PHARMACOKINETICS

See monographs on individual minerals.

INDICATIONS AND USAGE

See individual mineral monographs to determine whether chelated forms confer any advantage. The mere claim of "chelation" does not necessarily mean a superior product.

RESEARCH SUMMARY

The issue of mineral chelation is a complex one. See monographs on individual minerals.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS

See monographs on individual minerals.

OVERDOSAGE

The only mineral in which overdosage is a significant problem is iron. See monograph on Iron.

DOSAGE AND ADMINISTRATION

See monographs on individual minerals.

LITERATURE

See monographs on individual minerals.

Chicken Collagen II

DESCRIPTION

Chicken collagen II is type II collagen derived from the sternum of chickens. Type II collagen is the most abundant collagen found in hyaline cartilage (in synovial joints, sternum, respiratory tract), comprising 80 to 90% of the total collagen content. Chicken collagen II is also known as type II chicken collagen and is abbreviated as CCII.

Type II chicken collagen shares some similar antigenic regions with type II human collagen. Autoimmune response to type II collagen is thought to be a significant factor in the pathogenesis of rheumatoid arthritis. A few studies suggest that oral type II chicken collagen may be beneficial to some with rheumatoid arthritis, acting by a process known as oral tolerance.

ACTIONS AND PHARMACOLOGY

ACTIONS

Chicken collagen type II may have anti-rheumatoid arthritis activity in some.

MECHANISM OF ACTION

The mechanism of the possible anti-rheumatoid arthritis activity of chicken collagen type II may be through oral tolerance. Oral tolerance refers to the observation that if a protein is orally administered, subsequent immunization with the protein leads to a state of systemic hyporesponsiveness to it. Autoantibodies to type II collagen are thought to play a role in the pathogenesis of rheumatoid arthritis. Therefore, feeding antigenic type II collagen may be predicted to lead to the induction of immune tolerance to type II collagen, especially in the context of elevated autoantibodies to this substance.

The mechanism for oral tolerance appears to depend on the dose of the fed antigen. Low doses appear to induce active suppression, while high doses result in clonal anergy. Suppressive cytokines, such as interleukin-4 and transforming growth factor beta, appear to mediate active suppression. Studies in animals demonstrate the generation of regulatory lymphocytes in Peyer's patches, which subsequently migrate to mesenteric lymph nodes and spleen. Secretion of suppressive cytokines by these cells is believed to depend on antigen-specific stimulation with the fed antigen. Further, it is believed that active suppression of the inflammatory process by the regulatory lymphocytes requires their migration to the location where the fed antigen is present. Since the clinical studies to date indicate that low doses, but not high doses, have possible mild efficacy in rheumatoid arthritis, the mechanism responsible for oral tolerance would appear to be induction of active suppression, rather than clonal anergy.

PHARMACOKINETICS

There are no reports on the pharmacokinetics of chicken collagen type II. The pharmacokinetics of the substance should be similar to those of dietary proteins.

INDICATIONS AND USAGE

Chicken collagen II may offer some mild benefit for some with rheumatoid arthritis.

RESEARCH SUMMARY

A multicenter, randomized, controlled trial of oral type II collagen derived from chicken cartilage tested the substance in four different daily doses versus placebo in 273 rheumatoid arthritis patients. Various criteria were used to evaluate the results. The daily dose levels were 20 micrograms, 100 micrograms, 500 micrograms and 2,500 micrograms.

Results were negative at all dose levels except the lowest dose (20 micrograms daily). The difference in response between this dose level and placebo was significant only with respect to what was described as the weakest of the evaluative criteria. A *post hoc* analysis revealed that those who had antibodies reactive with type II collagen in their serum (at the baseline exam) were more likely to respond to collagen administration.

More research is needed, in part to investigate whether still lower doses might further improve efficacy of this antigenic substance.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS

CONTRAINDICATIONS

Chicken collagen II is contraindicated in those who are hypersensitive to any component of a chicken collagen II-containing product.

PRECAUTIONS

Because of lack of long-term safety studies, nutritional supplements containing chicken collagen II should be avoided by pregnant women and nursing mothers.

Those with rheumatoid arthritis who are interested in trying chicken collagen II should consult with their physicians before doing so.

ADVERSE REACTIONS

Chicken collagen type II supplements are generally well tolerated. There is one report of transient flushing in a patient with juvenile rheumatoid arthritis.

DOSAGE AND ADMINISTRATION

Chicken collagen II, derived from chicken sterum, is available as capsules and tablets. Some use 500 to 1000 mg daily. However, in the clinical trials showing possible mild effectiveness of chicken collagen type II, lower doses and different delivery forms were used. In these trials, the substance was first dissolved in 0.1 M acetic acid and added to orange juice prior to ingestion. The dose used in the trial of juvenile rheumatoid arthritics was 100 micrograms (0.1 mg) daily for one month followed by a dose of 500 micrograms (0.5 mg) daily. In a subsequent larger clinical trial involving rheumatoid arthritics, a dose of 20 micrograms (0.02 mg) daily appeared to have mild benefits in some. Higher doses did not.

LITERATURE

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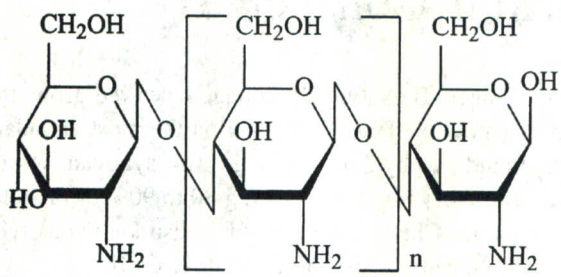
Watson WC, Cremer MA, Wooley PH, Townes AS. Assessment of the potential pathogenicity of type II collagen autoantibodies in patients with rheumatoid arthritis. *Arthritis Rheum.* 1986; 29:1316-1321.

Chitosan

DESCRIPTION

Chitosan and chitin are polysaccharide polymers containing more than 5,000 glucosamine and acetylglucosamine units, respectively, and their molecular weights are over one million Daltons. Chitin is found in fungi, arthropods and marine invertebrates. Commercially, chitin is derived from the exoskeletons of crustaceans (shrimp, crab and other shellfish). Chitosan is obtained from chitin by a deacetylation process.

Chitin, the polysaccharide polymer from which chitosan is derived, is a cellulose-like polymer consisting mainly of unbranched chains of N-acetyl-D-glucosamine. Deacetylated chitin, or chitosan, is comprised of chains of D-glucosamine. When ingested, chitosan can be considered a dietary fiber. Chitosan has the following chemical structure:



Chitosan

Chitosan itself is the major source of the nutritional supplement glucosamine.

ACTIONS AND PHARMACOLOGY

ACTIONS

Chitosan may have hypocholesterolemic activity in some and may be beneficial in renal disease in some.

MECHANISM OF ACTION

Chitosan is, at the pH of the gastrointestinal tract, a positively charged polymer and can bind to negatively charged substances. It is believed that chitosan, similar to cholestryamine, has bile acid sequestration activity and that this may be the mechanism for its putative hypocholesterolemic effect. There is some evidence that chitosan binds to bile acids and some evidence that the polymer affects the metabolism of intestinal bile acids. However, in contrast to cholestyramine, chitosan does not have consistent hypocho-