

# 台北地區大氣中真菌孢子與真菌過敏原之粒徑分佈與特性探討

## The study on size distributions and characteristics of fungal spores and fungal allergens in the Taipei area

### 中文摘要

大氣中的生物性微粒無所不在，包括花粉、真菌孢子、細菌、病毒，以及其他源自於動物或植物體的碎片。暴露到戶外生物性微粒和過敏性呼吸道症狀、感染及氣喘加劇有關。雖然世界各地皆已積極地進行大氣生物性微粒的調查，但在台灣的相關研究並不多。

本研究於 2005 年 1-12 月利用 Burkard 連續性孢子採樣器進行大氣真菌孢子之採樣，以建立台北地區生物性微粒的基線資料，並評估真菌孢子與其他環境因子間的相關性。此外，於 2006 年 4-5 月使用高流量採樣器進行兩個星期的懸浮微粒採樣，以分析細(<2.5 μm)及粗(2.5-10 μm)微粒所含真菌過敏原濃度之分佈。根據結果發現，研究期間總真菌孢子平均濃度為 1930.62 spores/m<sup>3</sup>，優勢菌種包括 ascospores、basidiospores、Cladosporium、unidentified spores、

Aspergillus/Penicillium 及 Fusarium。常見真菌濃度有明顯之季節變化。在多變項迴歸模式中發現，溫度是影響真菌孢子濃度最主要的环境因子，其他如相對濕度、降雨、臭氧、PM<sub>10</sub> 及 PM<sub>2.5</sub> 等也和真菌孢子的濃度有顯著相關。調查三種在世界各地常見的真菌過敏原後，發現大部分樣本皆低於偵測極限。其中，PM<sub>2.5-10</sub> 及 PM<sub>2.5</sub> 所含 Cladosporium herbarum 過敏原的平均濃度分別為 0.0440 及 0.0095 ng/m<sup>3</sup>。而 Aspergillus fumigatus 只在 PM<sub>2.5</sub> 中有測到，其平均濃度為 1.9122 pg/m<sup>3</sup>。

本研究提供了台北都會區大氣中生物性微粒的基線資料，以及真菌孢子與空氣污染物及氣象因子間的相關性。未來應進行長期研究以評估大氣過敏原對健康的影響，並瞭解真菌孢子與空氣污染物及氣象因子間的交互作用。

### 英文摘要

Biological particulates are ubiquitous in ambient air, including pollens, fungal spores, bacteria, viruses, or any fragments originating from plants and animals. Exposure to outdoor biological particulates has been associated with infection, allergenic respiratory symptoms, and asthma exacerbation. Although many studies have been conducted worldwide to investigate the distributions and health effects of ambient biological particulates, relatively little has been done in Taiwan.

We used a Burkard seven-day recording volumetric spore trap to collect ambient fungal spores from January to December 2005 to establish the baseline data in the Taipei area. We also used a high volume air sampler to collect ambient particles for two weeks in April and May 2006. The concentrations of fungal allergens in fine

(<2.5 m) and coarse (2.5-10 m) particulates were analyzed. According to our results, the average concentration of total fungal spores was 1930.62 spores/m<sup>3</sup> during the study period, and the predominant fungal taxa were ascospores, basidiospores, Cladosporium, unidentified spores, Aspergillus/ Penicillium and Fusarium. Most common fungi had significant seasonal variations. In regression analyses, we found that temperature was the most consistent factor correlated with fungal concentrations. Other environmental parameters, including relative humidity, rainfall, ozone, PM<sub>10</sub> and PM<sub>2.5</sub>, also had statistically significant relationships with fungal levels. We analyzed three most dominant fungal allergens world-wide and found that the concentrations of these allergens were low in the ambient air in Taipei. The concentrations of Cladosporium herbarum in PM<sub>2.5-10</sub> and PM<sub>2.5</sub> were 0.0440 and 0.0095 ng/m<sup>3</sup>, respectively. Aspergillus fumigatus was only detected in PM<sub>2.5</sub>, and its average concentration was 1.9122 pg/m<sup>3</sup>.

Our study provided the baseline data of ambient biological particles in Taipei metropolis and the relationships between outdoor fungi and air pollution/meteorological factors. Future studies should be implemented to evaluate the health impacts of aeroallergens, and to examine the interactions among fungal spores, meteorological factors and air pollutants.