this did not reach significance in the NBS group. (NBS CF p= 0.05, established CF p<0.01).

**Conclusion** Our results demonstrate that inflammation is already present by 4 months of age in asymptomatic infants diagnosed through NBS, although at a lower level than seen in established CF. The results underscore the importance of early surveillance and lend support to the evolving focus on this age group for interventional trials.

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**Abstract S82 Table 1**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>CF Micro</th>
<th>CF Micro-</th>
<th>Established</th>
<th>Established-</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (Absolute cell count)</td>
<td>10</td>
<td>22</td>
<td>33</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Neutrophil differential (%)</td>
<td>17.3</td>
<td>9.4</td>
<td>8.3</td>
<td>19.3</td>
<td>1.4</td>
</tr>
</tbody>
</table>

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**Mechanisms of airway injury in COPD**

Severe deficiency of the major anti-elastase α-antitrypsin (AT) due to the Z (Glu342Lys) variant is the commonest genetic reason for the development of COPD. Cigarette smoke (CS) accelerates decline in lung function in Z-AT homozygotes. We investigated whether Z-AT is associated with an exaggerated inflammatory response compared to normal AT (M-AT).

Lung epithelial (A549 and NHBE) cells transfected with human M-AT or Z-AT (M-AT/Z-AT cells) were exposed to 12.5% CSE generated from IR5F cigarettes. Supernatants, lysates and inclusion bodies were assessed for total AT to confirm a successful cell-model system. Supernatant was assessed for TNF-α, IL-6, IL-8 and MCP-1, oxidised pZ-AT (Ox-pZ-AT), NF-kB and AP-1 by ELISA, immunoblot or RT-PCR. N-acetylcysteine (NAC, 10−3 M) was used to probe the effect of oxidants.

At 24h CSE in Z-AT (CSE-Z-AT) compared to CSE-M-AT (unless stated) significantly induced TNF-α (212±20.71 pg/ml vs. 37.1±2.7), IL-6 (421.4±20.8 pg/ml vs. 159.3±12.1), IL-8 (5763±497 pg/ml vs. 2593±450) and MCP-1 (23564±1852 pg/ml vs. 5329±706), p<0.001 for all. CSE-Z-AT had significantly induced mRNA for TNF-α, IL-6, IL-8 and MCP-1 at 0.5h (p<0.001 for all). Development of Ox-pZ-AT were exclusively detected in CSE-Z-AT inclusion (3246±435 pg/ml vs. undetectable, p<0.001). CSE-Z-AT had significantly activated NF-kB (p<0.001) and AP-1 (p=0.001) at 0.5h. In CSE-Z-AT treatment with NAC significantly inhibited TNF-α, IL-6, IL-8 and MCP-1. NF-kB, AP-1 and Ox-pZ-AT formation (p<0.001 for all). These findings were confirmed on NHBE cells.

In conclusion, following CS exposure Z-AT cells had significantly elevated inflammatory mediators compared to M-AT cells, which was inhibited by NAC. We propose that during CS exposure up-regulated inflammatory mediators further reduce the level of protective monomeric AT, which predisposes to increased lung inflammation.

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**S83 LEVELS OF ANTIMICROBIAL PEPTIDES IN THE AIRWAY OF CHILDREN WITH CYSTIC FIBROSIS ARE NOT RELATED TO SERUM VITAMIN D CONCENTRATION**  
doi:10.1136/thoraxjnl-2012-202678.089

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**Introduction** There is convincing evidence of the clinical health benefits of adequate vitamin D in many respiratory diseases but the evidence in cystic fibrosis (CF) is unclear. There are increasing data on the role of vitamin D as an immunomodulatory agent and it is thought, from *in-vitro* data, that this may be via induction of the antimicrobial peptides, LL37 and HNP-2. We hypothesised that antimicrobial peptide levels would be increased in children with adequate vitamin D and this could account for reported improvements in lung function via improved airway defence.

**Aims and methods** The main aim was to establish if a relationship exists between vitamin D and antimicrobial peptides, LL37 and HNP-2, and whether any clinically beneficial effects of adequate vitamin D exist in children with CF. Bronchoalveolar fluid (BALF) supernatants levels of LL37 and HNP-2 were by measured by ELISA and serum 25(OH)D by mass spectrometry coupled with high-performance liquid chromatography.

