

Letter to the Editor

“Fibre and Particle Release from Cigarette Filters” by M. Hengstberger and M. Stark; Beitr. Tabakforsch. Int. 23 (2009) 338-358.

Dear Editors,

HENGSTBERGER and STARK have recently reported the results of studies that were undertaken to determine whether “fibre-shaped particulates” of cellulose acetate fibers were released from a cigarette filter (1). The impetus for this investigation was attributed to observations, reported in 1995 (2), by me and co-investigators at RPCI.¹ Of the peer-reviewed publications cited by the authors, all but one paper were from my group (1; also see 3).

HENGSTBERGER and STARK claim to have reviewed all reports of the release of filter elements during smoking (1, Table 1). Important studies, however, were excluded, and others were not discussed. Not cited was the first investigation, reported in 1958, addressing fiber and particle release from cigarette filters. In this study, funded by B&W, “smoke samples were collected in a way that approximated the manner in which the smoke deposits come in contact with the surfaces of the respiratory tract of the smoker” (4). Fibers and particles in the cigarette smoke were examined using white light, polarizing light and electron microscopy. Cigarette filter fibers, carbon from cigarettes with charcoal filters, tobacco flakes and other debris was found in the smoke deposits of all filter cigarettes studied (Tareyton, Winston, Kent, L&M, Marlboro and Viceroy). The 109-page monograph presented 60 photomicrographs and 55 electron micrographs (4).

The term “fall-out” is used by the authors in describing the release of cellulose acetate fibers from cigarette filters (1). Our review paper is cited (5), but the authors fail to comment on the PM “fall-out” research. A tabulation of 80

documents has been prepared by PM in a review of their internal file for “carbon or fiber or filter and fallout” (6). These writings identify 11 different projects, and investigations that were pursued for at least 11 years (6). PM has continued these assays, particularly for Marlboro UltraSmooth (7).

To be noted is that:

- a) We (8) and many others (partial listing: B&W, PM, RJR) have used scanning electron microscopy (SEM) to analyze filter fibers and particles. PM has used SEM to count filter fibers. Thus, the approach by the authors is not unique.
- b) Cigarette filter fibers can be distinguished from those commonly used in textiles using a combination of white-light, polarizing and electron microscopy, SEM X-ray microanalysis, infrared spectroscopy and other instruments.
- c) The apparatus used by HENGSTBERGER and STARK: (I) is markedly different than the state-of-the-art smoking machines that have been used commonly, (II) does not model the proximity of the cigarette to the mouth of a smoker, (III) incorporates a unique “puffer” provided by a tobacco instrument resource company; and (IV) used cigarettes that were sham/dry puffed, and were not ignited.
- d) The identity of the cigarette standards and the brand names of the test cigarettes were withheld (“Zigarette C”).
- e) Cigarettes were not tested that had been subjected to daily transport conditions in which a few remaining cigarettes are jostled about within a pack which subjects the cigarettes to the physical/mechanical trauma that has been shown to be associated with the release of filter materials.
- f) The number, size and shape of the cellulose acetate filter fibers in the pack residue were not studied.
- g) The authors did not disclose whether the test cigarettes had filter rods made by Rhodia GmbH or by a market competitor.
- h) They make no attempt to reconcile their findings with the contrasting observations (B&W, PM, RPCI and REM).
- i) They are incorrect in their reference to our published paper (2) stating that the fibers that we observed in human lung tissue were seen with the use of polarizing light microscopy. We used confocal laser scanning microscopy; this instrument enables the examiner to capture a high-resolution, laser-generated optical section in real time.

¹ Abbreviations used: RPCI, Roswell Park Cancer Institute; B&W, Brown and Williams Tobacco Company; PM, Philip Morris; RJR, RJ Reynolds Tobacco Company; REM, Reemtsma GmbH.

j) Filter ventilation is an important feature in smoke delivery; notwithstanding, the authors did address this subject, and did not disclose whether the filter vents had been blocked.

The authors have withheld from the reader information as to the efforts made by the “affected industry” to correct filter fiber and carbon particle “fallout” (1). What modifications have been implemented during the last decade to reduce the propensity of cigarette filters to release material? Have there been any modifications in the technology with respect to the filter fiber (fabrication, type, morphology, size), filter-tubes (crimping, bonding, rod cutting), or dust-reduction during manufacturing, cigarette production and packaging? Ninety-seven US Patents have been awarded for cigarette filters during the last four years (04-11-2006 to 04-16-2010); these include US Patents awarded to Rhodia GmbH.

I am puzzled as to why Rhodia GmbH, a worldwide market leader in the manufacturing of cellulose acetate fiber that is used extensively in producing cigarette filters, has elected to address this matter at this time - more than 15 years after our paper was published in *Cancer Research*.

The authors and the referenced DIN Ad-hoc working group should note:

- a) Of the many reports evaluating the release of fibers, particles, tobacco and other debris from the cigarette filter, no two groups have used the same experimental scheme, smoking procedure or filter particle/fiber assay (identification and counting) method.
- b) With the exception of our own published studies, all other groups have a vested interest in the research and, for most all studies, including this paper, brand names of test cigarettes tested are not disclosed, and the reference control cigarettes are not identified.
- c) The assayed cigarettes are often dry-puffed and not smoked.
- d) Cigarettes are not coded as would be recommended to safeguard against bias.
- e) Marked differences have been noted for different brands; the authors noted that “we found high variations in the number of released particles from different (cigarette) samples.”
- f) No ISO standardized procedures for assessing the “fallout” of material from the cigarette filter have been approved.
- g) The absence of standard procedures precludes regulatory authorities to compare results, and compromises collaborative efforts to improve manufacturing procedures or to investigate new filter designs.
- h) It is commonly known that smoking machines, puffing devices, cyclones, impactors and other mechanical devices do not reflect human smoking behavior. In addressing the release of debris from the cigarette filter, PM acknowledges that: “Therefore, it is uncertain whether this laboratory method using machine-smoking parameter is useful to assess the potential exposure risk from fibers when a human smokes a cigarette”. There are no reports of studies of smokers.
- i) Aerodynamic diameters and mathematical models of inhaled fibers are hypotheses. These theories await valida-

tion in empirical investigations that map and count the deposition of particles and fibers in human lungs. In this context, and as applied to most tobacco smoke inhalation studies, laboratory animals are not suitable surrogates.

j) Human lung pathology is known to be associated with inhaled fibers and particles that are not “respirable.” Summarily, in the weight-of-evidence approach, the goal is the “reasonable certainty of no harm”.

In evidence of:

- a) the marked variation in the data reported by different investigative teams,
- b) the absence of standardized procedures,
- c) studies by independent laboratories, no claims can be made at this time regarding the propensity of the health risk to the smoker of materials that are known to be released from the cigarette filter into mainstream smoke that is inhaled during smoking.

It is in the best interest of the tobacco industry and the health community to foster a dialog, and to pursue a science-based approach. To this end, I look forward to working with members of the Institut für Textilchemie und Chemiefasern, Rhodia Acetow GmbH, and the DIN Organization.

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