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Atopic diseases, immunoglobulin E and cancer risk

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In the epidemiological literature there has been an ongoing debate whether “allergies”, atopy, or atopic diseases are associated with a decreased risk or increased risk of cancer. It appears that for some types of cancer the risk may be decreased, while for other types of neoplasms there may be an increased risk. Biological explanations for both directions of the association have been offered, but remain speculative. The primary objective of this investigation was to examine the occurrence of cancer in relation to atopy-related diseases and atopy (defined by specific IgE positivity in the serum). We were specifically interested in the role of immunoglobulin E (IgE) in the risk of cancer. In addition, the intention was to determine the possible epidemiological role of allergen-specific IgE in combination with the atopy-related diseases asthma, hay fever and atopic dermatitis, by separating these diseases into their intrinsic/non-allergic type (i.e. without IgE positivity) and their extrinsic/allergic type (i.e. with allergen-specific IgE positivity).

A population-based case-control study was conducted, comprising 318 patients with prostate cancer, 381 patients with breast cancer, 196 patients with lung cancer, and 477 patients with colorectal cancer, first diagnosed between Jan 2001 and Dec 2003, aged 50-74 years old, and residents of Saarland, Southwest Germany. Controls were a random sample of 4271 individuals from a population-based prospective investigation in Saarland, within the same age group as the cases. Data on demographic background, physician-diagnosed atopy-related diseases (asthma, hay fever, atopic dermatitis) and other relevant variables were obtained by

self-administered questionnaire. To access atopy, the presence of allergen-specific IgE antibodies against a range of common environmental inhalant allergens was determined in the serum of cases and controls. Odds Ratio (OR) and 95% confidence interval (95% CI) were estimated using an unconditional logistic regression model.

Atopy did not show an association with colorectal carcinoma risk after adjustment for potential confounders (OR 1.03, 95% CI 0.80-1.33). Similarly, the risk associated with any atopy-related disease was 0.96 (95% CI 0.71-1.30). However, we observed a 39% decreased risk, albeit non-significant, associated with atopic dermatitis (OR 0.61; 95% CI 0.31-1.23). There was some indication of a protective effect by the extrinsic/allergic types of asthma and hay fever.

The risk of lung cancer tended to be slightly lower in subjects who had a history of any atopy-related disease. Asthma was associated with an increased risk of lung cancer, although the risk estimate did not approach statistical significance (OR 1.36, 95 CI 0.71-2.59). Among asthma patients, those without specific IgE positivity had a similar pattern in risk of lung cancer to those with specific IgE positivity. Interestingly, a significantly decreased OR of lung cancer was associated with hay fever (OR 0.27, 95% CI 0.08-0.86), in particular among males.

Most of the associations between breast cancer and atopy-related diseases were positive, but none had a confidence interval that excluded 1. The adjusted OR for breast cancer risk with atopy positivity was 1.20 (95% CI 0.88-1.63). The increased risk associated with asthma and hay fever was enhanced if they also had a specific IgE positivity, but this was not observed for atopic dermatitis.

A statistically significant increased risk of prostate cancer was observed in association with atopy, defined as the presence of allergen-specific IgE antibodies in the serum (OR 1.38; 95% CI 1.02-1.89). The extrinsic/allergic types of asthma and hay fever (i.e. accompanied by IgE positivity) conferred a higher risk of prostate cancer, but the associations were not statistically significant.

Our results suggest that it is the atopy (specific IgE positivity), and not any of the atopy-related diseases separately, which increase the risk of prostate cancer. It is possible that atopy is a risk factor for breast cancer. An increased risk of lung cancer associated with asthma is consistent with the literature, and the similar effect between extrinsic/allergic types and intrinsic/nonallergic types of asthma suggests that the chronic inflammation in the lungs of

asthmatics play an important role in the development of lung cancer. The protective role of atopic dermatitis, especially in colon cancer, reveals the need for more studies.

Our results, in agreement with epidemiological evidence from other studies, indicate a complex association between atopy/atopy-related diseases and cancer risk that varies by type of atopy-related disorders and the particular type of cancer under consideration. The effect on cancer risk by atopy, defined by IgE positivity, may differ from the effect by the atopy-related clinically defined diseases such as asthma, hay fever and atopic dermatitis. Future studies should, besides the cancers investigated in this study, include other types of neoplasms, should also include IgE as biomarker, and should employ more precise instruments for the assessment of the atopy-related diseases.