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INTRODUCTION

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The lungs are exposed to a wide array of inhaled particles and organisms. Their ability to cope with noxious agents is extremely efficient, providing that the various protective mechanisms are not too severely disturbed. The first line of defence is mechanical, followed by innate immunity, which takes a stepwise approach to prevent undue inflammation and gas exchange disturbances. If antigenic particles reach the layers beyond the epithelial lining an adaptive immune response will be organised by an amazing traffic of antigen-presenting cells into the hilar lymph nodes [1]. Memory T-cells will then come back to the lungs, where they can be triggered to further multiply. These mechanisms will be reviewed in the following series of articles.

Recently, it has been learnt how pathogens may influence the adequacy of the immune system to fight viruses, other intracellular pathogens or bacteria early in life. It is becoming clear that the environment may condition some individuals at a young age to be particularly prone to allergy due to an unbalance in the immune system [2]. In this review HOLT [3] discusses some of these important hypotheses and suggests a link between polymorphisms of pattern recognition receptors and atopy [4, 5].

Viruses have been shown to play a major role in several lung diseases and JOHNSTON [6] summarises concepts on how viruses are a major source of asthma exacerbations [7]. The mechanisms by which viruses may exacerbate and evade human defence mechanisms leading to inflammation is reviewed. How intrinsic defects of antiviral and antibacterial defences could indeed precipitate asthma [8], as well as perhaps chronic obstructive pulmonary disease (COPD), is also discussed.

Bacteria are notably involved in COPD exacerbations [9]. Several strains are prone to persist in the airways if mucosal immunity is perturbed by smoking or other indoor or outdoor pollutants. Like viruses, they disturb human defences by a wide array of mechanisms, leading to severe persistent inflammation. Unravelling these mechanisms will improve the capacity to find new therapies to fight airway colonisation and target undue inflammation. These various strains involved are described in detail by TOEWS [10].

It is clear that outdoor and indoor pollution alters lung health [11, 12]. The molecules involved have been recognised for some time, but the way by which they activate cellular mechanisms in the epithelium of the airways leading to alterations of human defences is now better known. These pollutants cannot only induce severe inflammatory mechanisms, but will facilitate adherence of infectious pathogens, leading to vicious cycles of inflammation and infections [13] and may in turn facilitate the persistence and penetrance of allergens. OLIVIERI and SCODITTI [14] summarise major new data on the impact of pollution on airway diseases. This knowledge may influence healthcare legislation, as well as education of the patient regarding noxious agent avoidance.

It is becoming clear that many basic immune mechanisms are shared between the mucosa of the epithelium of the lungs and the gastroenterological tract. This is not a new concept, though the similarity between various epithelial defences is gradually becoming better known. The close links between innate mechanisms and adaptive immunity have also shown that bacterial structure could influence adaptive mechanisms in such a way that immune mechanisms against viruses could also be enhanced by bacterial extracts. For example, triggering innate immunity allows the release of danger signals, such as inflammatory cytokines, which can activate dendritic cells and thus turn on adaptive immunity [1]. These pathways should be explored to increase understanding of how the bowel flora or ingested bacterial extracts could influence immunity beyond the gut and in the lungs.

SCHAAD [15] reviews how nonspecific immuno-stimulation by *p.o.* bacterial extracts seems to protect infants with recurrent airway infections. The results of major studies performed with bacterial extracts (supplied by OM-Pharma), which to some extent have also been generated by competitors selling similar bacterial extracts, is critically presented.

SOLÈR [16] compares the results of studies performed in adults with COPD and recurrent exacerbations. Data obtained using the same bacterial extracts is reviewed. The results of these studies will be compared with the results obtained with medications currently recommended for COPD.

The definitive recommendation of bacterial extracts taken orally to fight respiratory infections or influence overall innate or adaptive immunity still needs to be supported by concordant placebo-controlled studies. The current results are already encouraging but deserve more basic research and studies with comparable designs.

The potential of bacterial extracts to influence early defences in children, in particular for those prone to develop asthma, is worthy of much attention to find new therapeutic approaches to treat allergy. More work is needed to extend the evidence beyond that obtained from rat models [17].

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