

MUCOCILIARY FUNCTION AND DYSFUNCTION IN THE AETIOLOGY
OF LUNG DISEASES : MEDIATORS AND MECHANISMS.

Annaleise Catherine Louise DaCosta

ABSTRACT

Impaired mucus transport is known to exist in patients with bronchitis and asthma. The mechanisms underlying mucociliary dysfunction in these diseases have not been established, as it is unclear whether the mediator substances act directly on the cilia or indirectly by changing the rheological properties of the mucus blanket.

Conditions leading to mucociliary dysfunction were created in Wistar rats in two ways. Firstly, by exposing one group of rats (Group A) to acetylcholine aerosol and then to house dust; and secondly by exposing a second group (Group B) to alternate hot and cold conditions. In control rats and both experimental groups mucus transport velocity (MTV), changes in tracheal diameter and the effect of various mediators on these were examined. The mediators investigated were the slow reacting substances of anaphylaxis (leukotrienes C_4 and D_4) leukotriene B_4 , prostaglandin $F_{2\alpha}$ and thromboxane B_2 (the stable metabolite of thromboxane A_2).

The treated rats were shown to have slower mucus transport velocities (MTVs) than the untreated ones, and also, Group B rats had slower MTVs than Group A rats. Group A rats were also shown to have increased airway resistance and decreased airway compliance in comparison to the Group B rats and the control rats. Group B rats all showed excessive mucus in the airway upon dissection. On the basis of the results and with the support of histological studies, it is suggested that the condition in Group A rats, at least initially, may more closely mimic an asthmatic hypersensitivity, while that in Group B rats is more related to bronchitis.

If the Group A rats are truly like asthmatic rats, which are known to have ciliary destruction at all levels of the airway, it can be inferred that mucus secretion might be a more important determinant of MTV than the number of cilia present, since MTV was faster in Group A rats than in Group B (bronchitic type) rats in which mucorrhoea was more prominent. It is therefore suggested that the mechanism underlying impaired mucociliary clearance in these treated rats is the changed viscoelastic properties of the mucus blanket induced by the mediators involved.