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CANCER AND SMOKING

THE CURIOUS ASSOCIATIONS with lung cancer found in relation to smoking habits do not, in the minds of some of us, lend themselves easily to the simple conclusion that the products of combustion reaching the surface of the bronchus induce, though after a long interval, the development of a cancer. If, for example, it were possible to infer that inhaling cigarette smoke was a practice of considerable prophylactic value in preventing the disease, for the practice of inhaling is rarer among patients with cancer of the lung than with others.

Such results suggest that an error has been made of an old kind, in arguing from correlation to causation, and that the possibility should be explored that the different smoking classes, cigarette smokers, cigar smokers, pipe smokers, etc., have adopted their habits partly by reason of their personal temperaments and dispositions, and are not lightly to be assumed to be equivalent in their genotypic composition. Such differences in genetic make-up between those classes would naturally be associated with differences of disease incidence without the disease being causally connected with smoking. It would then seem not so paradoxical that the stronger fumes of pipes or cigars should be so much less associated with cancer than those of cigarettes, or that the practice of drawing cigarette smoke in bulk into the lung would have apparently a protective effect.

A letter of mine in *Nature*[1] included a brief first report of some data on the smoking habits of twins in Germany kindly supplied by Prof. v. Verschuen. What was evident in these data, which concerned only males, was that the smoking habits of monozygotic, or one-egg, twins were clearly more alike than those of twins derived from two eggs. The monozygotic twins are identical in genotype and the clear difference in these data gave *prima facie* evidence that among the many causes which may influence the smoking habit, the genotype is not unimportant.

Unfortunately, considerable propaganda is now being developed to convince the public that cigarette smoking is dangerous, and it is perhaps natural that efforts should be made to discredit evidence which suggests a different view. Assumptions are put forward which, *if true*, would show my inference from von Verschuen's data not indeed to be false but at least to be inconclusive. I may refer to an anonymous writer "Geminus" in the *New Scientist*[2], who supports in this way "what is rapidly becoming an accepted truth—that smoking can cause lung cancer".

If it could be assumed as known facts (*a*) that twins greatly influence each other's smoking habits, and (*b*) that this influence is much stronger between monozygotic than between dizygotic twins, then an alternative explanation would be afforded for the result I have emphasized. The assumptions can be supported by eloquence*, but they should, for scientific purposes, be supported by verifiable observations.

[1] Fisher, R. A., *Nature*, 108 (1958).
[2] "Geminus", *New Scientist*, **4**, 440 (1958).

Since my letter was written, however, I have received from Dr. Eliot Slater, of the Maudsley Hospital (London, S.E.5), some further data, the greater part of which concern girl twins, and in this way supply a valuable supplement to Verschuer's data, and in which, moreover, a considerable number of pairs were separated at or shortly after birth.

For the resemblance in smoking habits, these female pairs give:

	Alike	*Unlike*	*Total*
Monozygotic	44	9	33
Dizygotic	9	9	18

So far, there is only a clear confirmation of the conclusion from the German data that the monozygotic are much more alike than the dizygotics in their smoking habits. The peculiar value of these data, however, lie in the subdivision of the monozygotic pairs into those separated at birth and those brought up together. Those are:

	Alike	*Unlike*	*Total*
Separated	23	4	27
Not separated	21	5	26

Of the 9 cases of unlike smoking habits, only 4 occur among the 27 separated at birth. It would appear that the small proportion unlike among these 53 monozygotic pairs is not to be ascribed to mutual influence.

There is nothing to stop those who greatly desire it from believing that lung cancer is caused by smoking cigarettes. They should also believe that inhaling cigarette smoke is a protection. To believe this is, however, to run the risk of failing to recognize, and therefore failing to prevent, other and more genuine causes.

* The quotation from "Geminus" was too short to do justice to the techniques of "modern publicity". The two paragraphs which follow deserve careful reading. They show how a simple assumption, which *might* have been true (though the first factual evidence at once showed it not to be) is progressively built up into confident assertions that both my method and my results were erroneous; and as it is built up, so it is progressively ornamented.

The public should not think that publicity, even if supported by the Ministry of Health, is always aimed at *improving* public knowledge.

"But things are not really as simple as this. Comparisons of identical and non-identical twins are unimpeachable when they are used to assess the inevitability of purely physiological characteristics, but the habit of smoking is not necessarily physiological at all. And in the formation of psychological attitudes towards smoking, one would expect that identical twins would be more likely to go along with each other than would non-identical twins. For one thing they must constantly be reminded of their identity by all those around them, and they are bound eventually to be blessed with a conviction that they ought always to do similar things. This, after all, is what society expects of them.

"Such a correlation of all kinds of habits might easily account for Sir Ronald Fisher's results. So it is too much to say that these imply the inheritance of smoking and of a susceptibility to lung cancer may be jointly inherited. There is therefore no support for the corollary that those who are going to die of lung cancer will do whether they smoke or not. I hope that heavy smokers will not seek some kind of solace in this latest smoke-screen between them and what is rapidly becoming an accepted truth—that smoking can cause lung cancer."

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