

LABORATORY
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Dear Hugh:

We were indeed most interested to receive your letter of January 19 and the accompanying report on the visit to Fabriques de Tabacs Reunies, Serrieras (Heuchetal). As Dr. Felton has pointed out, they have completely scrapped their ideas outlined in their original patent claim. I would think that the practicality of even their new process is very much in doubt both from the standpoint of efficiency of extraction and cost. It would, indeed, be interesting to know whether Matthey's work was conducted on tar from machine extracted or laboratory extracted tobacco.

As I think you know, we have recently started using an isotopic dilution technique for determining benzyrene. As a result of this technique, we feel we can place considerably greater reliance than formerly on the data which we obtain. The following table contains data obtained with the isotopic dilution method and these data indicate that extraction of tobacco with hexane does not cause any greater reduction of benzyrene than it does of the total particulate matter.

	Cigarettes prepared from:	
	<u>n-hexane extracted tobacco</u>	<u>Unextracted tobacco</u>
BP: $\mu\text{gm}/100$ cigs.	2.30	2.62
mg. tar/cigt.	24.2	23.4
SP ppm of tar	0.55	0.95

The amount of extract removed in this case was 4.2% based on the dry weight of tobacco. It will be noted that the reduction in tar in this experiment is only 14.8%. The average reduction for these cigarettes determined by constant smoking over a two-year period for biological testing, was 20% but there were occasional variations to as low as 15% and as high as 25% which we can only attribute to non-uniformity either of the extraction and/or in the cigarettes themselves. Determinations of the benzyrene contents of these tars were carried out but these analyses were

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were made before we started on the isotopic dilution technique, hence we hesitate to quote actual figures. However, the results most certainly do not support Bonnet & Eastman's claim to a 50% reduction in polycyclics, if, indeed, their statement is correct. (We note the correction slip says "aliphatic hydrocarbon reduction of 50 to 80%"). We would also add that most of Tennessee Eastman's data substantiates ours, although they have had one or two unexplained exceptions. Incidentally, just to keep the records straight, the work on assessing the effect of extraction on the benzo(a)pyrene content of smoke was not done by Dr. G. F. Wright but independently by Eastman and ourselves.

Confirmatory evidence of the unchanged ratio of benzo(a)pyrene to total particulate matter was given by long-term biological tests recently completed on our behalf by Dr. Gilman of the Ontario Veterinary College at Guelph. Both promotion and induction tests were run on C₃H male mice for a period of about 75 weeks. Whole tars from cigarettes made with benzene-extracted and non-extracted tobaccos were applied at the same rate. No significant differences in the response of the mice to the tars occurred when applied on the equal weight basis. It is important to know whether Neukom's toxicity tests are being carried out by using the same weight of tar or in the ratio of the weights of tars produced by the extracted and non-extracted tobaccos. We note that Matthey's results were reported per 100 grams of tobacco smoked and on this basis one would, therefore, expect to find a smaller amount of benzo(a)pyrene in the smoke of extracted tobacco cigarettes.

We have essentially repeated Bonnet and Neukom's original patent claim (Application No. 36606, to Commonwealth of Australia) in that 50 lbs. of tobacco (at 14% moisture) were washed with carbon tetrachloride for one hour at room temperature. After draining off the bulk of the solvent, the tobacco was first air-dried and then it was completely freed of solvent by passing a current of moist air over a 1-2" layer of the tobacco overnight. This treatment also made up most of the moisture losses. After one weekend of equilibration the tobacco had attained the same moisture content as that of the control tobacco. Both control and extracted tobaccos were made into regular cigarettes of identical weight and dimensions and smoked under identical conditions.

Results: Yield of extract: 1.3% (dry weight basis)
 % reduction in tobacco nicotine: 3.6%
 % reduction in whole tar: 4.5%
 % reduction in smoke nicotine: 8.6%

The extracted tobacco possessed a significantly better filling capacity as measured by the centrifuge method. The compression test on the cigarettes did not yield a significant difference between the extracted and control cigarettes because the standard deviation of these results was quite high, but the general trend was for the extracted tobacco cigarettes to be firmer which agrees with the results for the filling test.

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As a matter of interest, we would also mention that the filling and compression tests on n-hexane extracted tobacco and cigarettes and on the controls showed a significantly greater filling capacity for the extracted tobacco as well as a significantly greater resistance to compression for the extracted cigarettes.

Regarding the use of methylene chloride as a solvent we have carried out such an extraction of tobacco in a Soxhlet thimble. 6.5% of extract was obtained. No cigarettes were made from this tobacco, but from the amount of extract obtained, which represents a relatively small increase over the yield of a n-hexane extraction (4%), we would not expect the benzyrene in the smoke to be reduced by any significant amount over that of the tar reduction. In addition, we would not expect a spray extraction of the type used by Neukom and Bonnet to extract as much as a Soxhlet extraction and hence we would not expect either the tar reduction or benzyrene reduction by their method to be too different from that of a n-hexane extraction. You will, of course, realize that we are speculating a little bit here, the only concrete data we have being the 6.5% of extract obtained.

We would very much appreciate being kept informed of any further developments regarding extraction processes, the effects of extraction on the polynuclear hydrocarbon content of the smoke and the biological activity of the smoke. In particular, we would be most interested in the amount of extract removed by Bonnet & Neukom's process, if you should find it out.

With kindest regards,

Yours sincerely,

L. C. Laporte
RESEARCH AND DEVELOPMENT

LCW/TF

c.c. - Mr. R. S. Wada (2) ✓

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