

English summary

Introduction: Measurements carried out by the Danish Center for Environment and Energy in 2010 showed high concentrations of ultrafine particles (UFP) at Copenhagen Airport, Kastrup. Especially high levels were measured on the apron, where ground personnel are working. There is a growing scientific consensus that particulate air pollution in urban environments may lead to an increased risk of cardiovascular disease (CVD). However, there is still uncertainty about an association between occupational exposure to UFP and related health effects. It is not possible to predict any health risk among airport employees working outdoors at Copenhagen Airport, based on existing knowledge from urban environments, as the working population is younger and healthier than the general adult population. To our knowledge no previous studies have investigated an association between outdoor work at airports and the incidence of CVD.

Aims: The overall aim of this PhD thesis was to examine the association between occupational exposure to UFP and ischemic heart disease (IHD) and cerebrovascular disease among airport employees. The specific aims were;

- To compare the personal exposure to UFP among five different occupational groups working at Copenhagen Airport (paper 1)
- To describe the construction and data included in The Copenhagen Airport Cohort (paper 2)
- To investigate if long-term occupational exposure to UFP outdoors at Copenhagen Airport was associated with ischemic heart disease (IHD) and cerebrovascular disease (paper 3)

Method and materials: Employees were recruited based on information from company employment registers as well as union member registers. The cohort comprised 69,175 men in unskilled positions eligible for follow-up in the period 1990-2012 (paper 2). The exposure assessment was based on: 1. Person-borne UFP particle measurements in combination with Global Positioning Systems (GPS) to estimate work on the apron for each of the five largest occupational groups (paper 1). 2. Expert assessments of time spent on the apron for other occupational groups at the airport, used as a proxy for UFP exposure. We calculated the proportion of time spent on the apron for each calendar year (apron-years) and the primary exposure measure was cumulated apron-years (paper 2). We followed the cohort in the Danish National Patient Register and the Danish Register of Causes of Death for diagnosis of ischemic heart disease (IHD) and cerebrovascular disease (paper 3).

Results: The reference group and the exposed group were almost comparable in relation to register based information. We found that a smaller proportion of the exposed group compared to the reference group were current smokers, 27% and 32%, respectively (paper 2). The concentrations of UFP measured on the apron were much higher than concentrations measured at other locations, whether indoors or outdoors. Baggage handlers were exposed to 7 times higher average concentrations than employees mainly working indoors (baggage handlers: GM: 37×10^3 UFP/cm³ and employees working indoors: GM: 5×10^3 UFP/cm³). Catering drivers, cleaning staff and airside security were exposed to intermediate concentrations (GM: 12 to 20×10^3 UFP/cm³) (paper 1). We found no increased incidence of IHD or cerebrovascular disease associated with exposure to UFP among exposed employees at Copenhagen Airport compared to the reference group. Furthermore, in dose-response analyses, we found no significant associations between the cumulated apron-years and IHD and cerebrovascular disease (paper 3).

Conclusion: It can be concluded, that findings from this PhD thesis do not provide evidence for an association between occupational exposure to UFP and the incidence of IHD and cerebrovascular disease among airport employees at Copenhagen Airport. This is the first study that examines this association at an airport and more research is needed.