

Low back pain (**LBP**) is the second most frequent reason for doctor visits (after colds and flu). **Acute** episodes (rapid onset, severe pain, last less than three months) usually subside with or without treatment. Only 5-15% of cases have an obvious cause. **Chronic** LBP (lasting more than three months with slow progression) is one of the greatest health problems in industrialized societies. The cause is usually unknown or is assumed and over-treated or inappropriately treated.¹ Very often, there is no specific incident that can be blamed for the injury. People may bend over to brush their teeth or turn when someone calls and then feel severe pain. The problem accumulated over time and the movement was the straw that broke the camel's back.

After taking a history, ruling out red flags (evidence of fracture, tumor, neurological disease) and a neurological and musculoskeletal basic exam, about **85%** of cases can be classified as "non-specific low back pain"- cause **unknown**. This includes sciatica, pain that begins in the low back or buttock and runs down the leg.² Common causes of pain can include damage to muscle and tendon fibers (strain), injury to a ligament (sprain), or microscopic tears in tendon and muscle coverings (tendinosis; tendons rarely become inflamed so tendonitis is unlikely).³ Damaged tissues initiate **inflammation** and repair processes that increase blood flow and immune cell concentration to the area, increase cell permeability, and initiate other actions to attempt **healing**. But if there is interference (by anti-inflammatory drugs, for example), continued insult or injury to the area, an immune system not functioning properly (due to toxic load, drugs affecting the immune system, many injured areas, etc.), or insufficient levels of needed nutrients, chronic inflammation may result. **Chronic** pain involves both musculoskeletal and nerve tissues. The central nervous system is altered so pain is prolonged after the initial injury heals. Altered pain perception, nerve pathway changes, central sensitization, or activation of the hypothalamic-pituitary-adrenal axis can occur. Lifestyle (diet, physical activity, sleep patterns, stress, weight, tobacco use, alcohol overuse) predisposes or mediates chronic pain. So musculoskeletal, nerve, endocrine and lifestyle factors can be involved. But medical treatments are basically the same as those for acute pain.⁴

Almost 80% of visits to primary care physicians for LBP result in procedures and treatments not endorsed by evidence-based guidelines.⁵ Routine imaging **tests** (x-rays, CT scans and MRIs) for nonspecific back pain are not recommended because there is no evidence of benefit. Often there is no identifiable abnormality or something is seen-such as spinal stenosis (narrowing of the spinal canal) or a herniated disc (degenerated or bulging disc)-and surgery is recommended when it is not the cause. Many people with such conditions have no pain. X-rays don't always reveal stenosis. Over 50% of adults over age 45 have herniated discs but no pain. Unnecessary radiation from x-rays and CT scans carry a cancer risk. The 2.2 million CT scans for LBP performed in the U.S. in 2007 produced an estimated 1200 new cancers. MRIs don't emit radiation but often show problems when there are none, resulting in unnecessary or invasive procedures.⁶

Surgery for back pain is performed twice as much in the U.S. as in other industrialized countries. Not only over-treatment, it often does not provide long-term relief. For example, surgery may speed up relief for a person with a herniated disc, but after a year or two the person will "probably be in the same place" if surgery was not performed. Surgery carries risks of minor and major complications including nerve damage, deep vein thrombosis, muscle weakness, poor wound-healing, and failure to alleviate

pain. People who have surgery have a 41% increase in the use of painkillers. Complex fusion surgeries for spinal stenosis have increased which also increases risks for serious complications. Minimally invasive surgery to decompress nerves or stabilize vertebrae may lessen pain and improve function at least for a while, but even this type of surgery is often unnecessary. Pain can linger even if surgery is properly conducted; it is "failed back surgery syndrome." By three months 75% of people with severe back and leg pain from a herniated disk get better without surgery. Those undergoing surgery typically get quicker relief, but by one to four years have the same level of pain relief as those who don't have surgery. Other options should be considered before invasive treatment is used.⁷

