CORRESPONDENCE

Re: Tomatoes, Tomato-based Products, Lycopene, and Prostate Cancer: Review of the Epidemiologic Literature

In his review of tomatoes, tomato-based products, lycopene, and cancer, Giovannucci (1) notes that, although consumption of tomato sauce and tomatoes had an inverse association with prostate cancer risk, there was no such association with consumption of tomato juice. Does he have any thoughts as to the reason for this apparent inconsistency?

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REFERENCES


NOTE

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RESPONSE

At least three factors may have contributed to the “null” results. First, the consumption of tomato juice in this population was relatively low. Second, the dietary assessment was based on recall, and tomato juice was not reported as accurately as the other items on the questionnaire (1). A final consideration concerns the bioavailability of lycopene: Several factors have been shown to enhance intestinal absorption of lycopene. Cooking helps release lycopene bound in matrices, probably by the thermally induced rupture of the cell walls (2). Additionally, intestinal absorption of lycopene, a highly lipophilic compound, depends on its mixing with dietary lipids. In the small intestine, ingested lycopene is incorporated into micelles formed from dietary lipids and bile acids, which facilitates absorption into the intestinal mucosal cell. Cooking tomatoes in an oily vehicle, such as for spaghetti sauce, may be ideal not only in providing a lipid vehicle for lycopene but also in improving the extraction of lycopene into the lipid phase by heat. Although tomato juice is high in lycopene, depending on how it is processed and whether consumed alone or with a meal containing lipids, the proportion of lycopene absorbed will vary dramatically.

In regard to prostate cancer, the reported intake of tomato juice in a subsample of participants in a study (3) who provided a blood sample did not correlate with the plasma lycopene level ($r = -0.10$, two-sided $P = .28$). Relatively low intake, poor reporting, and perhaps relatively low bioavailability of lycopene from tomato juice as consumed in this population appeared to contribute to the lack of a correlation. Of note, plasma lycopene level was predicted most strongly by tomato sauce intake, which was by far the strongest predictor of low prostate cancer risk. When each dietary source of lycopene was adjusted by a factor taking into account predicted bioavailability from the source, the inverse association between lycopene intake and prostate cancer risk became stronger. For “aggressive” prostate cancer, the relative risk was 0.57 (95% confidence interval [CI] = 0.37–0.87) between high and low quintiles of lycopene consumption based on the adjusted lycopene intake score (3). A recent study (4) from the Physicians’ Health Study that used a direct measure of prediagnostic plasma lycopene found a remarkably similar relative risk of 0.56 (95% CI = 0.34–0.91) between high and low quintiles of plasma lycopene.

Two other studies also yielded interesting data. In a recent case–control study in Greece (5), raw tomatoes had only a weak, inverse association with prostate cancer risk (two-sided $P = .12$), whereas cooked tomatoes had a much stronger inverse association ($P = .005$). Also, a British case–control study (6) did not find an appreciable association between reported tomato intake and prostate cancer risk but found high consumption of baked beans associated with about half the risk of prostate cancer. The authors noted that, in Britain, the tomato sauce that usually immerses tinned baked beans may be an effective source of highly bioavailable lycopene. In fact, lycopene bioavailability has been shown to be about three times higher from tomato paste than from fresh tomatoes (7). The bioavailability of lycopene, influenced by the cooking, processing, and immersion of tomatoes in oil needs to be factored into future studies.

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REFERENCES


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