Fishy Off-Flavors in Autoxidized Oils

Sir: In a recent paper, Meijboom and Stroink (JAOCS 49:555 [1972]) describe 2-*trans*,4-*cis*,7-*cis*-decatrienal as the fishy off-flavor in certain autoxidized oils. The authors mention our previous work on autoxidation-flavor defects in lipids and in cold storage butter. Unfortunately, not all of our results are quoted correctly. We therefore wish to add the following information.

It is suggested that we found that 4-*cis*-heptenal has a fishy or whale oil flavor, if present in concentrations > 15 μg/kg. We actually said that the fishy flavor of cold storage butter is *not* caused by 4-*cis*-heptenal, but that this component in higher concentrations seems to contribute to oxidation flavors (Neth. Milk Dairy J. 19:69 [1965]).

In the conclusions of our earlier work (Neth. Milk Dairy J. 24:243, 244 [1970]) we wrote: ". . . the autoxidation of unsaturated fatty acids and particularly the autoxidation of *linolenic acid* (and fatty acids with the same alkyl-terminal structure) chiefly contribute to a trainy (= fishy) flavor. This could be confirmed experimentally; the addition of autoxidized linolenic acid with a small quantity of arachidonic acid to butter without flavor defects produced a trainy flavor." Meijboom and Stroink have now come to a similar conclusion.

We also studied the volatile flavor compounds in autoxidized linolenic acid. It was concluded that two stereo-isomeric 2,4,7-decatrienals contributed significantly to the off-flavor of oxidized linolenic acid. The flavor of these compounds (in concentrated solution after regeneration from their 2.4-dinitrophenyl hydrazones) was described by us as that of sliced beans. Meijboom and Stroink have now stated that 2,4,7-decatrienal (particularly the 2-*trans*,4-*cis*,7-*cis*-isomer) has a fishy or cod liver oil flavor, which they claim to be contradictory to our description. However we do not see any contradiction, because of our earlier report (Van Duin, H., Alg. Zuivelblad 53:273 [1960]; Badings, H.T., Neth. Milk Dairy J. 14:215 [1960]) that certain unsaturated aldehydes have ". . . a sliced-bean flavor, which becomes trainy-fishy upon strong dilution . . ." (Neth. Milk Dairy J. 14:236 [1960]).

Only one difference of opinion might remain between Meijboom and Stroink and our group: The former workers claim 2-*trans*,4-*cis*,7-*cis*-decatrienal to be "the fishy off-flavor occurring in strongly autoxidized oil containing linolenic acid or ω-3,6,9, etc., fatty acids" (JAOCS 49:555 [1972]). We feel, however, that the fishy, trainy or whale oil flavors in autoxidized oils and fats result from the presence of a complex mixture of compounds. We agree that 2,4,7-decatrienal may play a leading part in the generation of the flavor in question, but we hold the view that other volatile compounds (some of them not specifically fishy) may also contribute to an overall flavor that gives the impression of being fishy. In this group we include, among others, (poly)unsaturated aldehydes and ketones, particularly those with double bonds not in conjunction with the carbonyl group or other double bonds in the carbon chain.

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