Topic A6: Health and indoor air epidemiology

MODERN OFFICE RELATED DETERMINANTS OF DRY EYE COMPLAINTS — THE OFFICAIR STUDY

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INTRODUCTION

Dry eye complaints are amongst the most prevalent office-work related health effects. Previous large studies, in which the prevalence of health complaints in the office environment was investigated, have identified ocular discomfort as a widespread and common building-related health symptom (e.g. Bluyssen et al., 1996; Brightman et al., 2008; review by Wolkoff, 2013).

Building characteristics may, through affecting indoor environmental conditions, including air quality, affect health and comfort of office workers. Identification of causal factors and investigation of their relative contribution to observed effects is complex (e.g. Bluyssen et al., 2011). The indoor air of modern offices typically consists of a complex mixture of air pollutants, which may exert effects through complex interactions. In addition to air pollution, there may be a number of other risk factors, that include environmental characteristics (e.g. temperature, humidity; review by Wolkoff et al., 2012), but also individual risk factors which may confound or modify exposure response relationships. To allow development of practical measures geared towards reducing effects in modern offices, more insight is needed to interpret building related factors that play a role in the causal pathway, e.g. through adversely affecting indoor environmental conditions.

Within the framework of the EU project OFFICAIR a large field investigation was carried out, resulting in an extensive database that comprises not only data about physical building characteristics, but also on occupant related factors (incl. e.g. demographic characteristics, lifestyle and working conditions), as well as on health symptoms (incl. dry eyes). This offers the unique possibility to study associations between characteristics of modern office buildings and dry eye symptoms, taking into account factors that may confound or modify relationships.

This study aims to investigate the association between physical characteristics of modern office buildings and self-reported dry eye complaints, as a first, but important step towards unravelling modern office related causes of dry eye complaints.

METHODOLOGIES

During the winter 2011-2012 a large study was carried out in eight European countries: Greece, France, Finland, Hungary, Italy, Portugal, Spain and The Netherlands. Data were collected on a broad range of physical building characteristics for 167 modern office buildings. Furthermore, simultaneously, occupant data were collected through an on-line survey questionnaire (about 7.500 office workers). Data from the building investigations were linked to the questionnaire data that resulted in a large database comprising of both physical building characteristics as well as occupant data.

Multi-level logistic regression analyses were performed to iteratively investigate associations between building characteristics and self-reported dry eye complaints (experienced during the past 4 weeks (Y/N)), adjusting for potential confounders (incl. gender, age, level of education, smoking status, alcohol consumption, number of hours of computer work, and country). A multi-level design was needed to account for non-independency of respondents residing within the same building. Subsequently, for the most significantly prominently associated characteristics the relative contribution was evaluated in a combined model. Additionally, explorative analyses on possible interaction effects were carried out.

RESULTS AND DISCUSSION

After adjustment for potential confounders, preliminary results show statistically significant associations with dry eyes for 37 out of 405 building characteristics, including e.g.: number of occupants, the availability of ‘a documented complaints procedure for occupants with problems of the indoor environment’, construction materials (e.g. type of floor covering, presence of wood partitions), lighting related factors (e.g. individual control of solar shading devices), ventilation related characteristics (including e.g. ventilation type, design outdoor flow rate, and (other) characteristics of HVAC systems), cleaning frequency, and (other) sources of indoor air pollution (e.g. the presence of underground car parking, location of the printers/copying machines). Prominent factors associated with dry eyes, emerging from the combined model included: The availability of a ‘documented complaints procedure for occupants who have a problem with the indoor environment’ (higher risk), ‘stone/ceramic’ floor covering (lower risk in buildings with stone/ceramic floor covering), ‘openable windows’ (higher risk in buildings without openable windows), and frequency of surface cleaning in communal areas (lower risk for cleaning surfaces at least once a month, compared to less often). Furthermore, first indications were found of a significant interaction effect of the placement of printers/copy machines and ‘use of chemicals during cleaning services’.

It should be noted that associations observed in observational studies should be interpreted with caution, as they are not necessarily causal: About possible underlying causes one can only speculate. However, such associations provide valuable information about important clues to potentially causal underlying factors, which deserve further investigation in dedicated studies. Factors that otherwise may have remained unidentified.

CONCLUSIONS

The OFFICAIR study demonstrates that building characteristics data can be successfully combined with questionnaire data for identification of potential risk factors for eye complaints. This study is a first step towards identification of modern office building related risk factors of dry eyes. In-depth studies are needed, to further investigate associations identified in our study.

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