

day experience for ten years in a large mining population supports those tables. In fact, I know of no disease peculiar to miners, or any disease in excess existing among miners. I have also consulted many other medical men practising amongst colliers, and their opinion coincides with my own. In conclusion, I have to state, as my belief, that the conditions connected with miners' occupation are as favorable to health as those in the occupation of any other workmen, and this opinion is borne out by the vital statistics quoted.

#### The Etiology of Phthisis

This subject, so frequently touched upon, has been admirably dealt with in an experimental manner, in a paper by R. W. Philp, M.D., F.R.C.P., E., before the Ninth International Congress. From the clinical standpoint, nothing can be more important to the practitioner than to be able to obtain some correct idea of the methods by which the disease progresses, and the factors principally engaged in its causation. The usual causes of death from phthisis have usually been roughly classed, says Philp, under four heads: (1) Progressive asthenia; (2) loss of hæmatisis; (3) the lighting up of fresh inflammatory foci; (4) the absorption of waste products. In his opinion, however, these do not afford sufficient explanation. Each of them was fully discussed prior to the discovery of the tubercle, but since then but little had been added in this direction, though the features and clinical course of an ordinary case of phthisis, and those of experimentally induced tuberculosis, are well defined and strikingly similar. What then, is the *modus operandi* of the tubercle bacillus in leading towards death? Its fatal propensities cannot, he thinks, be regarded as merely irritant or privative. In all probability they are attributable to a power often possessed by it of elaborating new products which are afterwards absorbed. Weber, as early as 1885, had already hinted at such a possibility. Such elaboration has its analogues in the various fermentative processes and products thereof, as of alcohol, lactic acid, etc.

On practically applying the hypothesis based upon such analogies, Philp devoted his attention first of all to the urine.

The results, however, were indefinite. Examination of portions of diseased organs was similarly abandoned owing to indefinite, determining evidence.

Sputum was, for a number of detailed reasons, resorted to. Extracts were used for experimentation from different phthisical sputa. The sputum was carefully collected in a clean vessel in the wards of the Royal Infirmary, Edinburgh. From (1), all such cases used as showed signs of advancing phthisis; (2), all those with persistently elevated temperature; (3), sputum from smokers was set aside; (4), the reaction of the sputum in all cases was required to be either acid or neutral; (4), the presence, and, approximately, the relative abundance of the tubercles was in every instance ascertained.

The sputum was then measured and diluted with three volumes of rectified spirit. Having been placed in a Florence flask with neck covered with muslin, it is placed in a steam sterilizer and kept at 36.40 C. for twenty-four hours. The fluid is then carefully filtered through muslin and filter paper. Then evaporated down to its bulk.

This is now become a muddy-looking extract. This process of drying out is conducted slowly to prevent escape of more volatile products. The extract was then used for injection. The extract is extremely unstable and liable to attack of fungoid growths. The extract was used always within two or three days from time of preparation.

The experiments were made to show: (1), Its effects on the system generally; (2), its effects on the cardiac rate; (3), to test the antagonistic effects of certain drugs, especially atropine, and especially as seen in the cardiac rate.

Then follows a series of experiments on (a) frogs, (b) on mammalia.

On frogs the result showed a striking uniformity—a progressive increase in the symptoms being observable in the increased dosage, till tending toward the development of voluntary motor depression—contraction of pupil, but with reflexes remaining normal. On mice .3 c. c. of the extract produced definite symptoms.

On rabbits the effects were with considerable doses produced, but tended to become transitory while the system became tolerant of the poison.

The poison proved a steady cardiac depressant. In larger doses the cardiac rate was reduced from 44 to 18 or 14 in four hours, associated also with decrease of weight.

Atropine was found to alter the effects. Most perfect antagonism was produced by  $\frac{1}{10}$  m.m. of