Evaluation of the risk of fungal colonization/infection in patients with cystic fibrosis: an international prospective study comparing the performance of media for mycological culturing – MuFong International Project (MFIP)

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Introduction: The major cause of morbidity and mortality in Cystic Fibrosis (CF) is pulmonary disease. Although bacterial infections are responsible for the majority of pulmonary damages, there is an increasing recognized role of fungal infection. Patients with CF may suffer increased morbidity and mortality from colonization, allergic reactions and invasive fungal infection.

Objectives: The aim of MFIP study was (i) to determine the frequency of fungi isolated in sputum samples from a large CF population, and (ii) to evaluate as well as to compare the performance of different semi-selective media used for fungal culture, in order to propose a standardized protocol of this analysis suitable in routine microbiological laboratories supporting CF units.

Patients and Methods: We organized an international prospective multicenter study, 19 centers participated: 18 Europeans and one Austranian. (Fig.1).

A total of 469 sputum samples (252 males and 217 females) were collected from CF patients followed-up in these centers. Sputum samples (20μl/medium) were inoculated on 8 culture media: Chromogenic medium (CM), YPDA or Sabouraud medium (YPDAS), Dichloran-rose Bengal Benomy agar (DRBBA), Sce-Sel+ medium (SSM), YPDA plus chloramphenicol at high concentration and cycloheximide (YPDACC), B+ medium (BM), Erythritol medium (EM) and 1:10 diluted sputum sample YPA or Sabouraud medium (DIYPDA). Culture media were incubated aerobically at 37°C except B+ medium [1] and Erythritol medium that were incubated at 30°C for 15 days.

Growth fungal species were identified on the basis of macroscopic and microscopic characteristics.

Results: A total of 469 sputum samples from CF patients aged 1-67 years (mean 24 ± 12) were analyzed. 78% of patients had a positive culture for fungi. (Fig.2), with a significant difference ( p<0.001) between the age of patients with positive fungal culture (mean age was 25 years) and with negative culture (mean age was 17) (Fig.3).

Discussion: This study represents the first one organized at the international level, aiming at sharing and coalescing our experience to investigate fungal risk in CF.

In agreement with its ability of being responsible for infectious or allergic diseases (such as ABPA or invasive aspergillosis), A. fumigatus was the most frequently isolated filamentous fungus (34.5%). This fungal frequency was significantly correlated to the patient age. B+medium appeared to be the most sensitive medium (global sensitivity was 67.4%), for the detection of fungi from CF sputum. In further assessment, CHAID (Chi-squared Automatic Interaction Detector) method will be used to confirm the best association to detect fungi.

Acknowledgements: The authors wish to acknowledge Sandrine Bonaventure, Dorothée Monvillets and Stéphanie Delbart for technical supporting especially in preparing growing media, and thank laboratory assistants for technical support in each center.


Fig.1: Map of the participating centers

Fig.2: Positive or negative culture

Candida albicans was detected with the highest frequency (47.7%); Aspergillus fumigatus was the most frequently isolated filamentous fungus (34.5%) (Fig. 4), which is in agreement with published data [1, 2, 3].