NO SECRET

Detailed information about tobacco ingredients is available in the public domain—but you have to know where to look.

By John H. Lauterbach

In a well-publicized Jan. 18, 2010, article by Michael Felberbaum of the Associated Press[1], Dr. Lawrence R. Deyton, director of the U.S. Food and Drug Administration's new Center for Tobacco Products, was quoted as saying, "Tobacco products today are really the only human-consumed product that we don't know what's in them." Deyton's statement was patently incorrect. It's unclear whether he made such a statement because he was misinformed or if he was deliberately attempting to misinform the press and the public.

However, the subject of tobacco ingredients has been a controversial one, and much misinformation on ingredients used in tobacco products has already been published over the past few decades. One reason the use of tobacco ingredients has been controversial is that many of them are complex mixtures. Another reason is that the compositions of many such mixtures are closely guarded trade secrets of their manufacturers. This complexity and secrecy has led to speculation about ingredient safety and the reasons they are used. Consequently, the purpose of this article is to outline what is known about tobacco ingredients and reported in the public domain, what has been available on a confidential basis to the U.S. government through reports required under the Federal Cigarette Labeling and Advertising Act (FCLAA) and the Comprehensive Smokeless Tobacco Health Education Act (CSTHEA)[2], and what the U.S. government scientists learned or could have learned through good laboratory work.

By the time Deyton began his tenure at the Center for Tobacco Products (CTP) last year, much was already in the public domain on ingredients used in tobacco products. First, there had been several studies published in the peer-reviewed literature that showed currently used ingredients at typical usage rates had little if any effect on the toxicological properties of mainstream tobacco smoke[3, 4, 5, 6, 7] when compared with the smoke from additive-free cigarettes. Those studies, as well as more than 100 related studies that can be found by searching for related articles in PubMed.gov (*www.ncbi.nlm.nih.gov/pubmed*), include listings of many of the additives, typically used combinations of those additives, studies on single-compound additives and complex materials, and references to analytical methods used to determine ingredient levels on tobacco.

Ingredient listings are available at several manufacturers' Web sites (and additional Web pages available from the given URL), including:

- Philip Morris USA, *www.pmusa.com/en/cms/Products/Cigarettes/Ingredients/default.aspx?src=top_nav*
- Lorillard, *www.lorillard.com/fileadmin/20090210Ingredients.pdf*
- R.J. Reynolds Tobacco Co., *www.rjrt.com/ingredients.aspx*
- Swedish Match, *www.swedishmatch.com/en/Our-business*
- U.S. Smokeless Tobacco Co., *www.ussmokeless.com/en/cms/Products/Ingredients_Nav/Ingredients/default.aspx*
- British American Tobacco, *www.batingredients.com*

Depending on how the ingredients and tobaccos are processed, other compounds (so-called reaction products) can be formed. These are known to experts in tobacco chemistry, and reports on the identities of some of these reaction products and methods for finding them can be found in tobacco company research reports that are in the Legacy Tobacco Documents Library at the University of California at San Francisco (*http://legacy.library.ucsf.edu*). However, if Deyton had only reviewed the major journal articles on tobacco ingredients and the information at the company Web sites, he would have had a hard time saying, "Tobacco products today are really the only human-consumed product that we don't know what's in them."

Since 1986, the U.S. government had been getting confidential ingredient disclosures from the tobacco industry under the FCLAA and the CSTHEA[2]. While it may be argued that the legislation called only for qualitative ingredient disclosures, there were voluntary agreements between several of the tobacco companies and the U.S. Centers for Disease Control and Prevention (CDC) Office of Smoking and Health to provide additional information such as maximum use levels and annual pounds used in production[8, 9].

continued on page 29

Was Deyton aware of that information at the time he spoke with Michael Felberbaum? In addition to the information in the disclosures, was Deyton aware of the studies[10, 11, 12] that CDC scientists had made on flavor-related compounds in tobacco products? Much earlier, other U.S. government scientists had also reported on flavors in tobacco products[13].

Even if Deyton did not have access to any of the information mentioned above, he could have had the FDA laboratories analyze tobacco products for added ingredients. Numerous articles on the detailed analyses of tobacco products have appeared in the general scientific literature as well as in journals devoted to tobacco science such as *Beiträge zur Tabakforschung International* (*www.beitraege-bti.de*) and *Tobacco Science* (*www.tobaccoscienceonline.org*).

Abstracts for many of the presentations at CORESTA meetings (*www.coresta.org*) and the Tobacco Science Research Conference (TSRC—formerly known as the Tobacco Chemists' Research Conference, TCRC) are available through Tobacco Abstracts (*www.tobaccoabstracts.ncsu.edu*). In addition, the symposium volumes of the TSRC and the TCRC are available and indexed at *www.cals.ncsu.edu/agcomm/rats_2006_contents.html*. Those articles and abstracts will often have enough information in them to perform a detailed analysis of a tobacco product. The articles and abstracts can often be used to identify company reports in the Legacy Tobacco Documents Library that provide detailed information on how to identify and quantify ingredients added to tobacco.

