Indoor air quality and thermal comfort - Results of a pilot study in elderly care centers in Portugal

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Problems of indoor air quality (IAQ) are recognized as important risk factors affecting human health. In residences, day-care centers, retirement homes and other special environments, indoor air pollution affects population groups that are particularly vulnerable owing to their health status or age (WHO, 2010). The age of the European population is rising, and the percentage of adults aged 65 years and older is projected to increase from 16% in 2000 to 20% in 2020 (Adan *et al*., 2006). Older persons spend about 19-20 hours per day indoors (WHO, 2003), and many spend essentially all of their time indoors in elderly care centers (ECCs). Moreover, older persons may be particularly at risk of adverse health effects from pollutants, even at low exposures, due to multiple underlying chronic diseases. Therefore, the study of IAQ among the elderly is becoming an important research issue.

This study is design to analyze 320 elderly living in Porto in ECCs. Both individual persons and ECCs were chosen randomly among 1550 elderly living in 56 ECCs. This population is being studied to collect the following data types: (i) health and quality of life questionnaires including St. George's Respiratory Questionnaire (Jones *et al*., 1991; ATS, 2000) and the World Health Organization's Quality of Life – BREF (WHO, 2004; Liang *et al*., 2008; Bobic *et al*., 2009); (ii) building structural and environmental characterisation; (iii) IAQ parameters including formaldehyde, particulate matter up to 10 micrometers in size, total volatile organic compounds, carbon monoxide, carbon dioxide, total bacteria and fungi species identification, temperature, relative humidity; and (iv) perceived IAQ, including predicted mean vote (PMV) and predicted percent of dissatisfied people (PPD). IAQ monitoring is being performed during spring/summer and autumn/winter in ECC areas within dining rooms, drawing rooms, medical offices and bedrooms. Ambient air samples are also collected for comparison to the indoor measurements. This paper presents results of a pilot study for this ongoing work, and specifically describes findings at 6 ECCs studied in two seasons).

The study areas were all natural ventilated, had a mean floor area of 30 m^2, and the following mean occupancy rates per room during monitoring: dining rooms (3.8), drawing rooms (7.2), medical offices (1.5) and bedrooms (0.4). IAQ autumn/winter results indicate that indoor concentrations are within the Portuguese reference values, but 40% of the participants were dissatisfied with indoor thermal conditions, rating it ‘slightly cool’.

Results for the spring/summer season show a lower rate of dissatisfied persons (8%), but fungal concentrations exceeded reference levels (> 500 CFU/m^3).

To our knowledge, this is the first study in Portugal to assess effects of indoor air contaminants on health status and quality of life in older persons living in ECCs. Although the preliminary results suggest that indoor concentrations of most parameters were within reference values, the results highlight several issues, including the need to improve the balance between IAQ and thermal comfort in ECCs.

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