Steroid injections relieve pain only if it involves compressed or irritated nerves. They provide only slight, short-term improvement (average two to six weeks) in leg pain and disability, but little or no back-pain benefit. Short-term impairment in blood sugar regulation is common. Impaired movement or loss of sensation in the lower body is possible. Repeated use can upset the body's natural steroid hormone balance; temporarily worsen pain; weaken nearby bones, muscles and tendons; delay recovery or lead to rupture. Each shot increases the risk of fracture by 29%. Rare but serious side effects include loss of vision, stroke, paralysis and death. People with spinal stenosis who get shots have far less improvement in function and pain over four years compared to those getting other treatment.⁸ **Muscle relaxants** may give short term relief of muscle spasms, but are often no more effective than painkillers for discomfort. Potential side effects include headache, rapid pulse, agitation, gastrointestinal distress, dizziness, disorientation, weakness. **NSAIDs** (non-steroidal anti-inflammatory drugs) relieve pain, but the magnitude is small. Used regularly, they increase the risk of side effects such as stomach bleeding and ulcers. They don't help nerve-related pain, don't promote healing and can slow development of collagen, a key component of muscles, ligaments and tendons. Acetaminophen (Tylenol) may be no better than placebo.⁹ Prescriptions for **narcotics**, especially opioids, have soared. They do little to improve function and have serious side effects. Spiraling numbers of addiction and overdose deaths are linked to opioid use.¹⁰

Traction may provide temporary relief for some people, but a 2010 Cochrane review concluded that it is no better than placebo, other treatments or no treatment. Performed incorrectly or with too much force, it can impinge nerves or cause other problems. Inversion traction can cause increased blood pressure and bleeding into the retina. Lumbar **supports** may not prevent or treat LBP; they are no more effective than to teach proper lifting or no treatment. **TENS** (transcutaneous electro-stimulation) may ease acute pain, but not chronic pain.¹¹ **Prolotherapy injections** for 12 to 15 months may relieve chronic pain. They can contain any number of substances, are given at different intervals for different lengths of time, and with various co-therapies such as exercise, physical manipulation and nutritional supplements. The aim is to create local inflammation for tissue strengthening and repair.¹² "What about nutritionally supporting inflammation and repair from the start?"

Exercise is one of the most effective ways to prevent and alleviate LBP. Sometimes surgery can be avoided. Strengthening back and abdominal muscles aid recovery even if it is caused by degenerative disc disease (breakdown of spinal discs that form a cushion between vertebrae). Overly strenuous or excessive exercise can cause injury, so activities should be geared for the individual. A combination of

strength training, aerobic exercise and stretching is ideal. Yet brisk walking alone or varied recreational or gardening activities can reduce pain and disability. Core muscle (deepest layer of abdominal and back muscles) strength is vital to reduce pressure on vertebrae, protect and support the back. But these muscles are often weak due to lack of exercise and habitual slumping. A person with back pain has usually lost trunk stability, the ability to maintain proper spinal alignment. Both relatively large voluntary muscles along the spine and smaller involuntary reflex muscles (that provide 42% of the spine's stability) must be worked. This involves making many different types of movements, varied activities.¹³ **T'ai Chi** reduces tension and musculoskeletal pain plus promotes circulation and muscle nutrition. Yoga improves strength and flexibility to relieve pain and bring long term improvement in comfort. In one study, 78% of participants doing yoga enjoyed significant improvement. The wide variety in styles, levels of difficulty and goals should be considered. Other exercise programs are also beneficial.¹⁴

With good posture, musculoskeletal tissues function better and are less likely to be injured. Bad posture is stressful, fatiguing and tends to get worse over time so even minor misalignment causes muscles and tendons to stretch out of position. Recognizing and correcting postural habits, strength training and stretching all help. With or without an exercise program, people with chronic or recurrent LBP who learned the postural Alexander Technique enjoyed the greatest and longest-lasting improvements in pain and function.¹⁴

Spinal manipulation (by chiropractors, osteopaths, physical therapists) is safe and as effective as medical therapies for treating uncomplicated LBP. One study found that manipulation benefited 60% of people with sciatica who did not get relief from medical treatment. Pain is eased by altering the position of musculoskeletal structures, releasing entrapped structures, breaking up soft tissue adhesions and favorably affecting nerves to improve movement and pain processing. A manipulation regimen met or exceeded the Cochrane Back Review Group criterion for a medium effect size in relieving chronic LBP, and was found to be safe. There is "tangible and physiologically plausible benefit for SMT [spinal manipulation therapy] for people with low back pain."¹⁵

