RESEARCH HIGHLIGHTS

Technical Series 99-100

THE EFFECT OF IMPROVING THE HOME ENVIRONMENT ON ASTHMA: A PILOT STUDY

Introduction

Sufficient information exists on the health effects of housing. The likelihood of the home environment contributing adverse health effects is greater for the population with asthma, who together with people suffering from other forms of lung disease comprise 20% of the population in Canada.

A recent survey of basements found visible signs of moisture in more than half of the houses. It is likely that some asthmatic individuals may be living in moldy houses and may not be aware of the impact of the air quality of the home on their asthma.

Research Program

This research project was a pilot study to determine the effect of improving the IAQ in the home on the asthmatic condition of the occupants. The objectives of the project were to design the study, to monitor the effects of the air quality of the home on asthma, to examine different ways of following the health of the asthmatic individual and to determine any housing/health correlation from an actual field study.

Homeowners with at least one asthmatic family member in the Ottawa-Hull area were invited to participate. Only non-smoking households without pets were considered for the study. The selected homeowners had to be willing to carry out renovations to improve indoor air quality at their own expense.

Fifty respondents were interviewed by telephone and asked to complete a questionnaire about their house and the asthmatic occupant's health condition. This preliminary screening identified eleven candidates who associated the onset of asthma or the aggravation of symptoms with their houses.

Each of the eleven houses was inspected following the protocol developed for CMHC's Residential IAQ Investigator Program. Ten of the eleven houses were found to have IAQ problems primarily due to molds in the basements. Remediation measures, grouped into Required (required for participation in the study), Recommended and Optional, were developed for each house.

Six households expressed their willingness to carry out the required renovations within the time frame of the study. The asthmatic subjects included four adults, a teenager and a young child with asthma. To complete the study, four control subjects, whose houses were not to be renovated, were recruited.

Following the inspections, detailed specifications were developed for carrying out the renovation work. Prior to the renovation, the houses were tested for air tightness, carbon dioxide (CO_2), relative humidity, volatile organic compounds (VOCs), house dust mites, ergosterol and molds.

Findings

No correlation was found between measured dust mite levels and the reported aggravation of asthma in the basements. Lower levels of dust mite antigens (Der f 1) in the basement compared to the main floor in two houses ruled out dust mites as the cause of the aggravation of the occupants' asthma.

The mold tests confirmed the qualitative findings of the inspections, that the basements were very moldy, and substantiated the recommended remedial steps. Air and dust samples from the basements failed the Pass/Fail criteria for contamination due to molds, and bulk samples confirmed the growth of non-phylloplane molds. All six houses had toxigenic molds. Five houses had one or both of the dangerous molds, *Stachybotrys chartarum* and *Aspergillus versicolor*. These five

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houses were renovated. One homeowner, unwilling to carry out the more stringent remedial work dictated by exceptionally high levels of a toxigenic mold in his basement, opted out of the study.

The five houses were renovated to varying degrees of completion. Inspections of the renovation work were performed to monitor the progress and to ensure the work was carried out as specified. One house (House 3) was meticulously and thoroughly cleaned for molds, and the foundation was improved to prevent moisture entry. The air quality of this house was markedly improved, and no molds were detected on re-testing. The basements of three houses (House 1, 4 and 5) were cleaned, but no remedial work was undertaken to control moisture entry. The perceived air quality improved after the clean up, but mold regrowth had occurred at the end of the study. The basement of the fifth house (House 2) was only partially cleaned up. Tests showed that this house continued to be highly contaminated.

Information about the health of each of the occupants with asthma was obtained through interviews, detailed questionnaires before and after renovation and daily recording of symptoms. The participants and controls were also asked to measure peak expiratory flow rates (PEFRs).

The participants reported that peak flow measurements were not a sensitive measure of how well or poorly they were breathing. Hence, a record of how they felt, their need for medication, the frequency, severity and duration of respiratory infections and frequency of visits to their doctor was more informative than peak flow measurements.

Improvements in the asthma condition of the occupants correlated with the degree of improvement of the air quality of the house. Both daughter and mother in House 3 experienced significant improvement of asthma and chronic fatigue syndrome, respectively, after the renovation. The adult asthmatics of Houses 4 and 5 reported marked improvement and no longer needed medication half a year to nine months after the renovation. The adult asthmatic of House 1 did not find any improvement. The asthma of the owner of House 2 became worse while he gutted his basement. The control subjects did not report an improvement during the study period.

Conclusions

Awareness of indoor air quality in the home was poor, even among asthmatics. Mold was found to be the predominant contaminant in the houses, though sources of chemical contaminants were also found in some of the homes. There is considerable interest among people with asthma in information on the health effects of molds and other pollutants and how to improve the indoor air quality of the home.

Participation rate in this study was low - only five families out of fifty respondents renovated their homes. For the participants, being part of the study was a learning experience. The health outcomes obtained from this pilot study indicates a need for a larger study. Future studies should emphasize implementing long-lasting solutions for mold problems. Only participants with a demonstrated commitment to completely carry out the recommended remedial work should be selected.

Project manager: Virginia Salares

Research report: The Effect of Improving the Home Environment on Asthma: A Pilot Study, 1998

Research consultant: John VandeKleut, Buchan Lawton Parent Ltd

A full report on this project is available from the Canadian Housing Information Centre at the address below.

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