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Title: Indoor dampness and moulds and the risk of allergic rhinitis: A meta-analysis

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Body: Background A substantial proportion of the world's population is exposed to indoor dampness-related exposures. Since 1990s studies have assessed the relation between indoor dampness and mould and allergic rhinitis, but the evidence has been inconclusive. No previous meta-analysis on this topic has been reported. Objectives We conducted a meta-analysis of studies on the relations between indoor dampness and mould and the risk of allergic rhinitis, and investigated whether these relations differ according to the type of exposure. Methods A systematic search of Ovid MEDLINE and EMBASE databases was conducted (1950 through August 2012) and reference lists of relevant articles were reviewed. Cross-sectional, case-control and cohort studies in children or adults were selected according to a priori criteria. Three authors independently evaluated articles using a structured form. Results Altogether 18 studies on allergic rhinitis (AR) and five on rhinoconjunctivitis (RC) were included. In the meta-analyses the largest risk was observed in relation to mould odour (AR: 1.87, 0.95-3.68). The risk related to visible mould was also consistently increased (AR: 1.51, 1.39-1.64; RC: 1.66, 1.27-2.18). In addition, exposure to dampness (AR: 1.50, 1.38-1.62; RC: 1.67, 1.40-1.98) and any exposure were related to increased risk of both types of rhinitis. Conclusions This meta-analysis provides new evidence that dampness and moulds at home are determinants of allergic rhinitis. Our results provide evidence that justifies prevention and remediation of indoor dampness and mould problems and such actions are likely to reduce allergic rhinitis. Funding: The Academy of Finland, the Ministry of Social Affairs and Health of Finland.