Botanicals and Nutrients to Modulate Inflammation and Support Joint and Connective Tissue Health

Co-authored by Donald R. Yance, RH (AHG), CN and Suzanne E. Sky, L.Ac., MTOM

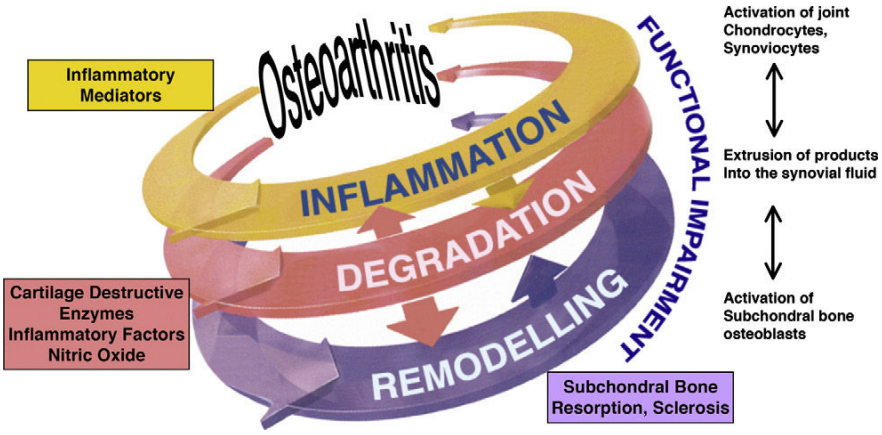
Discussion

HEALTHY JOINT FUNCTION

In healthy joints there is a balance of anabolic and catabolic processes that supports maintenance of cartilage tissue and repairs damage to cells and tissues from daily activity. Over time, as tissue breakdown becomes more predominant than tissue repair, there may be loss of cartilage tissue and synovial fluid. At the cellular level, healthy function is maintained through a complex network of biochemical pathways involving cell-signaling and production of anti-inflammatory factors. Molecular cross-talk between the synovial membrane, cartilage and subchondral bone influences the homeostasis of these systems.

OSTEOARTHRITIS

Osteoarthritis, one of the most common musculoskeletal diseases, is a chronic, inflammatory and degenerative condition with loss of articular cartilage and irreversible damage to joints. It involves increased and prolonged catabolic activity of the joint tissues including the cartilage, synovial membrane and subchondral bone.[1] This is partially due to loss of collagen, the most abundant protein in the body, which is vital for joint health and mobility. Our body continually uses and replaces collagen, which holds our tissues together and gives connective tissue its strength and resilience. Cartilage tissue, a unique connective tissue, consists of a dense matrix of collagen and proteoglycans. The normal volume and health of cartilage is maintained through an ongoing, dynamic remodeling process within the matrix. This process is mediated by enzymes that increase or decrease matrix synthesis. With aging, injury and in osteoarthritis, this balance shifts due to overexpression of enzymes that breakdown the matrix. The resulting loss of collagen and proteoglycans from the matrix contributes to syndromes such as arthritis, joint pain and loss of bone strength. This describes just one possible mechanism of joint dysfunction.



Representation of the process that occurs in the joint during osteoarthritis. (See reference #1)

Collagen (from Salmon)

Salmon skin is prized for its high gelatin content. Gelatin is a type of collagen which is the main fibrous protein in bones, cartilage and skin. Salmon-skin collagen is especially noted for its rich abundance of amino acids, especially the amino acids proline and hydroxyproline, which give gelatin its gelling effect. In the body, proline and hydroxyproline are building blocks for connective tissue.

