pharmacopoeia states that *Apium graveolens* was traditionally used in Western herbal medicine for gout.(18) It was thought that it helped to flush away the uric acid crystals that build up around the joints.(19)

Modern research has found that xanthine oxidase catalyses the metabolism of xanthine to uric acid. Overproduction of uric acid will lead to hyperuricaemia and finally cause gout and other diseases. Luteolin is one of the major components of *Apium graveolens*, believed to be responsible for its effects in gout. Specifically, it has been found that luteolin reversibly inhibits xanthine oxidase in a competitive manner.(20)

References available upon request.

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**Figure 3: Nutrients to Prevent Hyperuricaemia**