**Results** Samples were collected from 120 children with CF (58% female); median age (range) 6.9 (0.1–17.6) years. One third of patients were vitamin D insufficient (<50 nmol/L). Median 25(OH)D2 was 57 nmol/L (range 7–191 nmol/L). LL37 ranged from 0.1–21.9 pg/ml vs. undetectable, p<0.001). CSE-Z-AT had significantly activated mRNA for TNF-α, IL-6, IL-8 and MCP-1. NF-kB, AP-1 and Ox-pZ-AT formation (p<0.001 for all). These findings were confirmed on NHBE cells.

In conclusion, following CS exposure Z-AT cells had significantly elevated inflammatory mediators compared to M-AT cells, which was inhibited by NAC. We propose that during CS exposed lung inflammation Z-AT monomer undergoes oxidation to form oxidised polymers thereby further reducing the level of protective monomeric AT, which predisposes to increased lung inflammation.

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**S84 CIGARETTE SMOKE PROMOTES EXAGGERATED INFLAMMATORY RESPONSE IN THE PRESENCE OF Z-AT**  
doi:10.1136/thoraxjnl-2012-202678.090

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**S85 NEUTROPHEL CELL MEMBRANE EXPRESSION OF PROTEINASE 3 AND ITS RELATIONSHIP TO ALPHA-1-ANTITRYPSIN DEFICIENCY (A1ATD)**  
doi:10.1136/thoraxjnl-2012-202678.091

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**Introduction** Serine proteinases such as proteinase 3 (PR3) and neutrophil elastase (NE) on the surface of activated neutrophils retain their activity, which may be central to the tissue damage in emphysema. However, little is known about this expression in A1ATD when it may be more critical.
Aims
1. To compare neutrophil surface expression of PR3 and NE in patients with A1ATD, usual COPD and healthy controls.
2. To determine the influence of the local concentration of A1AT on neutrophil surface expression of PR3 and NE.

Methods
Clinically stable patients with A1ATD (n=9), COPD (n=6) and healthy controls (n=9) were recruited. Neutrophils were isolated from blood. Half were stimulated with fMLP and half were unstimulated. Membrane expression of NE and PR3 was measured by flow cytometry.

Neutrophils isolated from six further healthy controls were stimulated in the presence of either normal (PiMM) or A1ATD plasma (PiZZ). Membrane expression of NE and PR3 was measured.

Results
PR3 expression on the surface of unstimulated neutrophils was greater in A1ATD patients (2365±305MFI) compared to healthy controls (1921MFI; p=0.031) and COPD patients (1560±15MF; p=0.046). NE expression was similar between groups.

PR3 expression on stimulated neutrophils was greater in A1ATD patients (5117±253MFI) compared to healthy controls (1360±315MFI; p=0.046) and COPD patients (1517±253MFI; p=0.048). NE expression was similar between healthy controls (1472±41MF; p=0.042), but not different to COPD patients (1341±15MF; p=0.046).

Conclusions
Baseline neutrophil surface expression of PR3 is greater in A1ATD patients compared to controls. Neutrophils express more PR3 when stimulated in an environment with low concentrations of A1AT, suggesting that membrane binding is dependent on the ability of A1AT to bind released PR3 but not NE.

This may have clinical significance for A1ATD emphysema since active membrane-bound PR3 is resistant to inhibitors and can replicate the pathological features associated classically with NE.

These findings may explain the association of Wegener’s granulomatosis (where PR3 is an autoantigen) with A1ATD.

### FORMATION OF OXIDISED ALPHA-1 ANTI-TRYPsin INDUCES INFLAMMATORY RESPONSE IN HUMAN BRONCHIAL EPITHELIAL CELLS

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Alpha-1 antitrypsin (AT) is a major anti-elastase and protects the lung from uncontrolled elastolysis. AT is highly susceptible to oxidation in vivo. We investigated the role of Ox-AT in the inflammatory response.

Lung epithelial (A549 and NHBE) cells were exposed to 25% CSE. Ox-AT, TNF-α, IL-6, IL-8, MCP-1, NF-kB and AP-1 were assessed by ELISA or RT-PCR. Anti-Ox-AT mAb (3F4, 10 µg/ml) and N-acetyl-cysteine (NAC, 10 M) were used to probe the effect of Ox-AT.

