4.4.3. Experimental Work: Wagner at the Pneumoconiosis Research Unit has shown (1964) that under animal experimental conditions, asbestos appears to be a powerful carcinogen. Twenty mg. of asbestos injected into the pleura of specific pathogen-free strains of rats has produced mesothelial tumours in a high proportion of animals. This is so for Chrysotile, Amosite and Crocidolite, both natural and after extraction of its natural oil by a single solvent. The investigation, a survival experiment, is not yet complete, thus, it is not yet known whether there are significant differences in the number of tumours produced by different types of fibres. So far, Amosite has produced the least.

Studies on the organic components of asbestos are being carried out by Harington of the Chester Beatty Research Institute. No hydrocarbons have been isolated from Chrysotile, but Crocidolite, which was mined in an area of South Africa with a high incidence of mesothelioma, contained 3,4 benzopyrene in relatively high amounts. Harington (1965) has also shown that during a storage period of 6 months, asbestos absorbs 70-85% of the jute oil present in jute sacks. It is not yet clear whether these oils are of any biological or medical importance.

The suggestion has been made that asbestos carcinogenicity may be related to the metals or metal complexes contained in asbestos fibres; Chrysotile contains nickel (0.5%) and chromium (0.1%), while Amosite has manganese (0.7%). Serum can elute small amounts of nickel, chromium, magnesium and manganese from Chrysotile, iron and manganese from Crocidolite and Amosite. Wagner's animal experiments tend to make the significance of iron unlikely, as the proportion of this element in Chrysotile is only about one tenth of that of Crocidolite or Amosite.

4.5 Aerodynamic Behaviour of Asbestos Fibres

4.5.1. Influence of Fibre Dimensions: Dr. V. Timbrell of the Pneumoconiosis Research Unit has been engaged for the past few years in examining the size parameters of fibres which influence their respirability. His investigations have explained the observation which puzzled earlier workers in this field, namely, the presence of fibres of 100 microns or longer in the lungs of men or experimentally exposed animals.

The explanation is that the particle-free falling speed is the most important parameter influencing its entry into the lung. This falling speed is predominantly determined by fibre diameter, and shows very little sensitivity to length, especially when the aspect ratio (length:diameter) is high. If, therefore, a fibre has a sufficiently small diameter, the falling speed can be low enough for the fibre to escape deposition by settlement and inertial precipitation mechanisms in the upper part of the respiratory tract. Hence, deep penetration to the pulmonary air spaces is possible. This has been shown to occur if the fibre diameter is less than about 3.5 microns.