Having one leg slightly shorter than the other is common, but for some people, a difference in length causes hip, back, knee or foot pain. Legs of unequal length can distort posture and affect the ability to withstand impact when walking or running. The difference in length can be anatomical (born with it, result of a leg fracture, etc.) or functional (the legs are the same length but the pelvis is misaligned, there is muscle imbalance on one side, the feet hit the ground differently, or there was a total hip replacement). Strengthening muscles, spinal manipulation, orthotic use and switching to soft flexible shoes are potential remedies. A review of six studies found that wearing insoles (orthotics) did not necessarily prevent or help back pain. Walking barefooted or getting sole-flexible shoes strengthens foot muscles that enhance stability and balance. Men may need a **walletectomy**, removal of a wallet from a back pocket since sitting on it raised one hip and throws the spine out of alignment.¹⁶ Women wearing high-heeled shoes strike the ground in a toe-forward motion rather than a normal heel toe gait; the body's angle is altered so weight is not evenly distributed over the spine and can lead to pain and

injury in knees, hips or back. Backless shoes (even flats and flip flops) allow the heel to slide around, distribute weight unevenly and place pressure on the spine.¹⁷

Acupuncture and auriculotherapy (magnetic pellets placed at acupoints on the ear's auricle) relieves persistent nonspecific LBP. People with chronic LBP who received 12 acupuncture sessions over eight weeks had greater improvements in pain compared to those not receiving acupuncture. Acupressure is more effective than physical therapy for chronic back pain and reduces disability by 89%. Massage can reduce chronic pain, improve range of motion, and alleviate muscle tension, stiffness and spasm while improving blood circulation and releasing endorphins. Neuromuscular therapy (soothing trigger points) also helps.¹⁸ **Trigger points** (small, hard knots within taut bands of muscle) are thought to result from injury or chronic overuse or overload of muscles. But there is no general agreement as to what they are or how they produce referred pain. Pain is felt when they are pressed in the immediate area and also as referred pain such as headache when a spot on the shoulder is pushed, or pain in the hip when a point in the lower back is touched. There may be restricted movement, numbness, tingling, weakness or stiffness. Treatments include deep tissue massage, heat, electrical stimulation, ultrasound, or a cooling spray follow by stretching. Injection of an anesthetic or dry needling is used by some doctors, but this should not be a first-line treatment.¹⁹

Icing is often recommended for two or three days after acute injury and some types of chronic inflammation to be followed by **heat**. Icing constricts blood vessels so there is less internal bleeding and less fluid leakage into tissues. It lessens swelling, numbs pain and reduces spasms. However, it interferes with the inflammation and repair processes and reduces the amount of nutrients getting to tissues. After icing for a short time, wet heat can be applied even if there is a light increase in inflammation. Heat dilates blood vessels and increases blood flow to promote healing by removing waste products from and getting immune cells and nutrient to the area. Heat relieves pain and spasm, relaxes muscles, lessens chronic inflammation and reduces joint stiffness.²⁰

Excess **weight and fat** are related to back pain. A 2011 study found that for each five-point increase in body mass index, the odds of intense back pain increased by 35%. For each 11-pound increase in fat mass, the odds also increased by 35%. So both the type of tissue and total weight are involved. The relationship was stronger (66%) for pain disability. Losing an average of 10 pounds reduces pain by 20% to 30%. Excess fat causes imbalances and disruptions that go beyond the simple gain of weight. Excess weight may not cause disc degeneration but can contribute by placing pressure on the spine. A few extra inches around the mid-section makes the pelvis tilt forward and strains the lower back.²¹

Stress and anxiety are significant factors for back pain and whether it is chronic rather than short-lived. A distressed nervous system contributes to physical deconditioning that makes the back more vulnerable to injury and leads to muscle tension, spasm and pain. Fear of recurring back pain can alter a person's movements and lead to more pain. Finding ways to reduce stress plus nutritional support to the nervous system are both helpful.²²

A number of **herbs** help reduce LBP and other musculoskeletal discomforts. A Cochrane review found three herbs more effective than placebo: devils' claw, willow bark, and topical cayenne. Willow bark has

been used for eons to treat pain; salicin in the herb is converted into pain-relieving salicylic acid in the intestines. But the amount of salicylates produced is not enough for a true analgesic effect. So other willow bark components contribute to its pain-relieving effects. Ethnobotanist James Duke suggests drinking a tea with spearmint or peppermint, ginger, and capsaicin or pepper sauce. Mints have analgesic menthol. Wintergreen (containing methyl salicylate) can be added to the tea for a topical wash. He recommends alternating this with mustard plasters. Hot baths with lemon balm, wintergreen and peppermint are soothing. Other mints, bayberry, yarrow, thyme, ground ivy, West Indian lemongrass, mallow, flax seed and walnut contain compounds that can provide relief. Applying essential oils (such as arnica, lavender, chamomile or marjoram) over an injured area can ease discomfort. Rubbing on herbal liniments encourages blood flow and warms muscles and other tissues.²³

