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• 中文摘要

環保署爲推動空氣污染物健康風險評估政策，於台北縣新莊運動公園建立北部微粒超級測站，以最先進之連續自動監測儀器，進行大氣微粒重要物理、化學和光學等特性之監測。爲進一步探討現有微粒空氣品質標準修訂之可能性，本整合型研究計畫彙整超級測站所監測的微粒資料，並結合微粒之基因、動物及人體毒理反應研究，進行都會區之健康風險評估，以作爲環保署修訂現有法規之重要參考依據。鑑於戶外生物性微粒可能的健康及生態危害，且爲超級測站監測項目中所缺乏，本子計畫於新莊超級測站進行大氣中生物性微粒的長期監測，評估長程傳輸及本地高污染事件對生物性微粒成份及濃度的影響，並利用統計模式分析生物性微粒與氣象因子以及大氣污染物間之相關性。主要測量之生物性成份包括真菌孢子、常見戶外過敏原(Cladosporium)以及細菌內毒素。針對真菌孢子的部份，我們進行了每月連續七天的定期採樣，以及二波大陸沙塵和中元節高污染事件的監測。在過敏原以及內毒素的部份，我們則進行了三次爲期兩個星期的密集採樣。根據研究結果指出，台北都會區大氣中的優勢菌種爲 ascospores（子囊孢子）、Cladosporium（分枝孢子菌）、basidiospores（擔孢子）、Curvularia（彎孢黴菌）及 Aspergillus/Penicillium（麴菌/青黴菌）。今年度由於沙塵影響期間較短，以及中元節期間下雨、污染物濃度未明顯上升，因此無法確認長程傳輸及本地高污染事件對生物性微粒是否有顯著的影響。Cladosporium 過敏原及內毒素濃度有明顯的季節變化，且在粗微粒中濃度較高。在多變項?歸分析中發現，總真菌孢子濃度與大氣溫度及一天前的相對濕度有正相關，而與風速及一氧化氮濃度有負相關。Cladosporium 過敏原及內毒素則與多種氣象因子間有相關性。本研究提供了台北都會區大氣中生物性微粒的基線資料，以及生物性微粒與氣象因子及空氣污染物間的相關性。由於生物性微粒與氣象及空氣污染因子間有複雜且重要的相關性，因此未來在進行健康風險評估時應同時納入考量，以釐清各因子的各別及共同作用。生物性微粒的長期變化除了受本地污染源的影響外，亦會受到長程傳輸事件、氣候變遷、全球大氣污染所影響，因此在未來的研究中應評估其變化趨勢，以及可能的生態及環境影響。

- 英文摘要

o implement the health risk assessment for air pollution, the ROC Environmental Protection Administration (EPA) established a state-of-the-art particulate matter (PM) monitoring station, "Supersite," at Hsinchuang Sport Park in Taipei County, Taiwan. The Supersite utilizes research grade equipment to automatically and continuously monitor the physical, chemical and optical characteristics of PM. In order to evaluate the possibility of amending current PM air quality standard, this integrated study synthesizes the PM monitoring data at Supersite and the results of PM toxicity investigations to assess the health risk of PM. The results of this integrated study will be the major reference for EPA to amend current PM regulations. Biological particulates have yet to be included in the current Supersite monitoring system. In view of the potential health effects and ecological impacts, we conducted an environmental monitoring study at the Supersite station to assess the profile of ambient biological particulates longitudinally. We evaluated the effects of long-range transported pollutants and local high pollution events on the concentrations and compositions of biological particulates. We also examined the interrelationships between biological particulates and air pollution/meteorological factors using statistical models. The major biological components assessed included fungal spores, a common outdoor allergen (Cladosporium), and endotoxin. We monitored fungal spores for 7 days at the end of every month, during two episodes of China dust events, and during the period of Zhong-yuan Festival, a highly polluted local event. We also conducted three two-week environmental samplings to collect ambient fungal allergens and endotoxin. We found that the most prevalent fungi in Taipei metropolis were ascospores, Cladosporium, basidiospores, Curvularia, and Aspergillus/Penicillium. We were not able to evaluate the impacts of China dust events and Zhong-yuan Festival on biological particulates statistically, because of the short event period and low pollutant levels due to raining, respectively. Both Cladosporium allergen and endotoxin levels had significant seasonal variations and were higher in coarse particles than in fine particles. In regression analyses, total fungal level was positively associated with current temperature and relative humidity one day before and negatively with wind speed and nitrogen oxide. Cladosporium allergen and endotoxin levels also had significant relationships with several meteorological factors. Our study provided the baseline data of ambient biological particulates in Taipei metropolis and their relationships with air pollution/meteorological factors. Due to complex interactions among biological particulates, meteorological factors and air pollutants, all these factors should be considered concurrently to assess their health risks in future studies. Long-term variations of biological particulates are influenced not only by local sources, but III also by long-range transport events, climate change, and global ambient pollution. Thus the trend of biological particulates should be examined longitudinally in order to evaluate their long-term impacts on ecology and environment.