Salmon-derived collagen exerts a positive influence on collagen matrix homeostasis. It is found to provide nourishment for and to support treatment of bones, muscles, the spine, tendons and ligaments. It is used to speed healing of wounds, bruises, fractures and sprains.[2]

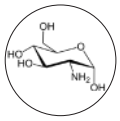
Salmon-derived collagen is found to beneficially influence the development of bones.[3] It is rich in cartilage proteoglycans which are known to modulate, calm and even suppress excess inflammation in conditions such as Rheumatoid arthritis. Salmon-derived collagen also supports production of synovial fluid, which nourishes joints by acting as a transport medium for nutrients and assists joint mobility by functioning as a lubricant.[4,5]

In other studies, wound closure, healing and tensile strength were improved with use of marine collagen peptides (MCP). Use of MCP was found to improve angiogenesis and to support organized deposition of collagen fibers in wound healing.[6]

Green Lipped Mussel (*Perna canaliculus*)

Endemic to New Zealand, green lipped mussel (GLM) offers a rich source of intrinsic nutrients that nourish joint health including a wide range of glycoaminoglycans such as chondroitin sulfate. In clinical trials it was found to significantly reduce pain and improve joint mobility, flexibility and comfort with no side effects.[7]

GLM extracts are being studied for their potential to calm inflammation and offer symptomatic relief to those suffering from osteoarthritis. It is found to decrease inflammatory biomarkers such as inflammatory mediators and pro-inflammatory cytokines and to promote anti-inflammatory cytokine production.[8]



Glucosamine Sulfate and Chondroitin Sulfate

Both glucosamine and chondroitin provide structural building blocks for macromolecules such as proteoglycans. Proteoglycans contribute to structural resilience by trapping water in cartilage matrix and this contributes to healthy joint function and structural resilience.[9]

Glucosamine is a naturally-occurring compound essential for the formation of synovial fluid and connective tissue in the body. Known as an aminosaccharide, or amino sugar, it becomes part of the glycosaminoglycan chains in proteoglycans and other macromolecules that are constituents of synovial fluid and joint cartilage. Proteoglycans help hold water in the cartilage matrix, which provides the necessary resilience for joint mobility.

The proteoglycan chondroitin sulfate is most often combined with glucosamine for synergistic benefits. Chondroitin sulfate enhances synthesis of proteoglycans and inhibits factors that can cause deterioration to the cartilage matrix.

Chondroitin also exerts anti-inflammatory activity and inhibits synthesis of proteolytic enzymes and other factors that contribute to damage of cartilage matrix and the death of these cells. It modulates factors involved with bone resorption and supports a healthy anabolic/catabolic balance in articular tissues.[1]

Devil's Claw (*Harpagophytum procumbens*)

Native to South Africa, Devil's Claw (*Harpagophytum procumbens*) is historically known as a powerful analgesic and anti-inflammatory. The German Commission E monograph cites it as being effective for degenerative disorders of the musculoskeletal system.

In clinical studies, Devil's Claw extract was found to alleviate pain and improve mobility in musculoskeletal disorders.[10, 11] Harpagoside is the primary anti-inflammatory compound in Devil's Claw. It is found to inhibit iNOS (lipopolysaccharide-induced inducible nitric oxide) and COX-2 expression thus inhibiting inflammation.[12,13] Other major active constituents of Devil's Claw include glycosides, sugars, triterpenoids, phytosterols and aromatic acids.

White Willow Bark (*Salix alba*)

The bark of White Willow, used for thousands of years by many cultures, is known to reduce pain, calm inflammation and reduce fever. Hippocrates (400 BC) was said to advise his patients to chew on the bark to reduce fever and inflammation. In modern times, German chemist Felix Hoffman first isolated the compound salicin from the bark. This was later modified to the chemical

acetylsalicylic acid, or aspirin.

Salicin, a potent anti-inflammatory agent, inhibits over-expression of COX-2 and NF-kB factors, which are implicated in inflammation and abnormal gene expression.[14,15] The advantage of white willow bark extract is that it does not irritate the stomach lining. This is because the salicin naturally found in white willow bark is only converted to the acid form after absorption by the stomach.

