On the First Double Bond Site in Natural Fats and Oils

Sir: I wish in this letter to provide some constructive criticism relative to Kartha and Selvaraj's recent communication (A.R.S. Kartha and Y. Selvaraj, JAOCS 47:365, 1970) on the first double bond site in fats and oils. The wide distribution of double bond positions given in the indicated article, involving major amounts of fatty acids having Δ^8 through Δ^{11} unsaturation, in such oils as safflower, rapeseed, peanut, olive and sesame seed, has never been found by any previous investigators. Unusual isomers are indeed present in natural fats and oils, but these have single discrete bond positions with little if any of adjacent isomers present. Thus 11-18:1 in addition to 9-18:1 is present in numerous fats and oils but little or no Δ^8, Δ^{10} or Δ^{12} unsaturation is present in the monoenoic acids (D.F. Kuemmel and L.R. Chapman, Lipids 3:313, 1968). Significant amounts of 5-18:1 in addition to 9-18:1 and 9,12-18:2 have been found in two seed oils but no other unusual C_{18} isomers were detected (G.F. Spencer, R. Kleiman, F.R. Earle and I.A. Wolff, Lipids 4:99, 1969).

Kartha and Selvaraj state that only one study has been made of the first double bond site in common oils since the work of Hilditch ("The Chemical Constitution of Natural Fats," Second Edition, Chapman and Hall, London, 1946, p. 388-435) and that, in these prior studies, "the number of samples studied is far too small for generalization." Apparently neither the authors nor the reviewers are aware of several additional references (D.F. Kuemmel and L.R. Chapman, Lipids 3:313, 1968; D.F. Kuemmel, JAOCS 41:667, 1964; M.K. Bhatty and B.M. Craig, JAOCS 41:508, 1964; E.W. Haeffner, Lipids 5:430, 1970; H. Brockerhoff and R.G. Ackman, J. Lipid Res. 8:661, 1967) on the fatty acid composition of a wide variety of animal fats, marine oils and vegetable oils which serve to emphasize how aberrant the results of Kartha and Selvaraj are. Other oxidative cleavage methods (which do not show a wide distribution of fragments) are criticized for being prone to overoxidation or leading to isomerization; yet both these effects would lead to a wide distribution of isomers rather than to the single, discreet positions found by other workers.

The method used by Kartha and Selvaraj involved titration of fractions obtained from column chromatography of the dicarboxylic acids resulting from acetic acid-acetone-permanganate oxidation. Confirmation of the chain length of the fragments by modern techniques (such as GC or TLC) should have been carried out, particularly where the data reported conflict with all previous work in the field.

Although the possibility exists that the group of fats and oils reported is anomalous, I am of the opinion that the column separation of dicarboxylic acids and/or the permanganate oxidation technique recently proposed by Kartha and Selvaraj (A.R.S. Kartha and Y. Selvaraj, JAOCS 47:365, 1970; A.R.S. Kartha and Y. Selvaraj, JAOCS 46:685, 1969; A.R.S. Kartha and Y. Selvaraj, Indian J. Agr. Sci. 39:633, 1969; Chem. Abstr. 72:68478d, 1970) has led to grossly misleading results.

D.F. KUEMMEL
The Procter & Gamble Company
Miami Valley Laboratories
Cincinnati, Ohio 45239

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