Letter to the Editor

Tobacco Smoke Components

EDITORS – I read with great interest the letter from Dr. Dietrich and Ilse Hoffmann [Beitr. Tabakforsch. Int. 18 (1998) 49] in which they discussed (1) the number of identified tobacco smoke components and (2) criticized Table 6 on a tobacco smoke component listing from the *Seminars in Tobacco Science* section of a previous issue [Beitr. Tabakforsch. Int. 17 (1997) 61].

1. In their discussion of the number of tobacco smoke components identified, they cited data from page 56 of the 1988 review 'Natural Tobacco Flavor' by D.L. ROBERTS [Recent Adv. Tob. Sci. 14 (1988) 49–81] and from page 48 of the 1982 review 'Methods of Collection of Smoke for Analytical Purposes' by M.F. DUBE and C.R. GREEN [Recent Adv. Tob. Sci. 8 (1982) 42–102]. These publications were written a decade and more than a decade and a half ago, respectively. The Hoffmanns did not cite the 1996 review 'The Tobacco Chemists' Research Conference: A Half Century Forum for Advances in Analytical Methodology of Tobacco and Tobacco Products' by C.R. GREEN and A. RODGMAN [Recent Adv. Tob. Sci. 22 (1996) 131–304] in which the authors offered a reasonable explanation (pages 136–142; endnote 39, pages 282–283) why the number of identified smoke components was, in mid-1996, approaching 4,800.

2. The Hoffmanns offered a table of their own as a revision of Table 6 in the September 1997 issue of Beitr. Tabakforsch. Int. Unfortunately, the Table 1 they offered is replete with numerous inconsistencies and inaccuracies. Hoffmann and Hoffmann suggested the substitution of their Table 1 ('Biologically active agents in the mainstream smoke of nonfilter cigarettes') to purportedly reflect "our current knowledge more satisfactorily". But does their Table 1 really achieve the goal of reflecting "our current knowledge more satisfactorily"? Comparison of their 1998 Table 1 with one they published in 1997, 'The Changing Cigarette: 1950–1995' by D. HOFFMANN and I. HOFFMANN [J. Toxicol. Environ. Health 50 (1997) 307–364] reveals numerous serious inconsistencies between the delivery data presented for several components, and these

inconsistencies certainly do not reflect our current knowledge more satisfactorily! In fact, not only are there inconsistencies between the data in their 1997 publication and 1998 letter but also there are troubling inconsistencies between the delivery data of several components listed in Tables 1 and 3 within the 1997 article. Some of the data cited by Hoffmann and Hoffmann are also incomplete.

Examination of the Hoffmann and Hoffmann 1997 publication and 1998 letter reveals the following:

- Explanations are required for the listing of a single value for dibenz[*a,b*]anthracene and 5-methylchrysene. For example, B.L. VAN DUUREN [J. Natl. Cancer Inst. 21 (1958) 623–630] listed a cigarette mainstream smoke delivery of 5 ng/cigarette for dibenz[*a,b*]anthracene, a value obviously not included by Hoffmann and Hoffmann in either their 1997 publication or 1998 letter.
- There is need for correction of a serious mix-up in the delivery data presented in the two publications for dibenzo[*a,i*]pyrene and dibenzo[*a,l*]pyrene. The delivery data listed in the 1998 letter for dibenzo[*a,l*]pyrene (1.7–3.2 ng) are those of dibenzo[*a,i*]pyrene. Also, the authors need to specify precisely to which dibenzo[*a,l*]pyrene they are referring: The dibenzo[*a,l*]pyrene first reported in the 1950s but which was subsequently shown by D. LAVIT-LAMY and N.P. BUU-HOI [Chem. Comm. 4 (1966) 92] to be dibenz[*a,e*]aceanthrylene (dibenzo[*a,e*]fluoranthene) or the bonafide dibenzo[*a,l*]pyrene reported in cigarette smoke by M. E. SNOOK *et al.* [Beitr. Tabakforsch. Int. 9 (1977) 79–101].
- Explanations are required for the substantial differences in per cigarette mainstream smoke delivery ranges listed in the 1997 publication *vs* the 1998 letter for pyridine (20–200 µg *vs* 16–40 µg); nicotine (0.1–3.0 mg *vs* 1.0–3.0 mg); quinoline (1–2 µg *vs* 2–180 ng); dibenzo[*c,g*]carbazole (0.7 ng *vs* 0.9 ng); furan (18–30 µg *vs* 18–30 ng); aniline (360 ng *vs* 360–655 ng); 2-toluidine (30–200 ng *vs* 30–337 ng); 2-naphthylamine (1–22 ng *vs* 1–334 ng); *N*-nitrosopyrrolidine (3–60 ng *vs* 3–110 ng); methanol (80–180 µg *vs* 100–250 µg); vinyl chloride (1–16 ng *vs* 11–15 ng); 2-nitropro-

Table 1.
Dibenz[*a,h*]acridine, dibenz[*a,l*]acridine, and 7*H*-dibenzo[*c,g*]carbazole in nicotine pyrolysates (Pyr) and mainstream cigarette smoke condensate (CSC).