Detailed analytical studies were sometimes used to "reverse engineer" competitive product or to identify causes of poor hedonic qualities. Even with cigarettes and other smoking products, it is generally more efficient to analyze the unsmoked product. During the late 1980s, scientists at Brown & Williamson Tobacco Corp. (B&W) conducted a major reverse engineering project on a competitive cigarette product. The scientific instrumentation they used (mostly benchtop gas chromatography/mass spectrometry systems) was relatively "low-end" and far behind the instrumentation available today. However, the B&W scientists took advantage of their in-depth knowledge of analytical chemistry, tobacco science and organic chemistry to identify the additives and the relative proportions used in processing the tobacco[14]. One of the key aspects of that work was the identification of reaction products and their importance in the hedonic properties of the products. Listing of reaction products is required for the ingredient reporting due June 22[15]. The same researchers later turned their attention to compounds that migrate from packaging and other nontobacco sources to the product[16]. Such compounds are also required to be listed in the reports due June 22[15].

In this brief report, we have shown that Deyton could have found out the ingredients used in most tobacco products and the particular combinations used along with sufficient quantitative data to make any needed toxicological assessments if he wanted to do so. There is no doubt that analysis of tobacco products is technically challenging and that interpretation of the data can be difficult. However, the FDA is supposedly watching the foods we eat and the medicines we take to maintain our health. The identification of compounds in food, including added flavors and reaction products generated during cooking and other thermal processing, can be equally as challenging as making similar identifications in tobacco products. If the FDA can do such analyses on food, it could also analyze tobacco. However, it does not need to do so because all the information is already available in the literature, as we have shown. One of the hallmarks of good science is not to reinvent the wheel. TR

[1] Felberbaum, M. (2010). "What's in a cigarette? FDA to Study Ingredients." The Associated Press, Richmond, Virginia, Jan. 18.

[2] Centers for Disease Control and Prevention (2009). Tobacco Ingredient and Nicotine Reporting. *www.cdc.gov/tobacco/basic_information/tobacco_industry/reporting/index.htm*

[3] Gaworski, C.L., Heck, J.D., Bennett, M.B., Wenk, M.L. (1999). "Toxicologic evaluation of flavor ingredients added to cigarette tobacco: skin painting bioassay of cigarette smoke condensate in SENCAR mice." *Toxicology* 139(1-2):1-17.

[4] Carmines, E.L. (2002). "Evaluation of the potential effects of ingredients added to cigarettes. Part 1: cigarette design, testing approach, and review of results." *Food and Chemical Toxicology* 40(1):77-91 (see also parts 2, 3, and 4 in same journal).

[5] Baker, R.R., Massey, E.D., Smith, G. (2004). "An overview of the effects of tobacco ingredients on smoke chemistry and toxicity." *Food and Chemical Toxicology* 42 Suppl:S53-83 (see also parts 1 and 2 in same journal).

[6] Renne, R.A., et al. (2006). "Effects of flavoring and casing ingredients on the toxicity of mainstream cigarette smoke in rats." *Inhalation Toxicology* 18(9):685-706.

[7] Theophilus, E.H., et al. (2007). "Comparative 13-week cigarette smoke inhalation study in Sprague-Dawley rats: evaluation of cigarettes with two banded cigarette paper technologies." *Food and Chemical Toxicology* 45(6):1076-90.

[8] Solana, R.P. (2004). 2004 "Voluntary Submission Regarding Cigarette Ingredients." Philip Morris letter to R. Henson, CDC, March 25 (*http://legacy.library.ucsf.edu/tid/yqm86a00/pdf*).

[9] Ely, C., Jr. (2000). Letter of Feb. 4 to Michael E. Eriksen, Sc.D. Director, Office on Smoking and Health (*http://legacy.library.ucsf.edu/tid/erw11c00*).

[10] Stanfill, S.B., et al. (2006). "Quantification of flavor-related compounds in the unburned contents of bidi and clove cigarettes." *Journal of Agricultural and Food Chemistry* 54(22):8580-8.

[11] Stanfill, S.B., et al. (2003). "Concentrations of nine alkenylbenzenes, coumarin, piperonal and pulegone in Indian bidi cigarette tobacco." *Food and Chemical Toxicology* 41(2):30317.

[12] Watson, C.H., Ashley, D.L. (2000). "Quantitative analysis of acetates in cigarette tobacco using solid-phase microextraction and gas chromatography-mass spectrometry." *Journal of Chromatographic Science* 38(4):137-44.

[13] Chamberlain, W.J., Schlotzhauer, W.S., Chortyk, O.T. (1988). "Chemical composition of nonsmoking tobacco products." *Journal of Agricultural and Food Chemistry* 36(1):48-50.

[14] Lauterbach, J.H., Johnson, R.R. (1989). "The Project Adverb Study of Marlboro KS." *B&W Report*, Oct. 10 (*http://legacy.library.ucsf.edu/tid/bfk30f00*).

[15] Center for Tobacco Products (2009). Final Guidance for Industry. Listing of Ingredients in Tobacco Products. Nov. 25 (*www.fda.gov/downloads/TobaccoProducts/GuidanceComplianceRegulatoryInformation/UCM192053.pdf*).

[16] Lauterbach, J.H. (1993). "Brown & Williamson Consumer Inquiry program and its relationship with the analytical laboratories." *B&W Report*, June 28 (*http://legacy.library.ucsf.edu/tid/ahc51f00/pdf*).

About the author

John Lauterbach is the owner of Lauterbach & Associates, LLC, a company providing consulting services in chemistry and toxicology.