Nutrition has a significant impact on LBP and other musculoskeletal discomforts. The health, function and adaptability of bones, muscles, ligaments, cartilage, tendons and nerves are all involved in preventing damage, breakdown and misalignment. Nutrient deficiencies increase susceptibility and are, according to Sherry Rogers, MD, the "silent cause" of back pain and musculoskeletal disorders. Pain medications such as NSAIDs (Celebrex, Aleve, Advil, Motrin, ibuprofen, etc.) deplete nutrients including calcium and other minerals, and impair the biochemistry of tissue repair and renewal. Bones, fascia, tendons, ligaments and muscles "stockpile" many toxins that can also contribute to pain and limit motion. Trigger points may be areas of poor circulation with trapped toxins. Gradual unloading of toxins from tissues can greatly improve discomfort. Additionally, various aches and pains can arise as drug side effects. An example is statin drugs, used to lower cholesterol or supposedly prevent heart attacks. Body aches are a less severe form of rhabdomyolysis, a serious statin side effect. Statins, most antibiotics and certain other drugs are derived from molds. Some people consequently develop a reaction to molds so eating any fermented or mold-derived food (mushrooms, cheese, bread, wine, etc.) can contribute to aches and pains. Any food intolerance can raise the risk of developing pain and spasms, foster nutrient losses or imbalances, and lower benefits from inflammation and repair processes. Leaky gut, irritable bowel and other gastrointestinal disorders often result in food intolerances.²⁴

Food-sourced nutrient-complexes facilitate inflammation and repair processes, sustain musculoskeletal and nerve tissues, and improve circulation. Poor circulation can be a key contributor to back pain. Constricted arteries occur much more often in back-pain sufferers compared to average people. Smoking is consistently linked to chronic pain disorders, especially back pain, and quitting can reduce pain. People who never smoked improve the most after experiencing back injury. Smoking constricts blood vessels (decreasing blood flow and nutrient distribution to tissues) and depletes the body of vitamin C complex among other nutrients needed to support repair and blood vessel integrity. Many nutrients are involved in tissue health and repair. Adequate balanced fatty acids (omega-3s and -6s, etc.) are crucial. All the B vitamins (thiamine, riboflavin, nicotinamide, folate, B₁₂, biotin and others) are required in higher-than-usual amounts for repair (especially of nerve tissues) and for myofascial pain (musculoskeletal pain including trigger points, weakness, decreased range of motion). Vitamin E (tocopherols, tocotrienols, fatty acids, selenium) and phosphatidylcholine (lecithin) are supportive. Coenzyme Q-10 (CoQ10), zinc, copper, ionizable calcium, magnesium and amino acids like lysine are

often deficient. Many of these nutrients are damaged by toxins. CoQ10 helps reduce muscular injury. Calcium and sunlight exposure (from which the body makes vitamin D) improve bone mineral content and mineral density. A deficiency of vitamin D affects not only bones, but also muscles, nerves, and other tissues. Improving vitamin D status may reduce back pain. Alpha-lipoic acid (ALA) and gamma linolenic acid (GLA) can improve nerve-related symptoms. ALA is effective in improving sciatica symptoms. Glycosamine sulfate was found to be of no value for osteoarthritis-associated LBP; this exemplifies the fact that an isolated nutrient part never provides the benefits of whole complexes. "Studies that show failures usually try to use only one or two solo nutrients as though they are drugs and not part of...the biochemical orchestration in our bodies."²⁵

Muscle plays a key role in whole-body **protein** metabolism by acting as the principal reservoir for amino acids. Because muscle is the major store of protein, factors that influence muscle mass, strength and protein metabolism have profound effects on health. When muscle metabolism is altered, many common diseases and disorders can develop.¹⁸ As we age, we need more protein. Without enough protein, the body breaks down muscles to carry out basic functions. Inadequate protein intake contributes to decreased calcium absorption which can result in weaker bones, decreased strength and increased frailty. How much is "adequate" protein? There are various recommendations. Two of the reasons why individuals differ in their needs and some older people lack sufficient hydrochloric acid for proper protein digestion. Our bodies can make 11 of the 20 amino acids that are the building blocks of protein. Since we must rely on food for the other nine, they are "essential." Essential amino acids, such as leucine, stimulate protein synthesis. Animal proteins and some plant proteins are beneficial, but too much cooking denatures some amino acids. Most meats and seafood are rich sources of creatine, an amino acid that increases lean-muscle production. But isolated creatine supplements can create imbalances and adverse effects. Milk proteins, specifically casein and whey, are among the "highest quality proteins" though they differ in their rates of digestion and absorption. Whey protein bolsters muscle protein synthesis better than soy protein. Whey protein fosters greater gains in muscle mass with resistance exercise and attenuates strength decline after exercise-induced muscle damage. As a supplement, whey protein should be a concentrate, not an isolate; a concentrate contains all the co-factors that make it a more complete and natural product. It should be cold processed (undenatured). Heat destroys some important nutrients in whey that promote muscle growth and tissue repair, including ALA and CLA (fatty acids), and l-cysteine, an amino acid that prevents muscle wasting.²⁶

