

CONSIDERATIONS ARISING FROM THE NEUKOMM/BONNET PROCESS

The claims made by Neukomm and Bonnet are that treatment of tobacco with a non-inflammable solvent with or without the addition of an organo-metallic catalyst yields a material which, when burnt as cigarettes, produces

20% less tar
50% less polycyclic hydrocarbons (e.g. benzpyrene)
80% less aliphatic hydrocarbons

There is also the implied suggestion that the smoke is thereby made less carcinogenic, although Neukomm has been careful to avoid claiming this.

The "Association Suisse des Fabricants de Cigarettes" have an option on the machine and process, presumably for three months from 18th December, the date of the demonstration. Assuming that an extension of this time cannot be obtained, 18th March is the last date by which the A.S.F.C. must decide.

In order to test Neukomm's claims, it would be necessary to determine the amounts of 3:4-benzpyrene in cigarettes made from treated tobacco and from control cigarettes of the same blend, and preferably the same operation, but without treatment. This should preferably be done in triplicate, in each case and, in order to apply the mathematical theories developed by Sir Charles Ellis, in every case the benzpyrene arising from the burning of the first half should be compared with that from the second half. It will then be possible to calculate the extent to which re-pyrolisis of laid-down tar is affecting the yield of polycyclic hydrocarbon. These are the time-consuming experiments.

For each estimation of benzpyrene, 500 cigarettes would be required as a minimum (250 backs, 250 fronts) and assuming no snags a result would be available in three weeks or so. 1000 cigarettes and a time of a month would be preferable.

The determination of the amounts of tar and of nicotine in the smokes from treated and control cigarettes could be done fairly expeditiously, but would

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- 2 -

yield only the barest minimum of useful information. Again, a subdivision into "backs" and "fronts" in each case would be preferable and a determination of the filtration efficiency of the tobacco rod in each case would add supplementary information. This aspect of the problem could be investigated contemporaneously with the determination of benzpyrene.

It would also be possible to determine the total fluorescent neutral fraction (total aromatic hydrocarbons) during the period of benzpyrene assay.

It is apparent, therefore, that in the period remaining before 18th March, even if the tobacco treatment had already been carried out and that the samples of treated and control cigarettes were to hand, only one experiment could be carried out to determine the amount of benzpyrene in the smoke from treated and from control cigarettes. We should, therefore, press for an extension of the option period to enable a complete and independent check of Neukomm's claims to be made. A further period of 4 - 5 months from the date of receipt of sample cigarettes would enable a full and detailed check to be made. When time for manufacture, shipment and customs clearance is added, an extension of six months from the date of processing a sample through the Neukomm-Bonnet machine would seem to be the realistic target at which to aim.

Effect on R. & D. E. Programme

The determination of 3:4-benzpyrene in smoke would entail the complete discontinuance of similar work, at present being carried out on cigarettes containing PCL, for the entire period of the investigation. The estimation of total fluorescent neutral fraction would not be so lengthy but would interfere with similar work on PCL-containing cigarettes for a period of, very approximately, one month. The determination of tar and nicotine, by the usual R. & D.E. method could be fitted into the programme with the minimum of upheaval but would delay work on smoke densitometry or on smoke-PCL for a week or a fortnight.

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100159409

- 3 -

Determination of tar by Foster Snell method would be more difficult since, at present, this work is allied with the estimation of benzpyrene and the latter would absorb the available staff.

Biological Aspects

Although Neukomm has been careful to exclude claims for the biological effectiveness or otherwise of his treatment, there is implicit in his approach the suggestion that treatment will reduce the specific activity of smoke condensate, i.e. the biological potency per gram of tar. This presupposes that benzpyrene is the active material, which of course is by no means certain.

Any value which the Neukomm process may possess depends upon such a reduction and it may be considered desirable to initiate such biological tests. Three such tests are available, two of which, while rapid, are of doubtful meaning. These are

- (i) Skin painting of mice - long term study leading to skin cancers. It requires large numbers of mice and plentiful supplies of smoke condensate neutral fraction. While not quantitative in response, it might show when a considerable change in specific activity was achieved.
- (ii) Sebaceous gland Suppression Test - suggestive, rather than definitive. Rapid, yields results in a few weeks. Correlates fairly closely with results obtained under (i).
- (iii) Nawi test - devised by Neukomm himself. Again suggestive and rapid. Correlates fairly closely with sebaceous gland suppression test but is sometimes negative with some carcinogenic hydrocarbons.

