release was also reduced after exposure to TNF α /IL1 β in those who later wheezed compared to non wheezers (0.09 [0.01, 0.72] versus 0.67 [0.32, 1.48] $p = 0.014$). Neonatal AEC release of IFN γ and IL-6 were not associated with later wheeze. Maternal asthma was not associated with AEC IL-8 release.

Conclusions These results suggest that an abnormality which is present at birth in AEC response to infection is important to asthma causation.

Abstract S70 Figure 1

S71 DO CHILDREN WITH TROUBLESOME PRESCHOOL WHEEZE HAVE EVIDENCE OF FUNGAL SENSITISATION?

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Introduction Preschool wheeze is very common and can be troublesome necessitating frequent hospital admissions and trials of preventer medications. It has been suggested that fungal sensitisation is associated with severe childhood asthma (Vicencio 2014), however it is unclear when this sensitisation occurs and whether fungal sensitisation is associated with preschool wheeze. We aimed to assess whether children attending our clinic due to preschool wheeze were sensitised to fungi and whether fungal sensitisation is associated with troublesome wheezing.

Methods Preschoolers attending our clinic due to wheezing investigated for allergic sensitisation to a panel of aeroallergens (*D. pteronyssinus*, cat, dog, timothy grass and tree pollen) and fungi were identified. Evidence of sensitisation was determined by a raised specific IgE (sIgE) > 35 kU/L detected by fluorescent enzyme immunoassay. Sensitisation to fungi was determined either by raised sIgE to a 'mould screen' (comprising *Penicillium notatum*, *Cladosporium herbarum*, *Aspergillus fumigatus*, *Candida albicans*, *Alternaria alternata* and *Helminthosporium halodes*) or to specific fungi including those in the mould screen and *Malassezia spp*. Data on the number of hospital-recorded admissions due to an exacerbation of wheezing within the preceding 12 months and currently prescribed medications, hence BTS treatment step, were collected.

Results Table 1 displays the demographic features of the 51 children identified, the number of children with a raised total IgE and evidence of sensitisation to aeroallergens and fungi. Six

(24%) children with a raised total IgE and 4 (31%) sensitised to aeroallergens were sensitised to fungi. Whilst we found a positive correlation between age and serum total IgE (0.364, $r^2 = 0.13$, $p < 0.01$ – Spearman's rank) there was no significant correlation between age and sIgE to the mould screen or specific fungi. We found no significant differences in the age, number of hospital-recorded admissions due to wheeze or BTS treatment step between those preschoolers sensitised and not-sensitised to fungi. **Discussion** Our preliminary data suggests that a) few children with preschool wheeze attending clinic have evidence of fungal sensitisation and b) fungal sensitisation does not appear to be associated with hospitalisation frequency or required medications. Further exploration is required to determine, if any, the relationship between fungal sensitisation and preschool wheeze.

Abstract S71 Table 1 Demographic data, evidence of sensitisation and clinical parameters

Male, n (%)	30 (59)
Median (range) age in months	39 (8–71)
Serum makers of allergic sensitisation	
Raised total IgE (> 52 kU/L), n (%)	25 (49)
Evidence of sensitisation to aeroallergens, n (% of those with raised total IgE)	13 (52)
Evidence of sensitisation to fungi, n (% of those with raised total IgE)	6 (24)
Evidence of sensitisation to fungi, n (% of those sensitised to aeroallergens)	4 (31)*
Number of hospital-recorded admissions due to wheezing in one year	
≥2 admissions (n = 14)	2 (14) †
Number sensitised to fungi, n (%)	
<2 admissions (n = 37)	4 (11) †
Number sensitised to fungi, n (%)	
BTS treatment step[#]	
BTS step 3 or above (n = 11)	2 (18) †
Number sensitised to fungi, n (%)	
BTS step below 3 (n = 40)	4 (10) †
Number sensitised to fungi, n (%)	

*Those children sensitised to aeroallergens were more likely to be sensitised to fungi than those not sensitised to aeroallergens, $p < 0.05$ (Pearson chi-square), †There was no statistically significant difference between the number of children sensitised and not-sensitised to fungi and the number of hospital-recorded admissions or required asthma medications, $p > 0.05$ (Pearson chi-square), [#]BTS treatment step (BTS/SIGN 2014 guidelines on the management of asthma).

S72 IMMUNOMODULATORY EFFECTS OF CARBON PARTICULATES ON MACROPHAGE HANDLING OF STREPTOCOCCAL INFECTIONS

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Background and objective Airway macrophages are key to a successful immune response to pulmonary infections. Smoke exposure has been previously shown to result in particulate loading of alveolar macrophages and subsequent impaired macrophage responses to infection with *Streptococcus pneumoniae*.¹ Rheumatic heart disease (RHD) is an autoimmune disorder that follows an airway infection with *Streptococcus pyogenes* in some individuals. Little is understood about the aetiological factors predisposing the development of RHD but smoke exposure from combustion of solid fuels has recently been epidemiologically linked to RHD.

In the context of this epidemiological observation, we hypothesised that smoke exposure would affect macrophage handling of

Streptococcus pyogenes in a similar manner to that observed in studies with *Streptococcus pneumoniae*.