Investigators	Dibenz[<i>a,h</i>]acridine		Dibenz[<i>a,l</i>]acridine		7 <i>H</i> -Dibenzo[<i>c,g</i>]carbazole	
	Pyr	CSC	Pyr	CSC	Pyr	CSC
VAN DUUREN <i>et al.</i> (1)	yes ^a	yes	yes	yes	no	yes
CANDELI <i>et al.</i> (2)	NE	no	NE	yes	NE	NE
KABURAKI <i>et al.</i> (3)	no	NE	no	NE	NE	NE
SCHMELTZ <i>et al.</i> (4)	no	NE	no	NE	no	NE
SCHMELTZ <i>et al.</i> (5) ^b	no	no	no	no	no	no
SNOOK (6)	NE	no	NE	no	NE	no
SNOOK <i>et al.</i> (7)	NE	no	NE	no	NE	no
GRIMMER <i>et al.</i> (8)	NE	no	NE	no	NE	no
KAMATA <i>et al.</i> (9)	NE	no	NE	no	NE	NE

^a yes = compound identified; no = compound not found or identified; NE = substrate not studied or not examined for compound in question.
^b Study with radiolabeled nicotine.

REFERENCES for Table 1

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9. Kamata, K., N. Motohashi, R. Meyer and Y. Yamamoto: Analysis of benz[*c*]acridines in cigarette smoke by high-performance liquid chromatography; J. Liq. Chromatog. 15 (1992) 1907–1921.

- pane (0.73–1.21 µg *vs* 0.2–2.2 µg); hydrazine (24–43 ng *vs* 24–34 µg).
- Explanations are required for differences in delivery ranges presented in Tables 1 and 3 of the Hoffmann and Hoffmann 1997 publication and the reasons for the inclusion of the specific delivery range listed in the 1998 letter for furan (18–30 µg *vs* 20–40 µg); formaldehyde (70–100 µg *vs* 20–100 µg); acetaldehyde (18–1,400 µg *vs* 400–1,400 µg); 1,3-butadiene (20–75 µg *vs* 25–40 µg); isoprene (450–1,000 µg *vs* 200–400 µg); benzene (12–70 µg *vs* 6–70 µg).
 - Corrections of nomenclature are required for benzo[*b*]fluoranthene; benzo[*b*]furan; IQ (2-amino-3-methyl-3*H*-imidazo[4,5-*b*]quinoline); PhIP ([4,5-*b*] *not* [4,5-*l*]), di(2-ethylhexyl) phthalate *not* di-(2-ethylhexyl)phthalate.
 - In several instances in the 1998 letter, a period has inadvertently been replaced with a comma in the delivery range cited, *e.g.*, *N*'-nitrosonornicotine (3,700 ng *not* 3.700 ng); acetaldehyde (1,400 µg *not* 1.400 µg); isoprene (1,000 µg *not* 1.000 µg); DDT (1,200 µg *not* 1.200 µg). The delivery range for Glu-P-1 is 0.37–0.89 ng *not* 6.37–0.89 ng as indicated in the 1998 letter.

In addition, as they did in their 1997 publication 'The Changing Cigarette: 1950–1995' by D. HOFFMANN and I. HOFFMANN [J. Toxicol. Environ. Health 50 (1997) 307–364], the Hoffmanns continue the questionable practice initiated in the 1990 publication 'Advances in Tobacco Carcinogenesis' by D. HOFFMANN and S.S. HECHT [Chapter 3 *in*: 'Chemical Carcinogenesis and Mutagenesis', I, edited by C.S. Cooper and P. Grover, Springer-Verlag, London, UK, pp 63–102] of listing in their 1998 letter the three aza-arenes dibenz[*a,j*]acridine, dibenz[*a,j*]acridine, and 7*H*-dibenzo[*c,g*]carbazole as biologically active tobacco smoke components.

It has long been known that these three compounds are indeed biologically active, but why are these compounds included in the list of tobacco smoke components? Despite numerous attempts in Japan, Germany, and the U.S.A. between 1960 and 1992 to confirm the presence of these three aza-arenes in cigarette mainstream smoke and nicotine pyrolysates, the 1960 findings reported in 'The Carcinogenic Nitrogen Heterocycles in Cigarette Smoke Condensate' by B.L. VANDUUREN, J.A. BILBAO, and C.A. JOSEPH [J. Natl. Cancer Inst. 25 (1960) 53–61] have not been confirmed except for comments by WYNDER and HOFFMANN ['Experimental Tobacco Carcinogenesis' by E.L. WYNDER and D. HOFFMANN, Adv. Cancer Res. 8 (1964) 249–453 at pages 332–334 and in E.L. WYNDER and D. HOFFMANN 'Tobacco and Tobacco Smoke: Studies in Experimental Carcinogene-

sis', Academic Press, New York NY, 1967, at pages 372–374] on an unpublished study in which dibenz[*a,j*]acridine was reportedly identified in their laboratory by CANDELI *et al.* at a delivery nearly four times that reported by VANDUUREN *et al.* Table 1 summarizes the results from these various aza-arene studies.

Examination of the Hoffmann-Hecht 1990 list and the Hoffmann-Hoffmann 1997 and 1998 lists indicates the lists were obviously designed to emphasize only supposed harmful components of cigarette mainstream smoke. Omitted from the lists are any indications of the numerous tobacco smoke components known not only to be biologically active but also to inhibit or counteract the harmful effects attributed to many of the smoke components listed.

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