Respiratory infections and asthma

The relationship between asthma and respiratory infections is an important one, in two respects. Firstly, respiratory infections with viruses and allied organisms, such as Mycoplasma and Chlamydia species, are frequent causes of exacerbations of asthma, particularly in children, and are thus important triggers. Secondly, respiratory syncytial virus (RSV) infection and, more recently, Chlamydia infection have been proposed as possible causes of asthma.

Viral infections and asthma

Most exacerbations of asthma in childhood can be proven to be associated with viral infections. In a study by Johnston et al using the polymerase chain reaction (PCR) and culture, viruses were detected in 80% of episodes of wheeze or reduced peak flow in 9–11-year-olds with asthma. Rhinoviruses accounted for 61% of the viruses detected, coronaviruses 16%, influenza 9%, parainfluenza 9%, and RSV 5%.

Rhinoviruses have been detected in lower-airway cells during experimental rhinovirus infection. The mechanism by which viruses cause bronchospasm is not yet understood, but is likely to involve cytokine production in response to viral replication in the lower airway.

RSV infection, although detected in only 5% of asthma episodes in the study by Johnston et al, is known to be a potent cause of wheezing, particularly in infancy. It has been shown that RSV infections in infancy are associated with a TH2-like cytokine response (see page S66) in the upper airway, whether or not the infant is atopic. T H2 cytokine patterns are known to be associated with viral immunopathology and allergic-type responses, in contrast to TH1 cytokine patterns, which are classically associated with viral elimination. It has also been shown that levels of at least one cytokine (IL-2) are similar in upper and lower respiratory tract secretions during RSV infection, suggesting that upper respiratory tract levels can be used as an indicator of lower respiratory tract levels. Interestingly, the nasal cytokine responses to rhinoviruses are of the TH1 type, as are the responses to other viruses (except RSV). This could explain the propensity for RSV to cause wheezing, but not the association between other respiratory viruses and wheezing.

Does RSV infection cause asthma?

There is controversy as to whether RSV infection in infancy can cause asthma, or merely uncovers pre-existing asthma. The evidence to date favours the latter. The incidence of later asthma is higher compared with controls for infants whose RSV bronchiolitis is severe enough to require hospitalisation, but not for infants who develop milder RSV bronchiolitis that can be managed at home. A recent study has suggested that RSV bronchiolitis in infancy is associated with an increased risk of recurrent wheeze up to six years of age, but that the risk decreases markedly after that age. No association was found between RSV lower respiratory tract infection and atopy.

Chlamydia pneumoniae

Chlamydia pneumoniae causes 5%–20% of community-acquired pneumonia in children and adults.
Bacterial infections

There is accumulating evidence that frequent respiratory infections in infancy, particularly bacterial infections, may protect against atopy. This may explain the low rate of atopic asthma in Indigenous children and adults found in one study, although recent data from Western Australia and Queensland suggest that asthma may be more common in Indigenous people than the earlier study reported.

Conclusions

It is known that some respiratory pathogens provoke asthma attacks, although much is still unknown about the mechanisms involved and why some pathogens are more potent inducers of wheeze than others. The possibility that organisms such as RSV and Chlamydia might actually cause asthma is intriguing but needs further study.

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Mycoplasma pneumoniae

Mycoplasma pneumoniae classically causes dry cough and fever in school-aged children (>5 years old). Wheeze is not a classical symptom of Mycoplasma infection, although it may occur, and Mycoplasma is an uncommon cause of exacerbations of asthma. M. pneumoniae occurs in outbreaks every three to five years, and is relatively uncommon between these epidemics (see Box). The diagnosis of Mycoplasma infection is problematic. Culture is slow and insensitive. Serum IgM is a sensitive indicator of infection, but, because it persists for up to 12 months, is not specific. A single high complement fixation test (CFT) result, which detects IgG and IgM, has the same problem as IgM, while a rising CFT is specific but only 50% sensitive. The use of macrolide antibiotics should be reserved for children in whom there is a high suspicion of atypical pneumonia — they should certainly not be used routinely to treat acute asthma.

Number of cases of M. pneumoniae reported by LabVISE, Commonwealth Department of Health, 1991–2000*

*Courtesy of Paul Roche, Immunologist, Population Health Division, Commonwealth Department of Health and Ageing.