Both (ii) and (iii) can yield "false positives".

None of the above three tests can be said to be very relevant to the problem of human lung cancer, but they are the best available at present.

All three tests are now being conducted by Dr. Day at Leeds, who has expressed himself to I.M.S.C. (through Dr. Bentley of I.T.Co.) as willing to undertake any tests required. He has plenty of space for animals. The limiting feature of such tests, which applies to (i) only, is facilities for cigarette

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- 4 -

smoking. For skin painting tests, Day would require a minimum of 100 mice for treated cigarettes and 100 for control cigarettes. The experiment would run for at least a year, and preferably 18 months, and each group of animals would require condensate from 150,000 cigarettes in each case, thereby demanding facilities for the smoking and processing of 4,000 cigarettes per week. This would be utterly beyond the capacity of the unit operated by I.T.Co. on behalf of T.M.S.C., and would require detailed planned expansion, i.e. provision of more smoking machines, staff training, etc. Tests (ii) and (iii) are relatively simple and would require only very small amounts of condensate which could be produced by R. & D.E.

Logically, of course, the production of cancers is the only certain test of carcinogenicity and thus Test (i) is the only way in which the biological effectiveness of Neukomm's treatment can be evaluated. Even then, the results cannot fairly be extrapolated to the human.

Other Collaboration

1) I.T.Co. (of G.B. & I.), Bristol. This unit has discontinued the assay of benzpyrene in smoke and is largely occupied with determinations of tar and nicotine and the preparation of smoke fractions for biological testing by M.R.C. and T.M.S.C. grantees. They could not usefully undertake any work on cigarettes treated by the Neukomm process.

ii) I.T.Co. (Canada). These laboratories have a procedure established for benzpyrene assay, and it might be considered advisable to suggest, and check, the effort of R. & D.E. in this direction. They also have access, through Dr. Gilman, to biological testing facilities (mouse skin painting) and may be able to arrange for such evaluation more readily.

Mr. Dobson's Questions

Considerations, such as the foregoing, greatly colour any answers which could be made to Mr. Dobson's four questions. Clearly, the minimum quantity

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- 5 -

of tobacco to be processed is that which is just sufficient to enable machine-made cigarettes to be manufactured, e.g. 30 Kg. A somewhat larger quantity would ensure that the machine was operating under steady and optimum conditions. However, if biological testing were to be undertaken, many more cigarettes would be required, especially if skin painting studies are to be made. Thus the questions may be answered from two aspects.

Chemical Analysis Only

(a) Minimum number of Cigarettes : 20,000. In order to obtain these, it is suggested that 100 Kg of tobacco be processed on the Neukomm machine, the initial hour's run being discarded. The remainder should be made into cigarettes and 20,000 sent to R. & D.E. Perhaps 20,000 might also be sent to Canada, for analysis.

(b) No tobacco, other than made cigarettes would be required.

(c) A minimum number of 20,000 cigarettes from the same operation, but untreated by the N/B process, would be required, as a control group. If Canada's aid is enlisted, they should be supplied with 20,000 also.

(d) Samples should be sent to R. & D.E. Southampton and perhaps, also, to I.T.Co. (Canada) Ltd., Montreal.

Chemical and Biological Investigations - assuming skin-painting experiments are undertaken.

(a) Minimum number of cigarettes : 20,000 + 150,000 - say 200,000 to be on the safe side. This would represent a run of at least 200 Kgs on the Neukomm machine, i.e. 2 days, again rejecting the initial portion until the machine is settled down.

(b) Again, no tobacco other than cigarettes would be required.

(c) 200,000 cigarettes would be required as a control group

(d) As above. The above figures are based on the assumption that

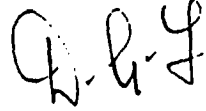
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- 6 -

either Canada or R. & D.E. arrange for biological testing, but not both.

The quantities of cigarettes called for under either set of investigations would provide sufficient for a fairly extensive series of smoking taste evaluations.



D. G. FELTON

DGF/BWR/46D

5th January, 1960

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