Cytokines, small nonstructural proteins which are mainly involved in regulating immune responses, also influence functions of skeletal muscle cells including regulation of muscle protein turnover and the response of tissues to physical stress or damage. Insulin, insulin-like growth factor, growth hormone, glucocorticoids, thyroid hormones and other hormones regulate protein metabolism, so blood sugar metabolism and hormonal balance should be analyzed when chronic musculoskeletal problems are present. Collagen, a component of muscle, ligament, cartilage and tendon, forms into tiny spiral fibrils that allow for stretching. If the fibrils are overstretched or the collagen is not healthy, injury can occur. The "glue" holding the fibrils together is a type of protein called proteoglycans. These molecules have a complex carbohydrate attached called glycosaminoglycans (GAGs). The most familiar is chondroitin sulfate, but there are others such as dermatan sulfate, heparan sulfate and keratan sulfate. That's why

food sources with numerous GAGs and their proteins are superior to an isolated chondroitin sulfate supplement.²⁷

It used to be thought that muscle soreness after vigorous exercise was due to a buildup of lactic acid in the muscles. Exercising harder than one is used to means muscles use energy faster than can be provided using normal sources. So the body turns to a process that produces lactic acid. Excess lactic acid is recirculated into glucose within an hour or two, so it's not the source of next-day soreness. Instead, the "delayed-onset muscle soreness" comes from breakdown of muscle tissue. Strenuous exercise for an extended time creates microscopic tears in muscle fibers and inflammation sets in to repair them. For this the body needs many nutrients, including vitamin C complex (which also helps build connective tissue and strengthen muscle fibers), vitamin A complex, carotenoids, vitamin E complex, calcium, magnesium, potassium, other minerals, various fatty acids and total protein. Protein deficiency is known to delay healing. Zinc, copper, manganese and vitamin C are required to make and maintain collagen.²⁷ Calcium, known as a prime player in musculoskeletal health, needs to be balanced with magnesium, a mineral often overlooked in maintaining normal muscle mass, strength and function as well as bone health. Magnesium helps regulate the amount of calcium that enters muscle cells. Calcium helps initiate muscle contraction; magnesium helps muscle relaxation. Although calcium is essential for optimal bone health, many other nutrients are also vital to bone integrity and metabolism. These include magnesium, phosphorus, potassium, manganese, copper, boron, iron, zinc, essential fatty acids, vitamins A, C, D, K and B vitamins including B12. Vitamin D is important to calcium absorption. Minimally processed cod liver oil is an excellent source of vitamins A and D plus omega-3 fatty acids—all supportive to bone, connective tissues and joints. Vitamin K is needed for bone remodeling; it helps boost the proteins osteocalcin and osteopontin which keep bones strong. Vitamin K1 is found in plants, especially green leafy vegetables. The most common form of vitamin K2 is found in animal products (fish, liver meat, eggs) with a lesser amount in whole grains. It is normally produced from K1 in certain animal tissues (arterial walls, pancreas, testes). Bacteria in the colon can also convert K1 into K2. Low levels of vitamin E increase risk of bone injury and fracture. Boron is vital for building and maintaining strong bones, helps the body use glucose and fats, and improves the absorption of minerals such as calcium, copper and magnesium from foods.²⁸

The body's acid/alkaline (**pH**) balance has been a controversial subject regarding the musculoskeletal system. It is thought that excessive consumption of animal proteins, fish, grains, and dairy products results in a net acid load on the kidneys to which the body responds by breaking down muscle and bone to release calcium and magnesium in an effort to restore a slightly alkaline pH. Yet, three meta-analyses have failed to find support for this hypothesis or an adverse effect of phosphates from animal protein on bone health. According to Tieraona Low Dog, MD, a diet with adequate minerals, including plenty of fruits and vegetables that neutralize acid, will probably not result in the leaching of calcium or magnesium from skeletal stores. However, diets high in meat and soft drinks (phosphates) and low in fruits, vegetables, calcium and magnesium may produce mineral loss from bones to act as a buffering agent. Altered fats from over-processed items like French fries, pretzels and chips plus neglecting to eat enough vegetables leaves a person deficient in "bone back deposits." Consuming sufficient potassium, bicarbonate, magnesium, calcium and other alkaline-promoting minerals will contribute to a more

alkaline pH. Thus, "a whole-food, minimally processed diet" rich in fruits, vegetables, whole grains, legumes and high quality protein will not unduly stress any system. High intakes of fruit and vegetables are known to have positive effects on the musculoskeletal system. One factor about animal foods: We no longer eat the whole animal-make stock from bones to retrieve minerals, eat gristle for glucosamine and other nutritional factors and consume organs and glands for concentrated nutrition. Instead we eat just the muscle.²⁹

