Conference Report

53rd Tobacco Science Research Conference (TSRC), September 12-15, 1999, in Montreal, Canada

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The 53rd Tobacco Science Research Conference (TSRC), held in Montreal on September 12–15, 1999, was attended by about 300 scientists; 82 papers and 11 posters were presented.

A keynote theme of the Conference was addressed in the Symposium on “Genetics and the Future of Tobacco”, with four contributions focussing on the effects of modern gene technology on tobacco growing, possible uses of transgenic tobacco and the main areas of research in this field, as well as consumer acceptance of transgenic products and regulatory issues, respectively.

Deborah Ayers Koller (Philip Morris, Richmond, VA, USA) emphasized that, in her opinion, the use of transgenic tobaccos involves no risks other than those associated with the use of conventionally grown or modified tobaccos. Especially the different way tobacco is being used in comparison to foodstuffs (combustion during smoking) strongly minimizes the risks of transferring intact DNA fragments to bacteria in the gastrointestinal tract, a mechanism which is often made responsible for the increase of resistance to antibiotics. For the same reason the occurrence of allergenic effects due to transgenically coded proteins is extremely unlikely.

D. Ayers Koller argued that, in view of the stringent quality control procedures applied to processed tobaccos during cigarette manufacture, there is also no real likelihood that metabolic changes in the transgenic tobacco plant could have unforeseen negative consequences. Finally, D. Ayers Koller referred to the potential of transgenic tobacco and its uses in the future. Possible

applications are not only the production of valuable products such as antibodies, vaccines or enzymes for industrial use (molecular farming), but also the reduction of toxicologically relevant constituents of tobacco.

In his paper, Thomas J. Hoban (Department of Sociology and Anthropology, NCSU Raleigh, NC, USA) reported on surveys to determine public acceptance of biotechnological products. According to this research, 70–72 % of Americans favoured the use of biotechnology in agriculture when surveyed in 1992, 1994 and 1998. In all three years of survey acceptance was higher among men than among women. In Europe, the use of gene technology in medicine received more approval than applications in agriculture (71–74 % in medicine, 57 % in crop protection and 43 % in the production of foodstuffs). There was a marked difference in the readiness to buy biotechnological products between the various countries (e.g. 74 % in Canada, 73 % in the USA, but only 30 % in Germany and 22 % in Austria). This was also true for consumer perception of whether genetically engineered foodstuffs presented a serious risk to the consumers (65 % in Sweden, 57 % in Germany and 21 % in the USA). Th. J. Hoban holds the view that smokers are unlikely to regard individual modified genes in tobacco as a serious risk.

Many contributions dealt with the subject of additives in cigarettes. C. L. Gaworski (Lorillard Tobacco Co, Greensboro, NC, USA) presented two posters comparing the biological effects of cigarettes to which different concentrations of humectants or flavours had been ad-

ded. With respect to humectants, cigarettes with glycerol (1.2–7.2 %) and propylene glycol (0.7–4.2 %) were tested individually and in combination in inhalation experiments using Fischer 344 rats. No substantial changes were found in the respiratory tracts of the humectant-exposed animals. Nor were any physiological and morphological changes seen other than those found in the control group exposed to smoke generated from cigarettes without humectants.

In another study by Gaworski, 150 flavours were added to cigarettes and analysed by mouse skin painting assays. For this purpose, test cigarettes were treated with flavours at increased concentrations (in typical mixtures) and the resulting CSC (cigarette smoke condensate) was administered to the animals. Biological endpoints such as tumor incidence and tumor multiplicity were not statistically different between the groups treated with CSC of test and reference cigarettes.

In a paper on the use of propylene glycol as humectant Mark R. Kagan (American Health Foundation, Valhalla, NY, USA) presented interesting data on the pyrolysis of propylene glycol during the smoking of cigarettes. The analysis of four different cigarette brands available on the US market showed concentrations of propylene glycol between 2.8 and 9.4 mg/g tobacco. As shown by initial results, propylene oxide (PO) is formed during the smoking of filter cigarettes in amounts of 12–104 ng/cigarette. Furthermore, very good correlation was found between the concentrations of propylene glycol in cigarettes and the PO content in mainstream smoke ($r^2 = 0.98$). However, the cigarettes were not investigated for possible traces of present propylene oxide before smoking. According to Mark R. Kagan, future research should concentrate on the determination of PO in sidestream smoke, the demonstration of hemoglobin and DNA adducts and the correlation of these adducts with cigarettes smoked, as well as the smoke analysis of cigarettes with untreated tobacco to determine whether PO may also be formed during pyrolysis of polysaccharides.

