

Glucosamine

Introduction

Glucosamine has attained great popularity as a **nutritional supplement**, primarily for **osteoarthritis**. There have been large industry-sponsored clinical trials as well as independent studies. The role of glucosamine and nutritional supplements generally, in the development and progression of osteoarthritis, is of interest to the medical profession, the public, manufacturers and commercial producers of supplements.^[1]

Mechanism of action

Glucosamine occurs naturally and is one of the 'building blocks' of cartilage (made by combination of glucose and the amino acid glutamine by the enzyme glucosamine synthetase). Glycosaminoglycans and proteoglycans are larger molecules made from glucosamine, which in combination with proteins (such as collagen and elastin), form the extracellular matrix and the cartilage in joints. Animal models and in vitro experiments suggest that glucosamine acts at the level of the chondrocyte, both stimulating cartilage production and inhibiting degradation. The limited in vivo studies that have been done suggest that very little glucosamine taken orally actually gets into the joint. This raises the possibility of a placebo effect but does not rule out mechanisms of action at a level as yet unknown.^[2]

Evidence of efficacy^[3]

In practice, the evidence of efficacy is very mixed:

- The National Institute for Health and Clinical Excellence (NICE) has stated that there is insufficient evidence to support the use of glucosamine in osteoarthritis and recommends that it should not be funded by the NHS.^[4]
- In reaching this conclusion, NICE took account of a Cochrane review in 2005^[2], as well as a 2007 update by the same authors.^[2] 20 studies with 2,570 patients showed glucosamine to be superior to placebo for treatment of pain and functional impairment from symptomatic osteoarthritis, using a particular brand of preparations manufactured by Rotta and a particular method of assessment. However, the benefit at three months was less than that measured in an earlier review of treatment for six weeks. Glucosamine was found to be as safe as placebo.^[5]
- The fact remains that glucosamine has become popular with patients. This is, to no small degree, due to the encouragement of the medical profession who, when it was first marketed, advocated it as a low-risk alternative to non-steroidal anti-inflammatory drugs. It still has its advocates in the scientific community^{[1][6][7]} and there have been calls for more standardised and clinically relevant in vitro assay systems and in vivo animal models, as well as development of new outcome measures for inflammation and pain pathways.^[8]

Indications^[4]

NICE recommend that doctors do not to prescribe glucosamine on the NHS and state that patients who wish to buy it should be advised to expect only a mild-to-moderate reduction in pain. Glucosamine sulfate 1500 mg once daily appears to be more effective than 500 mg three times a day. The patient should review the benefits of glucosamine after three months.

Contra-indications

There are no contra-indications (other than allergy to glucosamine^[9]), although studies on these and toxicity are limited. The evidence of glucosamine on glucose metabolism is equivocal and further research is needed.^[10] Currently, the British National Formulary advises caution in patients with impaired glucose tolerance and recommends monitoring blood glucose concentration before treatment and periodically thereafter. In patients with a predisposition to **cardiovascular disease**, lipid monitoring is recommended.^[11] In well-established stable **diabetes**, oral glucosamine supplementation appears to be safe^[12] but further research is needed to confirm whether this is true for poorly controlled diabetics in the long term.^[13]

Further reading & references

- **Stuber K, Sajko S, Kristmanson K**; Efficacy of glucosamine, chondroitin, and methylsulfonylmethane for spinal J Can Chiropr Assoc. 2011 Mar;55(1):47-55.
- 1. **Miller KL, Clegg DO**; Glucosamine and chondroitin sulfate. *Rheum Dis Clin North Am.* 2011 Feb;37(1):103-18. Epub 2010 Dec 4. [abstract]
- 2. **Towheed TE, Anastassiades T**; Glucosamine therapy for osteoarthritis: an update. *J Rheumatol.* 2007 Sep;34(9):1787-90.
- 3. **Osteoarthritis - evidence on glucosamine**, Prodigy (August 2008)
- 4. **Osteoarthritis Quick Reference Guide - The care and management of osteoarthritis in adults**. NICE, February 2008
- 5. **Towheed TE, Maxwell L, Anastassiades TP, et al**; Glucosamine therapy for treating osteoarthritis.; *Cochrane Database Syst Rev.* 2005 Apr 18;(2):CD002946. [abstract]
- 6. **Brandt KD, Mazzuca SA, Katz BP**; Methodology and statistical analysis in the Glucosamine/Chondroitin Arthritis Arthritis *Rheum.* 2009 Nov;60(11):3514-5; author reply 3515-6.
- 7. **Lee YH, Woo JH, Choi SJ, et al**; Effect of glucosamine or chondroitin sulfate on the osteoarthritis progression: a *Rheumatol Int.* 2010 Jan;30(3):357-63. Epub 2009 Jun 21. [abstract]
- 8. **Block JA, Oegema TR, Sandy JD, et al**; The effects of oral glucosamine on joint health: is a change in research approach *Osteoarthritis Cartilage.* 2010 Jan;18(1):5-11. Epub 2009 Sep 1. [abstract]
- 9. **No authors listed**; Glucosamine allergy; *Prescrire Int.* 2006 Aug;15(84):139.
- 10. **Dostrovsky NR, Towheed TE, Hudson RW, et al**; The effect of glucosamine on glucose metabolism in humans: a systematic review of *Osteoarthritis Cartilage.* 2011 Apr;19(4):375-80. Epub 2011 Jan 18. [abstract]
- 11. **British National Formulary**; login required
- 12. **Scroggie DA, Albright A, Harris MD**; The effect of glucosamine-chondroitin supplementation on glycosylated hemoglobin levels in patients with type 2 diabetes mellitus: a placebo-controlled, double-blinded, randomized clinical trial.; *Arch Intern Med.* 2003 Jul 14;163(13):1587-90. [abstract]
- 13. **Marshall PD, Poddar S, Tweed EM, et al**; Clinical inquiries: Do glucosamine and chondroitin worsen blood sugar control in *J Fam Pract.* 2006 Dec;55(12):1091-3. [abstract]

Original Author: Dr Richard Draper

Current Version: Dr Laurence Knott

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