

CILIARY INHIBITION AS A TEST FOR IRRITANTS  
IN CIGARETTE SMOKE

T.M.S.C. has already agreed in principle that research should be undertaken at Harrogate into a study of the effects of irritant substances on lung tissue, with the aim of providing a scheme for the bio-assay of tobacco smoke. One approach has already been suggested: the study of goblet cell formation and proliferation, especially in the peripheral areas of the lungs of experimental animals, following closely the lines suggested by the work of Dr. Lynne Reid. A second approach, which has been discussed in the past, is based on the work of Dr. Leuchtenberger and is concerned with the progressive development of inflammatory and hyperplastic states following exposure of lungs of intact animals to irritants.

The purpose of this note is to suggest a third approach which, while closely linked to the other two, may be expected to yield a bio-assay method rapidly and which, moreover, may provide information complementary to that expected to be obtained by the Lynne Reid technique. This third study would consist in the development and use of a method for measuring ciliary activity and its inhibition in the trachea of intact animals, inhaling cigarette smoke and known irritant substances.

The purpose of ciliary action as a means of moving the mucous carpet lining the bronchial and tracheal epithelium and thus helping to rid the lungs of foreign bodies and debris, is so wellknown as to need no further explanation. What is not so well understood is the degree of importance to be attached to this route of elimination, compared with the alternative of phagocytosis. A second aim of the research would, therefore, be to

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assess the importance and relevance of this body defence mechanism to lung disease in general.

The inhibition of ciliary movement has already been proposed as a method of bio-assay but this has been based on in vitro testing, using ciliated epithelium derived from frog oesophagus or mussel or clam gills. These tissues are concerned with the digestive apparatus of the organisms and in the case of mammals, the cilia are lost from these organs before or at birth. In mammals, ciliated epithelium is only encountered in the respiratory tract or in the genito-urinary tract. Therefore, while there is no reason at present to suggest that the activity of ciliated epithelium may depend upon its site or purpose, it would seem more relevant to the problems of the effects of smoke on the lungs, if the techniques of bio-assay were concerned with ciliated epithelium from the respiratory tract and that this should be done in vivo on intact mammals so that recovery and regenerative processes may also be studied.

There are additional reasons for suggesting this approach. Thus, it has been suggested in the past that ciliated epithelium can be transformed into:

- (a) stratified squamous epithelium.
- (b) glandular cells, e.g. goblet cells in the trachea of lower animals.

It is, therefore, conceivable, once a suitable technique has been established for measuring ciliary activity and its inhibition, that it may be applied as a research tool to study the effect of chronic exposures on cellular transformation and this approach would complement that based on the work of Dr. Lynne Reid.

Dalhamn in Sweden, has already developed a technique for observing the ciliary beat in the trachea of living animals, by using high speed cine

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micrography through a tracheotomy while the anaesthetised animal is made to respire an irritant gas or smoke aerosol. An alternative, and simpler technique, which would dispense with cine micrography, may perhaps be to use stroboscopic illumination.

At this stage, it would seem premature to do more than lay down the broad aims of the proposed project. The physiologist appointed to pursue the work should, preferably, be <sup>a</sup>relatively <sup>young</sup> man with a sound research outlook who, it would be hoped, could develop the approach in a profitable, and scientific manner, thereby enhancing the reputation and standing, both of himself and of Harrogate.

ESTIMATE OF COST

Medically qualified Physiologist (Ph.D) 28-35 years old	£2,000 - £3,000
Superannuation (15%)	£ 300 - £ 450
One Senior Technician	£1,000
One Junior Technician	£ 500
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Approx.	£5,000
25% for overheads and running expenses	£1,250
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Estimated total cost per annum	£6,250
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This does not include the capital cost of laboratory space, laboratory furniture or laboratory equipment.

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