Aspergillus spp. and Candida spp. detection in CF children: implications on lung function and hospitalizations

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Objectives: Aspergillus spp. (Asp) or Candida spp. (CA) isolation from sputum samples in CF children is common, but with yet unclear significance. We studied Asp and CA isolation from respiratory secretions in CF children and their effect on lung function and hospitalizations.

Methods: 8-year retrospective cohort study of 121 CF children (3,601 sputum samples). Isolation was defined as the presence of at least one positive culture. Multiple regressions assessed the effect on spirometry results and hospitalizations on study completion after adjustment for 10 confounders whereas simple comparisons were also performed.

Asp (33.1%) was associated with genotype (p = 0.041), BMI (p = 0.037), pancreatic insufficiency (p = 0.005), ABPA (p = 0.006), pos corticosteroids > 3 months (p = 0.038), pos antifungal (p < 0.001), azithromycin (p = 0.021) and rhDNase (p = 0.008). CA (71.1%) was associated with weight (p = 0.042), pancreatic insufficiency (p < 0.001), CFTRD (p = 0.040), ABPA (p = 0.003), P. aeruginosa colonization (p = 0.006), Asp (p = 0.005), pos corticosteroids > 3 months (p < 0.001), inh corticosteroids > 3 months (p = 0.030), pos antifungal (p = 0.006) and rhDNase (p = 0.017). Asp was associated with FVC %predicted (β = −11.739, SE = 5.737, p = 0.045), FEV1 %predicted (β = −14.734, SE = 6.598, p = 0.029) and hospitalizations (β = 2.438, SE = 0.916, p = 0.009) after adjustment for confounders while CA wasn’t. But, there was a trend toward significance for hospitalizations (β = 2.230, SE = 1.200, p = 0.068).

Conclusions: Asp in respiratory secretions in CF children is associated with a decline in lung function and an increase in hospitalizations while CA tends to increase hospitalizations.

Aspergillus fumigatus upregulates elastase activity in Pseudomonas aeruginosa

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Purpose: Aspergillus fumigatus is an increasingly important pathogen within the lungs of Cystic Fibrosis (CF) patients. Recent clinical data indicates deteriorating lung function in CF patients containing where both of these organisms. The aim of this study was to investigate whether co-culture of these two species influences the pathogenic potential of P. aeruginosa.

Methods: Pseudomonas aeruginosa (wild type, mucoid and non-mucoid) and A293 (live/dead 24h biofilms) were co-incubated and supernatants collected after 0, 0.5, 1, 2, 4, 8 and 24h. An elastin congo red assay was optimised to assess the elastase activity of P. aeruginosa ± A. fumigatus. Exogenous elastin was used as positive control and to produce the standard curve.

Results: The elastase activity of P. aeruginosa was strain dependant, with mucoid strains producing more elastase than non-mucoid strains. Overnight co-culture of PA14 with both live and dead A293 significantly up regulated elastase activity compared to PA14 alone control (P < 0.001). The kinetics of elastase production in the presence of A293 showed a significant time dependant increase in elastase activity over the period of incubation time (P < 0.001).

Conclusion: In this study we have demonstrated that the presence of the fungal pathogen A. fumigatus causes an upregulation in elastase activity in P. aeruginosa. This enzyme is a key virulence factor of P. aeruginosa, causing proteolytic damage to tissue, thus contributing to overall deterioration of lung function which may explain why patients with these two pathogens have poorer clinical outcomes.

Microbiological diversity in patients with cystic fibrosis living in tropical Australia

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Introduction: Burkholderia pseudomallei has been described in patients living and visiting tropical climates and geographical differences in Pseudomonas aeruginosa have also been reported [1-2]. The Prince Charles Hospital CF centre serves patients from an area of ~1.8 million km2, half of which lies north of the Tropic of Capricorn where 17.9% of our patients reside.

Methods: Sputum microbiology from all samples processed in the previous 10 years from patients living in tropical Australia (n = 69) was compared with those from sub-tropical regions and with data from the Australian CF Data Registry (ACFDR). The data included patients who were alive, deceased and had been transplanted as of December 2011.

Results: Isolation of non-tuberculous mycobacteria (NTM) ever was elevated in tropical patients (24.6% compared with 8.2% sub-tropical patients, χ2 = 13, p = 0.0003 and < 1% of the ACFDR). Burkholderia cepacia complex (Bcc) was reported in 17.9% of tropical patients compared with 11.1% sub-tropical patients (not significant) and 7.4% of the ACFDR. Isolation of Burkholderia pseudomallei was elevated in the tropical group (7.3% compared with 0.6% of the sub-tropical group, χ2 = 13.9, p = 0.0002). Rates of S. aureus, MRSA and P. aeruginosa were comparable to the sub-tropical patients and the ACFDR, however Aspergillus sp. was more commonly isolated in the tropics (53% of patients compared with 14% ACFDR).

Conclusions: Patients residing in tropical Australia have higher detection rates of NTM, B. pseudomallei and Aspergillus sp than sub-tropical patients attending TPCH or the Australian CF population as a whole.

Reference(s)