# AIR POLLUTION AND RESPIRATORY DISEASE

J. L. BURN, M.D., D.HY., D.P.H.
*Medical Officer of Health, Salford*

At least 23,000 people die each year in England and Wales from chronic bronchitis, the " English disease " which accounts for about 7 per cent of all deaths—ten to forty times the recorded incidence in Scandinavian countries, and four times as high as that in the Ruhr or industrial Belgium. An impressive consistency is also seen in the increase in death rates from rural to small urban areas; other chronic respiratory diseases, such as lung cancer, pneumonia, and tuberculosis show a similar gradient but not so steep as that of bronchitis. A damp climate may exercise a deleterious effect. Air pollution, density of population, overcrowding, inadequate nutrition, social, economic, and occupational, environmental evils, all factors in urbanization, have a close association with disease and death from this cause.

Sub-acute pollution is defined by P. J. Lawther as that which " occurs frequently on winter evenings when high levels are reached for short periods ". Chronic pollution is at a high level in urban industrial areas throughout the year, but particularly in winter. An important study (Reid—1958)—a model of its kind—has been made by collecting figures of absence from work because of ' bronchitis '. The Civil Service contains large groups of men and women which have uniform pay, work, superannuation, sickness pay, and medical supervision. They are widely dispersed throughout the country in areas of high and low population density and air-pollution concentration. Their sickness records are meticulously kept and medical reasons for retirement are carefully considered by the Treasury Medical Service. Reid found that the wastage rates among postmen due to premature retirement because of bronchitis and pneumonia was highest in the large towns and industrial areas. Gradations of climate or temperature did not explain this fact and the pattern was not determined by social or occupational differences; some factor which operates in large industrial towns appears to be responsible, and the suspicion that

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this was in fact air pollution was heightened by the finding of increased sickness absence among postmen in the north-east of London where pollution is high because it is brought there by the prevailing winds. This work was extended and sickness absence rates were related to presumptive air pollution by means of fog frequency figures. Reid has summarized the early findings thus:—

> . . . we have found that in a stable group of men doing the same job for the same pay under the same conditions of service, there are wide geographic variations in the incidence of disabling respiratory disease. These variations cannot be explained by social, economic or occupational factors, or by any consistent differences in climate other than fog. Not only do more postmen become disabled by chronic bronchitis in areas where thick and presumably polluted fog is more frequent, but the character and natural history of the disease in these areas reflects variation in atmospheric pollution. In the most heavily polluted areas of the country—namely, the industrial cities—minor infections among younger bronchitics do not appear to be much more frequent than elsewhere. But among the older chronic bronchitic postmen in polluted areas these minor infections lead to more frequent absence from work, and seem more often to lead on to complications such as pleurisy, pneumonia and circulatory failure which hasten death.

In Newcastle upon Tyne a survey of 1,202 persons over the age of thirty suffering from chronic bronchitis has been carried out, using a sample consisting of every fortieth house, taken from the voters' list. It was thought that

> infection is the dominating factor in chronic bronchitis, but this is maintained and aggravated by other environmental agents. Such environmental factors seem to be cigarette smoking, atmospheric pollution (particularly in enclosed situations), and dust, draughts, and extremes of temperature at work. Elimination of these factors might well lead to arrest or healing of the process during the early stage, before irreversible changes occur.

## Sulphur Dioxide

Pemberton found that there was a significant correlation between the average sulphur dioxide air pollution in the county boroughs of England and Wales, and the mortality rates for bronchitis in men aged forty-five and over, for the three years 1950, 1951, and 1952.

There was no significant association between average sulphur dioxide pollution and two indices of general social conditions. The latter consisted of one based on income and one on housing conditions. The evidence supports the hypothesis that sulphur dioxide air pollution is a factor in determining the magnitude of the bronchitis death rate of middle-aged and elderly males. The consistency of the relationship between mean sulphur dioxide pollution and bronchitis death rates in the county boroughs does strongly suggest that, whatever other factors may be involved, sulphur dioxide pollution plays some part in causing death from bronchitis. From the limited data examined it would seem to be more important in this respect than pollution of the air with solid

matter. Sulphur dioxide has been shown to be capable of precipitating asthma in certain susceptible individuals, and Waller and Lawther noted an increase in bronchospasm in some patients with chronic bronchitis during a fog in which the atmospheric sulphur dioxide underwent a sharp increase. Prevention of infective processes concerned is uncertain, personal habits are difficult to influence and only air pollution remains as a man made circumstance which should be capable of control.

### Lung Cancer

There has been much speculation as to the cause of lung cancer, incriminating cigarette smoking, air pollution, occupational hazards, cigarette lighters, oil fumes, and so on. The Medical Research Council in their statement (1957) on Tobacco Smoking and Cancer of the Lung were unable to define the extent of the proportion of cases due to air pollution, but most observers accept the direct cause and effect between the gross pollution in urban areas and a proportion of the deaths from lung cancer.

The death rates in rural areas, with lessened air pollution, greater air turbulence, more sunlight, and less density per acre, are consistently lower.

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## RESEARCH ON AIR POLLUTION

P. S. LAWTHER, M.B., B.S., M.R.C.P.

Director Medical Research Council's Group for Research on Atmospheric Pollution

One could argue that there is no need to continue research on the clinical effects of air pollution; at its worst it is manifestly lethal and in its milder forms it could never be said to be beneficial to man. Hence there is an overwhelming case for its summary abolition by fuel technologists and chemical engineers. But in their formidable tasks the technologists will require us to define our problem and to tell them in what respects it differs from the economic and climatic considerations with which they are already wrestling. We cannot yet give a meaningful definition of physiologically pure air, and we must therefore be prepared to say how clean we want it in order to be sure that it will not be harmful.

Research must be directed to the determination of the chemical and physical nature of pollutants, to the investigation of their clinical effects in differing concentrations, to devise means of protection