

# 台北市長期照護機構員工生物性職業暴露評估

## Exposure to Occupational Biological Hazard in Long-Term Care Facilities in Taipei

### 中文摘要

本研究針對台北市長期照護機構進行生物性環境暴露評估，以瞭解員工的暴露狀況，並評估可能的生物性健康風險。針對五家同意參與計畫之長期照護機構分別進行一個星期的環境密集採樣，採樣項目包括室內空氣中、空調通風系統出風口、以及室外空氣中的可培養性真菌和細菌，採樣同時並測量溫度、相對濕度和二氧化碳濃度。在環境採樣的同時，利用結構式問卷進行長期照護機構員工的人口學資料及健康狀況調查，問卷內容包括受訪者基本資料、接觸史、個人健康狀況、個人防護、工作環境狀況等。根據研究結果發現，室內平均總真菌濃度最高及最低的機構分別是機構 D (1444.32 CFU/m<sup>3</sup>)及機構 B (426.69 CFU/m<sup>3</sup>)；室內平均總細菌濃度較高的為機構 C (811.83 CFU/m<sup>3</sup>)及 D (802.42 CFU/m<sup>3</sup>)，最低的為機構 E (282.12 CFU/m<sup>3</sup>)。受訪機構中最常見的真菌種類包括 Non-Sporulating Fungi、Geotrichum、Cladosporium、Penicillium 及 Aspergillus。在多變項迴歸中發現，總真菌濃度與相對濕度、建築年齡及採樣時段有關，而總細菌濃度則和二氧化碳濃度、採樣點人數以及機構別有關。由於工作關係而罹病，與年齡、使用消毒劑、替個案翻身、照護人數、環境溫度，以及空氣中真菌及細菌濃度有關；在工作場所產生不適症狀，則與年齡、照護人數、通風狀況及環境因子有關(如：空氣中真菌及細菌等)。綜合研究結果發現，長期照護機構的生物性暴露主要是因環境及空調通風系統清潔不佳，以及通風量過低所致。因此建議長期照護機構應有完善的環境清潔程序及計畫，並且提供機構內各區域適當的室外新鮮空氣，以降低員工及住民的生物性暴露及健康危害。

### 英文摘要

We investigated five long-term care facilities in Taipei, Taiwan to evaluate the distributions of biological contaminants and to assess workers' exposure to these contaminants. We conducted a one-week intensive environmental sampling at each study facility. We monitored culturable fungi and bacteria in indoor air, near AC (air conditioning) diffusers and outdoors, as well as temperature, relative humidity and CO<sub>2</sub> levels. Structured questionnaires were administered to the participants concurrently with the environmental sampling to collect information on workers' demographic data, medical and contact history, perceived work-related symptoms and work environment, and practices of personal protection. Facilities D and E had the highest (1444.32 CFU/m<sup>3</sup>) and lowest (426.69 CFU/m<sup>3</sup>) fungal concentrations respectively among the study facilities. Facilities C and D had higher bacterial levels

(811.83 CFU/m<sup>3</sup> and 802.42 CFU/m<sup>3</sup>, respectively) than other study facilities, and facility E had the lowest bacterial level (282.12 CFU/m<sup>3</sup>). The most prevalent fungi recovered in study facilities included Non-Sporulating Fungi, Geotrichum, Cladosporium, Penicillium and Aspergillus. In multiple regression analyses, fungal levels were associated with relative humidity, sampling time and building age. Bacterial concentrations were correlated with CO<sub>2</sub> levels, number of people in the sampling site, and facilities. Work-related diseases had significant associations with age, using disinfectants, turning over patients, number of cases cared per day, environmental temperature, and airborne fungi and bacteria. Work-related symptoms were correlated with age, number of cases cared per day, ventilation and environmental factors (e.g., concentrations of airborne fungi and bacteria). In summary, biological exposure in the study facilities mainly resulted from inadequate environmental and AC/HVAC (Heating, Ventilating and Air Conditioning) system cleaning and insufficient ventilation rate. Therefore, better cleaning programs and proper ventilation should be implemented in long term care facilities to decrease residents and workers' biological exposures and health risks.