A number of papers dealt with pyrolysis experiments to analyse the transfer of nicotine into smoke. In his presentation, Jay A. Fournier (Philip Morris, Richmond, VA, USA), reported on studies comparing gas phase transfer rates of free nicotine and of nicotine carboxylic acid salts. Under the experimental conditions used (heating rates of 400°C/min), the gas phase transfer rate was 92–94 % for the protonized form of nicotine and 97 % for the unprotonized form. While nicotine transfer did not increase after the addition of urea, co-pyrolysis of diammonium phosphate (DAP) actually led to a reduction of nicotine transfer into the gas phase.

Cathy L. Ellis (Philip Morris, Richmond, VA, USA) presented the results of a study which examined the effects of ammonium compounds, absent from or

added to the tobacco blend of a commercial cigarette, on “smoke pH” and smoke nicotine. The ammonium concentrations in dry filler were 0.13–0.31 %, which resulted in amounts of ammonia in mainstream smoke of 6.1 µg–11.9 µg per cigarette. However, there was remarkably little influence of both filler ammonium and smoke ammonia on “smoke pH” which, for all cigarettes tested, was in the range of 5.27–5.35. Smoke nicotine was equally unaffected and was between 0.74 mg and 0.81 mg per cigarette when determined by the FTC method.

The paper by Robin Kinser (Philip Morris, Richmond, VA, USA) focussed on the ammonium content of cigarettes and the efficiency of the FTC method for determining nicotine in mainstream smoke. The ammonium content of the cigarettes analysed (both commercial and experimental) was between 0.12 and 0.41 % on a dry filler basis. The Cambridge filter used for the FTC method proved highly efficient for retaining nicotine from mainstream smoke (>99 % for all cigarettes).

In his paper, Paul R. Nelson (RJR, Winston-Salem, NC, USA) reported on measurements of the composition of naturally formed ETS and of ADSS (aged and diluted sidestream smoke) produced by smoking machines. ADSS is used in many biological exposure studies. The data indicate that particulate matter constituents and CO occur at higher concentrations in ETS, whereas higher concentrations of gas phase constituents are found in ADSS. These differences are explained by the absence of exhaled mainstream smoke in ADSS, as well as by the different profiles of the combustion processes. As it is often the practice in toxicological studies to standardize exposure by quantifying particles (RSP) and CO, the use of ADSS leads to increased exposure to gas phase constituents, as compared to real ETS (for some components, the difference reaches a factor of 2–3).

The influence of non-tobacco sources of nicotine on salivary cotinine concentration - which is often used as a biomarker for ETS exposure - was the subject of a presentation by Donald E. Leyden (Philip Morris Europe, Neuchâtel, Switzerland). Data based on a new method on salivary cotinine measurement showed nearly fivefold elevated cotinine values (1.5 ng/ml, mean) as expected on the basis of levels reported in the relevant literature.

Humberto Collazzo (Eastman Chemical Company, Kingsport, TN, USA) reported on a study of the aerodynamic properties of cellulose acetate fibres from cigarette filters. This study was prompted by research carried out by Pauly indicating that fibres which detach from the filter during smoking might be inhaled into the lung and could thus present an additional health risk to the smoker. The findings show that for each cigarette used for machine smoking, 0.3–4 fibres (375–437 µm in length and 25–50 µm in diameter) become detached.

Since particles exceeding the size of $10\text{ }\mu\text{m}$ are considered to be not respirable, it is extremely unlikely that individual fibres penetrate into the distal respiratory tract during smoking.

Many other papers which cannot be discussed here in detail dealt with methods for determining various smoke constituents. It was made clear that, due to legislative

requirements for the analysis of cigarette smoke constituents (for example, in Canada), the validation and standardization of analytical methods and measurements for determining smoke constituents will represent an important part of many laboratory activities in the future (M. F. Borgerding, RJR Winston-Salem, NC, USA; W. S. Rickert, Labstat, Kitchener, ON, Canada).