to be methodologies developed to look at all the different isomers formed during cooking. This is one reason why we have not looked at cooking as extensively as we have looked at raw products—the inability to separate all the isomers that develop during cooking. As far as Khachik et al.'s method is concerned, it is not as good as our method for separating the isomers of β-carotene. The methodology must be developed for cooked products first and then the planned experiments performed.

R. J. Bushway

Department of Food Science
University of Maine
Orono, Maine 04469

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Rebuttal on Quantification of Major Carotenoids in Raw Fruits and Vegetables by HPLC

Sir: Dr. Sri Kantha raises several pertinent and interesting points to which we respond. In regard to Sri Kantha's first two points, which address detail description of foods in scientific publications, we agree and support these general concepts. However, the primary emphasis of our paper was the qualitative aspects of carotenoids in green vegetables; quantitative data were collected from a very limited sampling of several foods and a very limited number of analyses. These data were presented to permit the reader to make preliminary comparisons of the levels of carotenoids in several vegetables and were not intended as a large body of analytical data. Studies that concentrate on the analysis of nutrients in a large number of foods should also provide sufficient ancillary data, i.e., moisture, nitrogen, etc., to allow compilers of food composition tables to match new data with existing data by specific chemical criteria. In regard to publishing botanical nomenclature in concert with food composition data, we agree. However, reviewers of our paper were most insistant that we remove botanical nomenclature in the interest of the conservation of space. This information can be provided upon request. Nonetheless, journal editors and reviewers must be encouraged to permit sufficient descriptive information about foods to be published with composition data so that compilers of food composition tables can present accurate and precise information.

The effect of cooking and processing in fruits and vegetables can be best understood if in dealing with analytical data generated on these foods we realize that the degree to which the oxygenated carotenoids (xanthophylls) and the hydrocarbon carotenoids (mainly, α- and β-carotene) are destroyed is very different. Most of our results to date, including a recent manuscript submitted for review to the *Journal of Agricultural and Food Chemistry*, suggests the following: The destruction of hydrocarbon carotenoids as a result of cooking and processing green and yellow orange vegetables is about 15–20%. However, any vegetable that in addition to hydrocarbon carotenoids contains oxygenated carotenoids suffers more loss due to instability of the xanthophylls not the hydrocarbon carotenoids. Even among the xanthophylls, such data have to be dealt with much more carefully. For example, our data suggest that lutein is much more heat resistant than the epoxycarotenoids; therefore, it is not possible to arrive at a universal destruction percentage for fruits and vegetables as a result of cooking and processing. Depending on the nature and the chemical structure of the abundant carotenoids in various foods, they may exhibit different stability toward cooking. The increased level of β-carotene in the cooked vegetables reported by Sri Kantha can probably be related to the evaporation of the volatiles in raw vs. cooked samples. In our studies of the carotenoid content of raw and cooked vegetables, two identical batches of the well-homogenized raw vegetable are weighed: one batch is extracted raw, and the second batch is cooked and then extracted. If these measures of weight correction have already been employed, the increase in β-carotene level in the cooked vegetables can only be explained in terms of a more efficient extraction of the carotenoids in the cooked vegetables as a result of a more efficient denaturing of the carotenoid–protein complexes. In an attempt to minimize the errors due to varietal differences and experimental and analytical procedures, comparison between the various means of cooking and the levels of carotenoids destroyed must be carried out on the same vegetables employing an accepted extraction and HPLC procedure.

Frederick Khachik
Gary R. Beecher

Beltsville Human Nutrition Research Center
U.S. Department of Agriculture—ARS
Beltsville, Maryland 20705

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