

Possible Drug Interactions

- Carnitine has not been thoroughly tested for interactions with other herbs, supplements, drugs, or foods.
- L-carnitine might decrease the need for certain drugs such as glycosides, digoxin, diuretics, beta

blockers, calcium channel blockers, hypolipidemia (cholesterol-altering) drugs, and nitroglycerin derivatives.

- L-carnitine might increase the effects of warfarin (Coumadin) and heparin.

Anticipated Problems/Concerns

- None

Chitosan

Joan Spiegel

Uses

- Sustained-release drug carrier (chitosan glutamate)
- Transdermal drug delivery
- Weight-loss agent (poor)
- Decreases cholesterol and triglycerides and increases HDL total cholesterol ratio
- Cleaning petrochemical spills
- Water purification agent
- Hydrogel-based chitosan bandages for hemostasis and antibacterial properties

Risk

- None known

Perioperative Risks

- None known

Worry About

- Theoretical inhibition of absorption of fat-soluble vitamins A, D, E, and K

Overview

- Chitosan is a naturally occurring marine polysaccharide fiber derived from a common byproduct of shellfish processing. (Chitosan is the deacetylated form of chitin, a sugar from the shells of crustaceans.)
- Recently ingenious medical applications have been developed that use chitosan as a pharmaceutical drug carrier (thermogel) effectively encapsulating various anti-inflammatory and chemotherapeutic agents and allowing it to function as a moiety for safe sustained release.

Etiology

- Chitosan is a completely indigestible fiber source with the ability to electrostatically attract and bond with negatively charged dietary lipids, thus prohibiting their absorption.
- The hemostatic activity of chitosan is due to ionic interaction between the positively charged chitosan polymer and the negatively charged cell membrane of the red blood cell. It works irrespective of the presence of fibrin to form a biodegradable plug.

Assessment Points

| System | Effect | Test |
|--------|--|---------------|
| CV | Improved cholesterol | Lipid profile |
| HEME | Improved hemostasis | None |
| GI | Stomach upset, steatorrhea, loss of fat-soluble vitamins | None |

Key References: Koide S: Chitin-chitosan properties, benefits and risks, *Nutrition Res* 18:1091–1101, 1998; Ogle OE, Swantek J, Kamoh A: Hemostatic agents, *Dent Clin North Am* 55(3):433–439, 2011.

Perioperative Implications

- None known or studied

Chondroitin Sulfate

Rosemary M.G. Hogg

Uses

- CS has been recommended for use as a nutritional supplement to reduce joint pain and inflammation associated with osteoarthritis.
- CS has been shown to have both anti-inflammatory and antioxidant effects on articular tissue; it modulates the anabolic/catabolic balance of the extracellular matrix.
- CS is commonly used in conjunction with glucosamine to provide an alternative therapeutic option with minimal side effects as compared with traditional treatments such as NSAIDs.
- Studies have demonstrated modest but significant reductions in pain, joint swelling, and effusion with an improvement in functional status after the use of CS, in particular when used in conjunction with glucosamine and with results comparable in efficacy to celecoxib.
- Many such studies, however, are small or of short duration and may be unable to fully assess the long-term effects of CS on joint remodeling.
- The use of exogenous glycosaminoglycans such as chondroitin in novel targeted chemotherapeutic interventions for the treatment of malignancy is in

an early phase. Additionally, intravesical CS may be used to reduce bladder pain from interstitial cystitis.

Perioperative Risks

- No specific anesthetic interactions or complications have been identified from the use of CS.
- Use should be avoided in pts with shellfish allergy.
- Hepatotoxicity has been recognized in a number of case reports in pts taking combined G-CS supplements

Worry About

- Markedly similar in structure to heparin; should be avoided in pts at risk of heparin-induced thrombocytopenia and other heparin sensitivities. In addition may cause derangement in INR results in pts concomitantly taking warfarin (Coumadin).
- Worsening of previously well-controlled asthma has been demonstrated with the use of CS.

Overview/Pharmacology

- Chondroitin is a sulfated glycosaminoglycan found in the proteoglycans of the extracellular matrix of many connective tissues including intraarticular cartilage.

- In vitro studies have demonstrated an inhibition of interleukin-1 and metalloproteinases in synovial tissue while increasing type II collagen production in articular chondrocytes. The highly charged sulfate groups found in CS have been shown to generate electrostatic forces, which provide resistance to cartilaginous compression.
- Bioavailability varies from 10% to 20% after oral administration. CS exhibits first-order kinetics at single doses of up to 3000 mg and is not metabolized by cytochrome P450, thus minimizing interactions with other medications.
- Clinical effects are demonstrated within 4 wk in most pts and have been shown to persist for up to 3 mo after discontinuation of treatment.

Drug Class/Usual Dose

- Classified as a nutritional supplement.
- May be manufactured by the enzymatic hydrolysis of a variety of animal sources including shark fins, porcine muzzles, bovine trachea, and chicken bones. Nonanimal chondroitin had been developed from microbial fermentation but is not currently commercially available.