Methods Human positively-isolated CD14⁺ monocyte-derived macrophages (MDM), an established model for alveolar macrophages, were incubated with an optimised dose of carbon particulates. Phagocytosis of *Streptococcus pneumoniae* and *pyogenes* was assessed by bacterial culture of macrophages lysates. Autologous CD3⁺ T cells were co-cultured with infected MDM for 24 h. Expression of cell surface markers, T cell activation and uptake of FITC beads were assessed by flow cytometry.

Results Phagocytosis of *Streptococcus pneumoniae* and *pyogenes* by carbon loaded MDM was impaired compared to non-carbon loaded MDM (18.8% reduction, $p = 0.01$). Phagocytosis of FITC beads was also shown to be reduced by the carbon loaded MDM (10% reduction, $p = 0.03$).

Carbon loading decreased MDM surface expression of the phagocytic receptor CD36 ($p < 0.01$) and decreased the surface expression of antigen presentation molecules HLA-ABC and HLA-DR ($p = 0.04$ and 0.03 respectively). Addition of *S. pyogenes* increased expression of HLA-DR only on the cell surface of carbon loaded MDM ($p = 0.02$). Preliminary results suggest that autologous T cells express IFN γ in response to coculture with infected MDM and that this response is enhanced in carbon loaded MDM.

Conclusion We conclude that carbon exerts immunomodulatory effects on MDM phagocytosis of *Streptococcus pyogenes* and subsequent antigen presentation. Further investigation of this subject in the context of both chronic lung infection and RHD is therefore warranted.

REFERENCE

- Rylance J, et al. Household air pollution causes dose-dependent inflammation and altered phagocytosis in human macrophages. *AJRCMB* 2015;**52**(5):584–93.

S73

VIRUSES ASSOCIATED WITH COMMUNITY-ACQUIRED PNEUMONIA IN CHILDREN – A LARGE PROSPECTIVE STUDY IN THE POST-PREVENAR 13 ERA

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Introduction and objectives Community-acquired pneumonia (CAP) is a common childhood illness and frequent reason for hospital admission. CAP may be caused by bacteria or viruses. Many studies have relied on administrative records that typically provide poor quality retrospective aetiological data. We have performed a large prospective study to investigate the aetiology of CAP in the 'post-Prevenar 13 era'. We wished to describe the current epidemiology of viral CAP and compare this with data from studies that used similar methodology in the same population in 2009–2011 (post-Prevenar 7) and 2001–2002 (pre-Prevenar 7).

Methods Children aged under 16 years admitted to a large paediatric centre, between January 2015 and June 2016, with a chest radiograph meeting WHO criteria were eligible. Following informed consent nasopharyngeal aspirate, nasal swab, sputum or endotracheal secretions were collected. Influenza A and B, Human Rhinovirus, Human Metapneumovirus, Adenovirus, Parainfluenza 1–4 and Respiratory Syncytial Virus (RSV) were tested using real-time PCR assays. Comparisons were made using appropriate non-parametric tests.

Results A total of 148 children were recruited, median age 2.7 years, IQR 1.5–5.3. Samples from 63 participants (43%) were positive for a virus and 7 cases had co-infection with 2 viruses. Children that tested positive for a virus were significantly younger (median 2.1 years, IQR 1.2–3.2, versus 3.7 years, IQR 1.9–6.9, $p = 0.0005$). When compared with previous studies there was no significant change in the virus detection rate. The breakdown of individual viruses is shown in the table, no significant changes were identified apart from a reduction in RSV.

Conclusions These results represent the most comprehensive data available on viruses associated with CAP in children in the UK in the 'post-Prevenar 13 era'. They confirm that there has not been a significant shift in the viruses associated with children requiring admission to hospital. Our results also suggest that the introduction of the live attenuated intranasal influenza vaccine to children, which began in 2013, is yet to have a significant effect on the frequency of influenza detected in children with CAP. Future surveys will be important for ongoing evaluation of the viral aetiology of CAP.

REFERENCE

- Elemraid MA, et al. Aetiology of paediatric pneumonia after the introduction of pneumococcal conjugate vaccine. *Eur Respir J* 2013;**42**(6):1595–603.

Abstract S73 Table 1 Demographic data, evidence of sensitisation and clinical parameters

Virus	2001–2002 study ¹				2009–2011 study ¹				2015–2016 study			
	Number tested (percentage positive)	<5 years	5–16 years	Number tested (percentage positive)	<5 years	5–16 years	Number tested (percentage positive)	<5 years	5–16 years	Frequency change (2009–2011 study to 2015–2016 study)		
RSV	213 (15.0%)	29	3	147 (21.1%)	30	1	147 (10.2%)	15	0	$p = 0.015$		
Influenza A and B viruses	213 (6.1%)	9	4	149 (12.1%)	11	7	147 (10.2%)	12	3	$p = 0.713$		
- H1N1		NT	NT	141 (5.0%)	4	3	147 (4.8%)	6	1	$p = 1$		
Adenovirus	213 (6.1%)	11	2	145 (6.9%)	10	0	147 (10.2%)	11	4	$p = 0.404$		
Parainfluenza 1–4	158 (3.2%)	5	0	141 (4.3%)	5	1	147 (6.1%)	9	0	$p = 0.599$		
Human metapneumovirus	48 (0%)	0	0	141 (0.7%)	1	0	147 (3.4%)	5	0	$p = 0.214$		
Rhinovirus	Not tested	NT	NT	141 (8.5%)	10	2	147 (7.5%)	8	3	$p = 0.829$		
Total		54	9		67	11		60	10			

NT = not tested, note: children with bronchiolitis were excluded