To support the musculoskeletal, nervous and immune systems, the following may be considered:

Once per day: A healthful shake to which is added:

2 heaping Tablespoons [Whey Pro Complete](#)

1 Tablespoon [Calcifood Powder](#) (protein, minerals)

With two meals:

1 [Cod Liver Oil](#) (vitamins A & D, omega-3 fats)

1 [Glucosamine Synergy](#) (+ vitamins, minerals)

1 [Thymex](#) (supports inflammation & repair)

With each meal: (3 times per day):

1 [Cellular Vitality](#) (Bs, CoQ10, bromelain, more)

1 [Cataplex C](#) - chew (vitamin C complex)

1 [SP GreenFood](#) (multiple phytonutrients)

For pain: 1 [Saligesic](#) (Medi-Herb) 2 to 4 times per day to relax muscles and promote immune function.

If you would like to order all or some of these recommendations for yourself, please visit [Patient Direct](#). Call Dr. Broussard's office for the Health Care Professional's Patient Direct Code, and complete the 3 step process for **FREE** registration.

Finally, I recommend using the [Page Fundamental Diet Plan](#) to help reduce inflammation.

¹ Health News, Feb 2002, 8(2):4; D Hoy, L March, et al, Ann Rheum Dis, 24 Mar 2014, doi:10.1136/1204428.

² J Mafi, E McCarthy, et al, JAMA Intern Med, 29 Jul 2013, doi:10.1001/jamainternmed.2013.8992.

³ Altern Med Alert, Jan 2006, 9(1):S1-S2; C Meletis, R Berzow, Townsend Lttr, Oct 2012, 351 :86-90; Johns Hopkins Med Hlth After 50, Jul 2012, 24(5):3.

⁴ E Oberg, Integrative Med, Feb/Mar 2011, 10(1):25-31; J Rathmell, JAMA, 7 May 2008,299(17):2066-77.

⁵ Duke Med Hlth News, May 2010, 16(5):3.

⁶ F Balague, AF Mannion, et al, Lancet,3 Mar 2007, 369(9563):726-8; A Haig, C Tomkins, JAMA,6 Jan 2010, 303(1):71-2; A Bazouhi, et al, N Engl J Med, 14 Mar 2013,368(11):999-1007; B Kuehn, JAMA, 21 Nov 2007, 298(19):2253; R Chou, R Fu, et al, Lancet, 7 Feb 2009, 373(9662):463-72; Johns Hopkins Mid Hlth After 50, Sep 2013, 25(8):6.

