

DARK TOBACCO CIGARETTES

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Summary

Although a number of studies have been undertaken, there is relatively little information on dark tobacco cigarettes. Apart from the interest in cigar tobaccos, this may be partly due to the local 'native' nature of dark tobaccos, which are often produced from local, or locally naturalised, seed lines.

Mouse-skin studies show that condensate from dark tobaccos, including cigar tobacco manufactured into cigarettes, are at least as tumorigenic and often more tumorigenic than that from flue-cured Burley and oriental tobaccos.

Following a long-term inhalation experiment, assessed on the basis of the severity of laryngeal lesions in hamsters, Dontenwill concluded that smoke from a "black" cigarette was biologically very much less active than smoke from the reference cigarette; the latter being a 'standard' German blend. It should be noted, however, that the reduction in biological activity could be accounted for almost entirely by a lower accumulated dose from the "black" cigarette due to a shorter exposure time and the lower delivery of smoke. A similar reason may also be advanced for the marked reductions found for filter tip versions of the reference blend.

Because of the publicity which has surrounded the work of Passey and his colleagues, this must also be included in a consideration of dark tobacco cigarettes. Nevertheless, the studies, which were undertaken under poor experimental conditions, have been severely criticised and do not add materially to our knowledge of dark tobacco cigarettes.

In conclusion, the hypothesis that smoke from dark cigarettes is "safer" than that from flue-cured or blended cigarettes is certainly not supported by the results of the mouse-skin painting experiments and the Dontenwill inhalation study appears to provide only shaky supporting evidence. On the present evidence, it is suggested that any concept of a lower risk attached to dark cigarettes can, in a given population, only be associated with a reduced level of inhalation (accumulated dose) from such products.

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### a) Study of Cigar Tobacco Condensate

Following reports from Croninger (1) and Homburger (2), which suggested, but did not prove statistically, that cigar smoke condensate was more carcinogenic than that from cigarette smoke, Davies and Day (3) re-examined the position.

The results obtained after 116 weeks showed that the condensate from the cigar was more carcinogenic than that of the cigarette manufactured from cigar tobacco or from flue-cured tobacco. There was no significant difference in carcinogenicity to mouse-skin of the condensates from the two cigarettes. The differences in mortality rates were small and the results were not affected by age-standardisation.

### b) Comparison of Tobacco Types

In a further TRC experiment, a number of different types of tobacco, including an air-cured fermented (Paraguay) tobacco, were examined. The tumorigenic ratios and 95% confidence limits for the condensates from the various cigarettes compared with the flue-cured "control" (T4) were:

Sample T16	Air-cured fermented	1.38	(1.14 - 1.65)
T17	Burley	1.07	(0.89 - 1.29)
T18	Oriental	1.11	(0.92 - 1.33)
T19	Indian sun-cured	1.55	(1.29 - 1.90)
T20	Indian flue-cured	1.22	(1.02 - 1.47)

These results show that condensate from air-cured fermented tobacco is more tumorigenic than the flue-cured control. Condensate from Indian sun-cured is also more tumorigenic, while that from Indian flue-cured tobacco is just significantly more tumorigenic than the control. The differences for Burley and Oriental tobaccos are not significant.

Subsequently, Imperial Tobacco Ltd. have compared condensates from Gauloises and other continental brands with Embassy cigarettes. Full details are not available, but at 92 weeks, it was clear that condensate from Gauloises Caporal plain

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was very much more tumorigenic than that of Embassy filter.

The ranking was :

Gauloises > Belga Rouge filter > Nazionali Esportazione >  
Embassy

c) Inhalation Study Dontenwill et al. (4)

In this long-term experiment, smoke from a "black" cigarette manufactured from a blend of Burley (15%), Maryland (6%), and dark tobaccos was compared with a "standard" German blend and various other cigarettes.

Comparison of the various cigarettes was based on the severe laryngeal changes found following exposure of hamsters to 30 cigarettes twice a day for up to two years. On this basis, smoke from the "black" cigarette was found to have only 33% (stage 5) or 12% (stage 6) of the activity of the reference cigarette, ie. a 67-88% reduction in activity .

Apart from the absence of suitable methods for the analysis of such experiments, two main factors should be considered in attempting to put these results into perspective.