Native Americans used the bark to calm joint pain. Modern studies confirm its effectiveness and safety as an analgesic giving relief in arthritic joint pain, low back pain, headaches and low back pain.[16-20]

Yucca Root (*Yucca schidigera*)

A member of the Lily family, Yucca grows widely in Mexican and the Southwestern US deserts. It is historically renowned in Native folk medicine as a powerful plant for its anti-arthritic and anti-inflammatory effects. It is rich in steroidal saponins and polyphenols, both of which contribute anti-inflammatory and diverse biological effects to support bone and joint health.

Saponins (about 10% of the root) give Yucca its moistening effect. Some evidence suggests that saponins are anti-arthritic because they suppress intestinal protozoa that may play a role in joint inflammation. The phenolic compounds in Yucca are found to inhibit nuclear transcription factor NFkappaB. Yucca polyphenols also scavenge free radicals and exhibit potent antioxidant activity which contributes to calming the inflammatory response. Yucca phenolics also inhibit platelet aggregation which is characteristic of inflammation.[21]

Black Pepper (*Piper nigrum*)

Black Pepper is a widely revered herb in Ayurvedic medicine where it is often added to formulas to enhance the bioavailability of nutrients and herbs. Energetically, it is often combined in digestive or other formulas as it enhances circulation and the uptake of nutrients. Modern research finds it contains anti-inflammatory properties and significantly reduces pro-inflammatory markers. These qualities help enhance relief from arthritis.[22,23]

For more information on any of the ingredients listed here, including extensive research or individual monographs compiled by Donnie Yance, please email info@naturaedu.com.

