

1 Kurzfassung (Englisch)

An important task of the Municipal Department is to advise citizens on mold growth and prevention strategies. To evaluate the frequency of mold in Vienna, a web-based survey was developed. With this instrument the personal risk potential could be determined by residents based on their usage behavior and characteristics of the home, and feedback given immediately at the time of the survey. The questionnaire included questions about the general characteristics of their home, and the individual behavior of the residents, including heating and ventilation.

To further optimize the online questionnaire, and to develop additional prevention strategies, the survey data were comprehensively evaluated. For the 34 survey questions, statistical analyses were conducted in the form of descriptive statistics, correlations, and multivariate regression. As such, factors were identified which predict the growth of mold best, as well as those that can prevent the formation of mold.

The online questionnaire was completed by more than 4,000 people. The majority of respondents (77%) lived for more than two years at their home and one-third (38%) longer than 10 years. 42% of respondents lived in households with just two people, followed by 22% who live in a single household. About 17% live in a household with more than 4 people. Slightly more than half of the respondents live in a home between 40 and 80 square meters in size.

Almost half (40%) of respondents reported their windows had been replaced in recent years. A thermal renewal had been carried out in 25% of homes. The majority of respondents stated that the average temperatures in the bedroom (68%) and living quarters (52%) was in the optimal range (18°C - 21°C). In winter, homes were usually aired once or twice per day. Although only one-third of respondents reported the humidity of their home, approximately half indicated that the humidity in the home was less than 55%, with the other half reporting the humidity was above 55%.

Over 40% of homes had visible mold. Most commonly, the bedroom was affected, followed by the living room and bathroom. By regression analysis of the relationship between each factor and mold growth were examined in the apartments to make statements about the suitability of individual factors as predictors of mold growth.

There was a significantly increased risk of mold (expressed as odds ratios, or the "opportunity" for mold) for the following factors: apartment on the ground floor or basement apartment adjacent to unheated spaces, no thermal renewal, large obstructions to the outer walls, small apartment size, higher number of people in the home, presence of pets, no airing, no additional ventilation options (such as exhaust fans), higher humidity, and shorter length of residence.

In the multivariate analysis, a number of at least 4 people in the apartment turned out to be the strongest predictor of mold growth. As protective factors (with respect to mold growth) proved especially a short period of residence or a newly constructed house, airing and a thermal renewal.

In a further step of investigation, the occurrence of mold growth (in any room) was analyzed for rented apartments. The three most important risk factors for the development of mold crowding were high occupancy (the variable "crowding" was defined as follows: two or more persons in an apartment < 40 m² and 4 or more people in homes 40 to 80 m²), humidity

> 55% and unheated neighboring areas (lateral). Overcrowding was the strongest predictor of mold growth - on the order of about 130%.

While risk factors were identified, protective factors were also apparent. Survey results show thermal renewal lowered the risk of mold formation, a finding which was analyzed in detail. In total, 25% of the respondents reported that such a restoration was carried out. In an analysis simultaneously considering thermal renewal and crowding, thermal renewal still reduced the risk of mold growth by about 30%.

Viewing the present analysis from a civil engineering perspective, it may be generally stated that the main findings are congruent with previously known risk factors for mold from building construction. This concerns in particular the identified risk increasing with high humidity, with adjacent areas external or unheated areas, or obstructions on outside walls.

As structurally relevant result of this research project, the protective effect of thermal renewal of buildings is recommended where possible, especially for houses where overcrowding is common. These analyses show that the course already taken by the city of Vienna in terms of promoting thermal renewal of housing not only brings energy profit, but also a lower probability of exposure to mold, adding considerable public health benefit to the efforts.