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- ⁷ M Napoli, Cntr for Med Consumers Hlth Facts, Oct 2007, 32(10):1-3; R Deyo, S Mirza, et al, JAMA, 7 Apr 2010,303(13):1259-65; Duke Med Hlth News, Jul 2010, 16(7):1-2 & Jul 2013, 19(7):4-5; J Weinstein, J Lurie, et al, JAMA,221 29Nov 2006,296(20):2451-9.
- ⁸ Johns Hopkins Med Hlth After 50, Jul 2012,24(5):3 & Mar 2013,25(1):1-2; North American Spine Society 27th Ann Meeting, Dallas, TX, 25 Oct 2012; J Staal, P Nelemans, R deBie, JAMA, 19 Jun 2013, 309 (23):2439-40; S Wolfe, Worst Pills, Best Pills News, Nov 2012, 18(11):5-6 & Jul 2014, 20(7):8; R Dotinga, webmd.com/back-pain/news/20130729/docs-order-too-many-narcotics/, 29 Jul 2013; B Coombes, L Bisset, B Vicenzino, Lancet, 20 Nov 2010, 376(9754):1751-67; UC Berkeley Wellness Ltrr, Feb 2014, 30(7):4.
- ⁹ S Wolfe, Worst Pills, Best Pills Neurs, Oct 2008, 14(10):1, 3.
- ¹⁰ A Park, time.com/3445T28/painkillers-opioids-dangerous/, 29 Sep 2014; G Franklin, Neurology, 30 Sep 2014, 83(14):1277-84; B Koes, W Enthoven, Lancet, 1 Nov 2014, 384(9954):1 556 -7.
- ¹¹ H Wunsch, Lancet, 20 Feb 1999, 353(9153):649; UC Berkeley Wellness Lftr, Jul 2008, 24(10):8 & Apr 2010, 26(7):8 & Sep 2010, 26(12):8 & Mar 2012,28(6):7; Duke Med Hlth News, Aug 2008, 14(9):2.
- ¹² D O'Mathuna, Alternative Med Alert, Apr 2006, 9(4):37-40; W Kim, H Lee, et al, J Altern Complement Med,2010,12:1285-90.
- ¹³ S Leggett, V Mooney, et al, Splne, 1999, 24(9):889-98; B Nelson, et al, Arch Phys Med Rehabil, Jan 1999, 80:20-5; E Hurwitz, H Morgenstern , el al, Am J Public H\th,2005,95(10):1817-24; UC Berkeley Wellness Lftr, Jan2006,22(4):1& Jul 2013, 29(11):8; J Hartvigsen, K Christensen, Spine,2007,32(1):76-81; Duke Med Hlth News, Jun 2009, 15(6):1,'1 1;Weill Cornell Med Coll, Food & Fiffness Advisor, May 201 1,14(5):7 & Nov 2013, 16(11):7; S Lark, Women's Wellness Today, Mar 2007, 14(3):4-5.
- ¹⁴ Johns Hopkins Med Hlth After 50, Ju\2012,24(5):3; Tufts Univ Hlth & Nutr Ltrr, Feb 2006, 23(12):3; K Williams, et al, Spine, Jan 2010, 13(1):9-11 ; R Saper, K Sherman, et al, Altern Ther Hlth Med, 2009, 15:18-27; UC Berkeley Wellness Ltrr, Jan 2009, 25(4):6; N Selfridge, Altern Med Aleft, Mar 2012, 15(3):33-5; R Saper, et al, Evid Based Complement Alternat Med,2013,658030; A Ross, K Pringle, Altern & Complem Ther, Feb 2013, 19(1):53.
- ¹⁵ G McMorland, E Suter, el al, J Manipulative Physiol Ther,2010,33 (8):576-85; F Milan, Altern Med Alert Dec 2005,8(12):133-8; J Hart, Altern & Complem Ther Dec 2010, 16(6):334-8; J Licciardone, DMinotti, el al, AnnFamMed,Mar2013, 11(2): 122-9; J Bialosky, el al, Pain,2014, 15:136-48.
- ¹⁶ UC Berkeley Wellness Ltrr, Dec 2008, 24(3):8 & Sep 2013, 29(14):7; Duke Med Hlth News, Jan 2008, 14(1):10; H Gaier, What Doctors Don't Tell You, Jun 2007,18(3):22.
- ¹⁷ N DeCoursy, Health, Apr 2011, 25(3):71-4.
- ¹⁸ UC Berkeley Wellness Ltrr,Oct2011,28(1):6; K Thomas, et al, BMJ 2006,333:623, Epub 15 Sep 2006; Hlth News, Jun 2006, 12(6):11-2; L Hsieh, C Kuo, et al, BMJ, 25Mar 2006,332(7543):696-9; L Suen, T Wong, et al, Complement Ther Clin Prac,2007,13(1):63-9; J Crane, et al, Sci Trans Med,2012, 119:1.
- ¹⁹ J Mercola, articles.mercola.com/sites/articles/archive/20'10/03130/prevent-lower-back-pain; C Chandler, Altern & Complem Ther, Dec 2010, 16(6):360; UC Berkeley Wellness ftlr, Sep 2011, 27(12):6.
- ²⁰ UC Berkeley Wellness Ltrr, May 2008,24(8):6.
- ²¹ Duke Med Hlth News, Jul 2010, 16(7):2 & Nov 2011 , 17(11):2; UC Berkeley Wellness Lftr, Jan 2011,27(4):8.
- ²² Tufts Univ Hlth & Nutr Lftr, Oct 2006, 24(6):51-54; S Lamb, Z Hansen, et al, Lancet, 13 Mar 2010, 375(9718):916-23; N Morone, C Greco, D Weiner, Pain, 3 Feb 2008, 134(3):310-10; K Sawazaki, Y Mukaino, et al, Ind Hlth,2008, 46(4):336-40; Duke Med Hlth News, Nov 2007, 13(11):9-10.

