

PLEASE NOTE these studies are older but represent perspectives that STILL MATTER.

Epidemiology

Carotenoids/vitamin C and smoking-related bladder cancer

J. Esteban Castelao 1 *, Jian-Min Yuan, Manuela Gago-Dominguez 1, Paul L. Skipper 2, Steven R. Tannenbaum 2, Kenneth K. Chan 3, Mary A. Watson 4, Douglas A. Bell 4, Gerhard A. Coetzee 1, Ronald K. Ross 1, Mimi C. Yu 1

1USC/Norris Comprehensive Cancer Center, Keck School of Medicine of the University of Southern California, Los Angeles, CA, USA 2Department of Chemistry and Division of Toxicology, Massachusetts Institute of Technology, Cambridge, MA, USA 3The Ohio State University College of Pharmacy, Columbus, OH, USA 4Laboratory of Computational Biology and Risk Analysis, National Institute of Environmental Health Sciences, Research Triangle Park, NC, USA

email: J. Esteban Castelao (castelao@usc.edu)

*Correspondence to J. Esteban Castelao, USC/Norris Comprehensive Cancer Center, Keck School of Medicine of the University of Southern California, 1441 Eastlake Avenue, Los Angeles, CA 90089-9181

Fax: +323-865-0136

Abstract Previous epidemiological studies of fruit and vegetable intake and bladder cancer risk have yielded inconsistent results, especially with respect to the role of cigarette smoking as a possible modifier of the diet-bladder cancer association.

A population-based case-control study was conducted in nonAsians of Los Angeles, California, which included 1,592 bladder cancer patients and an equal number of neighborhood controls matched to the index cases by sex, date of birth (within 5 years) and race between January 1, 1987 and April 30, 1996.

Information on smoking, medical and medication history, and intake frequencies of food groups rich in preformed nitrosamines, vitamins A and C

and various carotenoids, were collected through in-person, structured interviews.

Beginning in January 1992, all case patients and their matched control subjects were asked for a blood sample donation at the end of the in-person interviews for measurements of 3- and 4-aminobiphenyl (ABP) hemoglobin adducts, and glutathione S-transferases M1/T1/P1 (GSTM1/T1/P1) and N-acetyltransferase-1 (NAT1) genotypes.

Seven hundred seventy-one (74%) case patients and 775 (79%) control subjects consented to the blood donation requests.

In addition, all case patients and matched control subjects were asked to donate an overnight urine specimen following caffeine consumption for measurements of cytochrome P4501A2 (CYP1A2) and N-acetyltransferase-2 (NAT2) phenotypes. Urine specimens were collected from 724 (69%) case patients and 689 (70%) control subjects.

After adjustment for nondietary risk factors including cigarette smoking, there were strong inverse associations between bladder cancer risk and intake of dark-green vegetables [p value for linear trend (p) = 0.01], yellow-orange vegetables (p = 0.01), citrus fruits/juices (p = 0.002) and tomato products (p = 0.03).

In terms of nutrients, bladder cancer risk was inversely associated with intake of both total carotenoids (p = 0.004) and vitamin C (p = 0.02).

There was a close correlation (r = 0.58, p = 0.0001) between intakes of total carotenoids and vitamin C in study subjects.

When both nutrients were included in a multivariate logistic regression model, only total carotenoids exhibited a residual effect that was of borderline statistical significance (p = 0.07 and p = 0.40 for total carotenoids and vitamin C, respectively).

Cigarette smoking was a strong modifier of the observed dietary effects; these protective effects were confined largely to ever smokers and were stronger in current than ex-smokers.

Smokers showed a statistically significant or borderline statistically significant decrease in 3- and 4-aminobiphenyl (ABP)-hemoglobin adduct

level with increasing intake of carotenoids ($p = 0.04$ and 0.05 , respectively).

The protective effect of carotenoids on bladder cancer seemed to be influenced by NAT1 genotype, NAT2 phenotype and CYP1A2 phenotype; the association was mainly confined to subjects possessing the putative NAT1-rapid, NAT2-rapid and CYP1A2-rapid genotype/phenotype.

The carotenoid-bladder cancer association was not affected by the GSTM1, GSTT1 and GSTP1 genotypes.

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