1. Cellulose acetate or paper filter versions of the reference cigarette also led to a considerable reduction in activity; 56-60% (stage 5) and 76-99% (stage 6) respectively.

2. The condensate delivery from the "black" cigarette was nearly 40% lower than that from the reference cigarette and the exposure time was also 20% lower. Similarly, condensate deliveries from the filter cigarettes were 30 and 33% lower than that of the reference cigarette.

Since the above reduction in condensate delivery and exposure time for the "black" cigarette compared with the reference cigarette obviously reduce the total accumulated dose to the respiratory system, it is considered that the marked reduction in biological response should be treated with considerable caution.

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Other Inhalation Studies Passey et al. (5)

In two experiments, groups of 12 rats were exposed to smoke under what can only be considered as poor experimental conditions. In one experiment, cigarette smoke was compared with smoke from cigarettes manufactured from cigar tobacco (TRC C2). A commercial cigar tobacco cigarette (Calypso) and a cigarette manufactured from Burley tobacco (TRC T17) were included in the second experiment. The rats exposed to smoke from flue-cured tobacco died early and with enlarged and severely diseased lungs.

The conclusions drawn were that smoke from flue-cured cigarettes is more dangerous to man and to animals than that from air-cured tobaccos and that this is related to the method of curing (and the sugar content) of the tobaccos.

These experiments have been criticised severely because the pathological findings of the rats which died suddenly could be related to an inflammatory condition not regularly encountered in man: Passey himself stated that chronic respiratory disease and bronchiectasis were endemic in the strain of rats used for their studies. Passey also undertook some limited mouse-skin painting experiments.

Passey's studies have become linked to lung cancer (because of a limited mouse-skin study) and also to a theory of lung cancer induction advanced by Braven and Fenner (7): the latter because of Passey's contention that the sugar content of the tobacco was an important factor. In the same review (6), it is argued that, although the studies of Passey may conceivably have some relevance to chronic inflammatory lung disease in man, there are no grounds for regarding them as relevant to lung cancer.

The link with sugar content and Braven and Fenner's work is also criticised, since there is no evidence that cystein offers protection from cancer inducing effects of chemical agents.

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2. Homburger, F. et al J. Natn. Cancer Inst. 1963, 31, 1445
3. Davies R.F. et al. Br. J. Cancer, 1969, 23, 363
4. Dontenwill, W. et al. J. Natn. Cancer Inst. 1973, 51, 1781
5. Passey, R.D. et al Br. med. J. 1971, IV, 198
6. Editorial Lancet, 1973, 187
7. Braven, J. et al. Br. J. Cancer, 1967, 21, 623
8. Fenner, M.L. et al. Br. J. Cancer, 1968, 22, 474

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APPENDIX

Details of Cigarettes and Cigars used in TRC Cigar Study

Table 1

Code	Length (mm)	Circum (mm)	Weight (g)	Butt Length (mm)	Puff No.	NVWSC <sup>(4)</sup> (mg)
C1 <sup>(1)</sup>	83	33.7	1.86	25	19.8	37.8
C2 <sup>(2)</sup>	70	25.1	0.94	20	8.4	19.4
T4 <sup>(3)</sup>	70	25.3	1.09	20	10.9	26.3

- (1) Composite blend cigar tobacco; granulated wrapper and binder of natural leaf.  
 (2) Blend as C1 cut at 50 cpi for cigarette manufacture  
 (3) Composite blend of flue-cured tobacco.  
 (4) Non volatile whole smoke condensate.

Smoking conditions : puff volume 25 ml  
 duration 2 seconds  
 one puff per minute

Table 2

Summary of results from Dontenwill Inhalation Study

Sample	Condensate		Relative Exposure Factor	Laryngeal Changes Relative Potency	
	Dry (mg/cig)	Factor		Stage 5	Stage 6
Control <sup>(1)</sup>	33.7	1.0	1.0	1.0	1.0
"Black" <sup>(2)</sup>	20.9	0.62	0.8	0.33	0.12
Control Acetate Filter	23.5	0.70	1.0	0.44	0.06
Control Paper Filter	22.7	0.67	1.1	0.40	0.24

- (1) German blend: 55% flue-cured, 35% oriental and 10% Burley  
 (2) Black cigarette: 15% Burley, 6% Maryland, 6% Java,  
 19% cigar tobacco, 54% other dark tobacco

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