CSE (compared to PBS) significantly induced TNF-α (440.4±76.8 pg/ml vs. 17.5±2.6, p<0.001) at 24h and induced IL-6 at 72h (554.7±58.4 pg/ml vs. 17.6±2, p<0.001). CSE induced TNF-α mRNA at 0.5h (p<0.001) and IL-6 mRNA at 3h (p<0.001). CSE (compared to PBS) activated NF-kB (OD at 405nm, 1.325 vs. 0.315, p<0.001) and AP-1 (OD at 405nm, 0.982 vs. 0.296, p<0.001) at 0.5h. At 24h CSE (compared to PBS) resulted in significant level of Ox-AT (mean±SEM, 1372±162.8 pg/ml vs. undetectable, p<0.001) and induced IL-8 (1415.7±92.5 pg/ml vs. 57.2±10, p<0.001) and MCP-1 (15683±713 pg/ml vs. 2208±157, p<0.001).

At 24h Ox-AT (compared to PBS) significantly induced IL-8 (1168±9 pg/ml vs. 110±8, p=0.008) and MCP-1 (14500±424 pg/ml vs. 4225±470, p=0.005) in A549 cells. NAC inhibited Ox-AT, TNF-α, IL-6, IL-8, MCP-1, NF-kB and AP-1 (p<0.001 for all). 3F4 selectively inhibited Ox-AT, IL-8, MCP-1, NF-kB and AP-1 (p<0.001 for all). These findings were confirmed with NHBE cells.

In conclusion, Ox-AT generated in the airway interacts directly with epithelial cells to release MCP-1 and IL-8, so enhancing lung inflammation. This mechanism could potentially contribute to the abnormal inflammatory response seen in COPD independent of CSE. Anti-oxidant treatment inhibited both CSE and Ox-AT induced inflammatory response further supporting a role for these agents in COPD.

### HIGH SENSITIVITY ERK AND AKT PHOSPHOSTATUS ASSAYS IN LUNG CANCER AND EMPHYSEMA

**S88**

**D Comer, M Ennis, JS Elborn. Centre for Infection and Immunity, Belfast, Northern Ireland**

**Introduction**

We investigated the responses of primary bronchial epithelial cells (PBECs) obtained from subjects with COPD, healthy smokers (HS), and non-smokers (NS) to cigarette smoke extract (CSE) treatment. We hypothesised that PBECs from subjects with COPD respond differently to CSE and Pseudomonas aeruginosa lipopolysaccharide (PA LPS) stimulation than PBECs obtained from HS and NS.

**Methods**

PBECs from 16 COPD subjects, 11 HS and 10 NS were obtained at fibroptic bronchoscopy and cultured up to air-liquid interface and stimulated with PA LPS, either with or without pretreatment with CSE for 24 h. COPD patients and HS were similar for smoking history in pack years and all 3 groups were matched for age. Apoptosis was evaluated using Annexin-V staining and the terminal transferase-mediated dUTP nick end-labelling (TUNEL) method. IL-6 and IL-8 were measured by ELISA and Toll-like receptor 4 expression by flow cytometry. CSE was prepared by combusting 1 Marlboro cigarette through 25 ml of media. Activation of NF-kB, mitogen-activated protein kinase (MAPK), and caspase-3 were determined by western blotting.

**Results**

Constitutive release of IL-6 and IL-8 was greatest from the COPD cultures. 5% CSE pre-treatment followed by PA LPS stimulation reduced cytokine release from COPD PBECs, but increased the release from HS and NS cultures. Constitutive TLR-4 expression, MAPK and NF-kB activation were reduced only in COPD cultures after 5% CSE treatment. After treatment with CSE for 24 h, 44% of the COPD cells were apoptotic and 9% necrotic, whereas only 18% of the healthy smoker’s cells and 6% of the non-smokers cells were apoptotic, with no cells in the latter 2 groups becoming necrotic. COPD cultures had the highest levels of cleaved caspase-3 after CSE treatment.

**Conclusions**

5% CSE attenuates inflammatory responses to LPS in cells from people with COPD but not from NS or HS. COPD epithelial cells have an increased susceptibility to apoptosis. Research funded by NI RDO.