References

1. Martel-Pelletier J, Tat SK, Pelletier J-P. *Effects of chondroitin sulfate in the pathophysiology of the osteoarthritic joint: a narrative review*. Osteoarthritis and Cartilage v18, Supplement 1, June 2010: pS7-S11. http://www.sciencedirect.com/science/article/pii/S1063458410000853?np=y
2. Liang J, Pei X, Zhang Z, Wang N, Wang J, Li Y. *The protective effects of long-term oral administration of marine collagen hydrolysate from chum salmon on collagen matrix homeostasis in the chronological aged skin of Sprague-Dawley male rats*. J Food Sci. 2010 Oct 75(8):H230-8. doi: 10.1111/j.1750-3841.2010.01782.x. Epub 2010 Sep 24.
3. Xu Y, Han X, and Li Y. *Effect of Marine Collagen Peptides on Long Bone Development in Growing Rats*. Journal of the Science of Food and Agriculture. July 2010
4. Yoshimura S, Asano K, Nakane A. *Attenuation of collagen-induced arthritis in mice by salmon proteoglycan*. Biomed Res Int. 2014:406453. doi: 10.1155/2014/406453. Epub 2014 May 22.
5. Sashinami H, Asano K, Yoshimura S, et al. *Salmon proteoglycan suppresses progression of mouse experimental autoimmune encephalomyelitis via regulation of Th17 and Foxp3(+) regulatory T cells*. Life Sci. 2012 Dec17:91(25-26):1263-9. doi: 10.1016/j.lfs.2012.09.022. Epub 2012 Oct 12.
6. Zhang Z, Wang J, Ding Y, Dai X, Li Y. *Oral administration of marine collagen peptides from Chum Salmon skin enhances cutaneous wound healing and angiogenesis in rats*. J Sci Food Agric. Sep 2011 91(12):2173-9. doi: 10.1002/jsfa.4435. Epub 2011 May 10.
7. Szechinski J, Zawadzki M. *Measurement of pain relief resulting from the administration of Perna canaliculus lipid complex PCSO-524 as compared to fish oil for treating patients who suffer from osteoarthritis of knee and/or hip joints*. Rheumatologia Volume 49, Issue 4:244-252.
8. Li G, Fu Y, Zheng J, Li D. *Anti-inflammatory activity and mechanism of a lipid extract from hard-shelled mussel (Mytilus coruscus) on chronic arthritis in rats*. Mar Drugs. 2014 Jan 27:12(2):568-88. doi: 10.3390/md12020568.
9. Lorenz H, Wenz W, Ivancic M, et al. *Early and stable upregulation of collagen type II, collagen type I and YKL40 expression levels in cartilage during early experimental osteoarthritis occurs independent of joint location and histological grading*. Arthritis Res 2005;7:R156-R165
10. Wegener T, Lüpke NP. *Treatment of patients with arthrosis of hip or knee with an aqueous extract of devil's claw (Harpagophytum procumbens DC.)*. Phytother Res 2003;17:1165-1172.
11. Chantre P, Cappelaere A, Leblan D, et al. *Efficacy and tolerance of Harpagophytum procumbens versus diacerhein in treatment of osteoarthritis*. Phytomedicine 2000:7:177-183.
12. Huang TH, Tran VH, Duke RK, et al. *Harpagoside suppresses lipopolysaccharide-induced iNOS and COX-2 expression through inhibition of NF-kappa B activation*. J Ethnopharmacol 2006:104:149-155.
13. Kaszkin M, Beck KF, Koch E, et al. *Downregulation of iNOS expression in rat mesangial cells by special extracts of Harpagophytum procumbens derives from harpagoside-dependent and independent effects*. Phytomedicine 2004:11:585-595.
14. Chrubasik S, Pollak S, Black A. *Willow bark extract, a useful alternative for the treatment of osteoarthritis: comment on the editorial by Marcus and Suarez-Almazor*. Arthritis Rheum. 2003 Jan:48(1):278-80.
15. Bonaterra GA, Heinrich EU, Kelber O, et al. *Anti-inflammatory effects of the willow bark extract STW 33-I (Proaktiv((R)) in LPS-activated human monocytes and differentiated macrophages*. Phytomedicine May 28,2010.
16. Schmid B, Ludtke R, Selbmann HK, et al. *Effectiveness and tolerance of standardized willow bark extract in arthrosis patients, Randomized, placebo controlled double-blind study*. Z Rheumatol. 2000 Oct:59(5):314-20.
17. Chrubasik S, Kunzel O, Model A, et al. *Treatment of low back pain with a herbal or synthetic anti-rheumatic: a randomized controlled study. Willow bark for low back pain*. Rheumatology. 2001:40:1388-1393.
18. Chrubasik S, Eisenberg E, Balan E, et al. *Treatment of low back pain exacerbations with willow bark extract: a randomized double-blind study*. Am J Med. 2000 Jul:109(1):9-14.
19. Gagnier JJ, van Tulder M, Berman B, Bombardier C. *Herbal medicine for low back pain*. Cochrane Database Syst Rev. 2006 Apr 19(2):CD004504.
20. Uehleke B, Müller J, Stange R, et al. *Willow bark extract STW 33-I in the long-term treatment of outpatients with rheumatic pain mainly osteoarthritis or back pain*. Phytomedicine. 2013 Aug 15:20(11):980-4. doi: 10.1016/j.phymed.2013.03.023. Epub 2013 Jun 2.
21. Cheeke PR, Piacente S, Oleszek, W. *Anti-inflammatory and anti-arthritic effects of yucca schidigera: A review*. J Inflamm (Lond). 2006: 3:6. Published online 2006 Mar 29. doi: 10.1186/1476-9255-3-6.
22. Umar S, Golam Sarwar AH, Umar K, et al. *Piperine ameliorates oxidative stress, inflammation and histological outcome in collagen-induced arthritis.* Cell Immunol. 2013 Jul 19: 284(1-2):51-9. doi: 10.1016/j.cellimm.2013.07.004.
23. Ying X, Chen X, Cheng S, et al. *Piperine inhibits IL-B induced expression of inflammatory mediators in human osteoarthritis chondrocyte*. Int Immunopharmacol. 2013 Oct:17(2):293-9. doi: 10.1016/j.intimp.2013.06.025. Epub 2013 Jul 6.