

# Potential of vitamin C in the prevention and treatment of gout

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We read with great interest the article by Nicola Dalbeth published in *Nature Reviews Rheumatology*, which discussed the important advances in the treatment of gout in 2010, including the use of urate-lowering therapy for chronic gout (*Gout in 2010: Progress and controversies in treatment. Nat. Rev. Rheumatol.* 7, 77–78; 2011).<sup>1</sup> As discussed by Dalbeth<sup>1</sup> and also by Tuhina Neogi in the recent review published in the *New England Journal of Medicine*,<sup>2</sup> the level to which uric acid can be safely lowered to avoid increasing the risk of other associated disorders, such as metabolic syndrome and cardiovascular disease, remains unclear at present. In view of the widely accepted concept that uric acid is the major water-soluble antioxidant and is principally responsible for the antioxidant capacity of human plasma,<sup>3</sup> when lowering the level of uric acid, the attenuated antioxidant capacity should be compensated. Here, we would like to propose that vitamin C deserves special attention for its dual function in this context: the ability to reduce the level of uric acid and also to compensate for the attenuated antioxidant capacity arising from the decrease in uric acid level. These properties suggest that this vitamin has great potential in the prevention and treatment of gout.

First, it has been reported that supplementation with vitamin C lowers the serum level of uric acid, and increased intake of vitamin C is independently associated with a reduced risk of gout.<sup>4–6</sup> These findings imply

a potential role for supplemental vitamin C intake in the prevention and management of gout. In a randomized, double-blind, placebo-controlled trial, Huang *et al.* demonstrated that vitamin C supplementation (500 mg per day) for 2 months resulted in a substantial reduction in the serum concentration of uric acid.<sup>4</sup> The results of a more-recent prospective study provide evidence for the inverse association between increased vitamin C intake and the risk of gout.<sup>6</sup> The mechanisms underlying the uricosuric effect of vitamin C have been proposed to be either competition for renal reabsorption of uric acid via an anion exchange transport system<sup>7</sup> or increased glomerular filtration.<sup>4</sup>

Second, vitamin C and uric acid possess similar antioxidant functions, and vitamin C supplementation might offset the decreased antioxidant capacity caused by lowering the level of uric acid. Interestingly, the speculated complementary antioxidant roles of vitamin C and uric acid is also supported by the evolutionary event whereby the loss of the ability to synthesize endogenous vitamin C in humans strikingly parallels the inability to break down uric acid to soluble allantoin.<sup>8</sup> In addition, reduced levels of vitamin C were associated with an increased risk of developing inflammatory polyarthritis, suggesting that vitamin C has a protective effect against gouty inflammation.<sup>9</sup>

Therefore, in view of this dual ability to reduce the level of uric acid and compensate for the attenuated antioxidant capacity,

additional well-designed trials should be encouraged to examine the beneficial effects of vitamin C in the prevention and treatment of gout.

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## Competing interests

The authors declare no competing interests.

1. Dalbeth, N. Gout in 2010: Progress and controversies in treatment. *Nature Rev. Rheumatol.* 7, 77–78 (2011).
2. Neogi, T. Clinical practice. Gout. *N. Engl. J. Med.* 364, 443–452 (2011).
3. Ames, B. N., Cathcart, R., Schwiers, E. & Hochstein, P. Uric acid provides an antioxidant defense in humans against oxidant and radical-caused aging and cancer: a hypothesis. *Proc. Natl Acad. Sci. USA* 78, 6858–6862 (1981).
4. Huang, H. Y. *et al.* The effects of vitamin C supplementation on serum concentrations of uric acid: results of a randomized controlled trial. *Arthritis Rheum.* 52, 1843–1847 (2005).
5. Gao, X., Curhan, G., Forman, J. P., Ascherio, A. & Choi, H. K. Vitamin C intake and serum uric acid concentration in men. *J. Rheumatol.* 35, 1853–1858 (2008).
6. Choi, H. K., Gao, X. & Curhan, G. Vitamin C intake and the risk of gout in men: a prospective study. *Arch. Intern. Med.* 169, 502–507 (2009).
7. Berger, L., Gerson, C. D. & Yü, T. F. The effect of ascorbic acid on uric acid excretion with a commentary on the renal handling of ascorbic acid. *Am. J. Med.* 62, 71–76 (1977).
8. Proctor, P. Similar functions of uric acid and ascorbate in man? *Nature* 228, 868 (1970).
9. Pattison, D. J. *et al.* Vitamin C and the risk of developing inflammatory polyarthritis: prospective nested case-control study. *Ann. Rheum. Dis.* 63, 843–847 (2004).