²³ J Gagnier, M VanTulder, et al, *Cochrane Database Syst Rev*, 19 Apr 2006, 19(2):CD004504; J Duke, *J Am Herbalists Guild*, 2010, 9(2):60-1; J Viachojannis, M Cameron, S Chrubasik, *Phytother Res*, Jul 2009, 23(7):897-900.

²⁴ S Rogers, *Total Wellness*, Jun 2008:6-7 & Oct 2012:1-3; F Depeint, et al, *Chemico-Biolog Interact*, 2006, 163:94 -112; R Ogle, et al, *J Ped*, 1997, 130:138-45; J Arenas, et al, *Arthritis Rheumatism*, 1996, 39:1869-74; D Mock, et al, *J Nutr Biochem*, 2002, 13:462-70; M Poynter, et al, *J Biolog Chem*, 1998, 273:49:32883-41; R Bedry, et al, *N Engl Med*, 13 Sep 2001, 345(11):798- 02.

²⁵ UC Berkeley Wellness Ltr, Apr 2013, 29(8):8; S Waikakul, *J Orthop Surg (Hong Kong)*, Apr 2012, 20(1):18-22; M Okumus, Z Yorgancioglu, et al, *J Back Musculoskelet Rehabil*, 2010, 23(4):187-91; M Ranieri, M Sciuscio, et al, *Int J Immunopathol Pharmacol*, 2009, 22(3 Suppl):45-50; A Memeo, M Loiero, et al, *Clin Drug Investig*, 2008, 28(8):495-500; P Wilkens, et al, *JAMA*, 2010, 304:45-52; J Whitaker, *Health & Healing*, Aug 2008, 18(8):5; *Altern & Complem Ther*, Aug 2014, 20(4):203-17; K Zhu, R Prince, et al, *J Am Geriatr Soc*, 2010, 58(11): 2063-8; J McBeth, SR Pye, et al, *Ann Rheumatic Dis*, 2010, 69:1448-52; J de Torrente, A Pecoud, et al, *BMJ*, 2004, 329:156-7; P Kyriazopoulos, G Trovas, et al, *Clin Endocrinol (Oxt)*, 2006, 65(2):234-8.

²⁶ R Wolfe, *Am J Clin Nutr*, Sep 2006, 84(3):475-82; M Iarazona-Diaz, F Alacid, et al, *J Agric Food Chem*, 20 Nov 2013, 61 (1546):1 11241; M Cooke, A Haynes, et al, *J Int Soc Sports Nutr*, 2010, 7(1):30; S Phillips, J Tang, D Moore, *J Amer Coll Nutr*, Aug 2009, 28(4):343-54; Weill Cornell Med Coll, *Women's Nutr Connect*, Jun 2014, 17(6):2; M Taylor, *J Prolother*, Aug 2011, 3(3):709-13; D Paddon-Jones, *J Nutr*, Aug 2006, 136(8):2123-6; Z Liu, W Long, et al, *J Nutr*, Jan 2006, 136(15):212-7; E Zoico, R Roubenoff, *Nutr Rev*, Feb 2002, 60(2):39-51; T Vary, C Lynch, *J Nutr*, Aug 2007, 137(8):1835-43.

²⁷ D Williams, *Alternatives*, Jun 2007, 11(24):190-1; A Carr, SM Bozonet, et al, *Am J Clin Nutr*, Apr 2013, 97(4):800-7.

²⁸ L Dominguez, M Barbagallo, et al, *Am J Clin Nutr*, Aug 2006, 84(2):419-26; L Ceglia, S Harris, et al, *J Clin Endocrin Metab*, 2009, 94:645-53; *Environmen Nutr*, Oct 2014, 38(10):1-2; K Michaelsson, A Wolk, et al, *Am J Clin Nutr*, Jan 2014, 99(1):107-14; *Proc Natl Acad Sci USA*, 2012, 109:19178-83; S Wolfe, *Worst Pills, Best Pills News*, Jan 2013, 19(1):6-7; UC Berkeley Wellness Ltr, Sep 2000, 16(12): 5-6.

²⁹ J Scheer, *Altern & Complem Ther*, Aug 2009, 15(4):208-9; T Low Dog, *Altern & Complement Ther*, Oct 2011, 17(5):252-4; C Prynne, G Mishra, et al, *Am J Clin Nutr*, 2006, 83(6):1420-8; *Nutr Week*, 18 Sep 1998, 28(36):7; S Rogers, *Total Wellness*, Jun 1999:6-7.