

## CORRESPONDENCE

### Flavor Artifacts

Sir: There is no question that modern chromatographic instrumentation such as GC-MS, with its slick, multicolor computer graphics and extensive reference libraries, has greatly facilitated analysis of flavors and other natural products. On the other hand, it is easy to be lulled into a false sense of complacency where all data presented by such instruments are accepted as fact, and the computer buff's admonition, "garbage in, garbage out", is forgotten. The appearance of an increasing number of papers in which conclusions about flavor components are based entirely upon GC-MS analysis prompts me to remind readers of serious pitfalls with this method.

For example, it has been known for many years that cutting *Allium* species such as garlic and onion affords strongly smelling and tasting thiosulfinates of the type RS(O)SR' (Block, 1992). It is also known that many of these compounds, as well as related sulfoxides RS(O)R', are thermally unstable, in some cases even at room temperature. It is therefore surprising that so many papers have appeared, and continue to appear, in which extracts of *Allium* species are subjected to severe GC-MS conditions, and diverse conclusions concerning the flavors are then drawn from the chromatograms. I suggest that, in the area of *Allium* chemistry, many of the so-called "new compounds" being reported are simply artifacts resulting from decomposition of the fragile primary flavorants in the injection port, column, and heated transfer line connecting the GC to the MS and that these artifacts have little if any significance in terms of the flavor of the plant. We find that authentic samples of most of the *Allium* spp. thiosulfinates, other than those containing allyl groups, can survive GC-MS under the proper low-temperature conditions and that *Allium* extracts analyzed under these conditions give relatively simple chromatograms showing only thiosulfinates and related sulfinyl compounds. However, introduction of these authentic samples into a GC-MS operating under "standard" conditions, e.g., injection port and transfer line >200 °C, gives a complex series of saturated and unsaturated polysulfide decomposition products, none of which are seen under low-temperature conditions. To confirm this situation, we have also analyzed *Allium* extracts and authentic samples using Si-

and C<sub>18</sub>-HPLC as well as <sup>1</sup>H NMR, demonstrating the presence of the identical mixture of S(O) compounds seen by GC-MS and the absence of polysulfides and sulfonyl (SO<sub>2</sub>) compounds (Block et al., 1992a,b).

By working with authentic samples as well as with parallel, nonthermal methods of analysis (e.g., HPLC, NMR), GC-MS separation conditions can be optimized (or in fact deemed inappropriate!) and artifact formation avoided. Such procedures should be routinely used in cases where thermal instability of flavorants or other mixture components is suspected. Even the fact that a product has been distilled does not guarantee that all distilled components will survive GC analysis. For example, a number of the higher molecular weight polysulfide components, RS<sub>n</sub>R' (n = 5, 6), of distilled oil of garlic seen by C<sub>18</sub>-HPLC decompose during gas chromatography (Lawson, 1990).

I urge the Editors to formulate a protocol for the Journal minimizing the possibility of publication of incorrect results based upon artifact formation during analysis.

#### LITERATURE CITED

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#### CORRECTION

DETERMINATION OF TOTAL VOLATILE COMPONENTS OF *CUCUMIS MELO* L. VARIETY CANTALOUPE NSIS, by Vassiliki I. Homatidou,\* Sophia S. Karvouni, Vassilis G. Dourtoglou, and Constantine P. Poulos. *J. Agric. Food Chem.* 1992, 40, 1385.

The correct middle initial for Constantine Poulos is P.