

AN INVESTIGATION OF THE
GENERATION OF FREE RADICALS
BY COMBUSTION OF TOBACCO

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SUMMARY

Cigarette smoke has been shown to contain free radicals in both the vapour phase and the particulate phase. The most satisfactory way to investigate free radicals is by electron spin resonance. However, since such a method was not at our disposal a colorimetric method using diphenyl picryl hydrazyl (DPPH) was used. The work was restricted to particulate phase after determining that over 90% of the free radicals sufficiently stable for detection by this method, were present in the particulate phase.

The following conclusions were drawn from the determination of free radicals in T.P.M.

The filtration efficiency of BENSON and HEDGES' plugs was approximately 50% with respect to free radicals. This indicates that cellulose acetate filters are not selective for free radicals compared to T.P.M.

By extracting tobacco, making cigarettes from the extracted tobacco and analysing the cigarettes it was found that no one fraction contributes disproportionately to the production of free radicals within the limitations of the fractionation scheme used.

C.R.S. generates less free radicals than does the corresponding lamina.

The addition of nitrates and nitrites to cigarettes has little or no effect on the free radical content as measured by this method.

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A study of free radical production by pyrolysis gave the following information.

It confirmed the conclusion that C.R.S. produces less free radicals than does leaf.

Artificial tobacco ("Artob") and P.L. do not differ significantly in the level of stable free radicals produced, a level which is, however, considerably less than that of Virginia tobacco.

Cellulose was found to yield more stable free radicals per gram than tobacco lamina, while pectin, lignin and sodium carboxymethyl cellulose (SCMC) all gave significantly lower yields than lamina.

Finally as the temperature of pyrolysis is raised from 120 to 800°C the stable free radical production increases from zero to a maximum at approximately 550°C and decreases again thereafter.

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