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Decreased Prevalence of Immediate Hypersensitivity (Atopy) in a Cancer Population

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SUMMARY

It has been suggested that the atopic population has decreased risk of cancer. This investigation examined the cumulative prevalence of atopy in a population with neoplastic disease and compared this with the prevalence of atopy in an age-matched control group and with published estimates of atopy in the general population. Seventy-four patients with neoplastic disease and 86 patients without cancer were evaluated. The subjects were given a standard allergic questionnaire which evaluated them with regard to a history of allergic symptoms, hives, eczema, frequent colds, frequent unexplained rashes, hay fever, and asthma. All were skin tested with a representative group of regionally significant allergens. There was a 15-fold decrease in prevalence of atopy in the cancer population, compared with the control group and compared with published estimates of atopy in the general population.

INTRODUCTION

There is much controversy in current scientific literature as to whether a relationship exists between the atopic state, characterized by an enhanced immediate-type hypersensitivity reaction, and the risk of developing cancer. Fisherman has stated that "possible advantageous functions of atopic mechanisms have all but been obscured by the more apparent deleterious effect of its over-activity."[2] It has been suggested, however, that the atopic population has decreased risk of malignancy (8, 12). This investigation examined the cumulative prevalence of atopy in a population with neoplastic disease and compared this prevalence with a control group of patients and with published estimates of atopy in the general population.

MATERIALS AND METHODS

Patients. Seventy-four patients with various stages of cancer were selected for study. There were 16 males and 58 females. The mean age was 56 years with a range of 21 to 76 years. The age-matched control group consisted of 86 patients admitted to the surgical and medical wards of The Milton S. Hershey Medical Center. There were 42 males and 44 females. The mean age was 52 years with a range of 18 to 86 years. Patients admitted to the hospital primarily due to their atopic disease were excluded from the control group.

Methods. All of the subjects were interviewed personally, and each completed a standard allergic questionnaire that evaluated him with regard to a history of allergic symptoms, hives, eczema, frequent colds, frequent unexplained rashes, hay fever, and asthma. Untoward reactions to drugs, *e.g.*, penicillin, were not included in the survey, since they do not bear any consistent relationship to atopy.

The immediate-type hypersensitivity reaction was studied in all of the subjects with neoplastic disease. They were all skin tested with a control and a representative group of regionally significant allergens consisting of the following: (*a*) *Alternaria tenuis*, (*b*) *Hormodendrum hordei*, (*c*) ragweed group, (*d*) cottonwood group, (*e*) 9 southern grasses, (*f*) 7 grasses, (*g*) oak, (*h*) maple, (*i*) acacia group, (*j*) mugwort, and (*k*) sorrel dock. Skin tests were performed by a trained nurse using the standard prick-test method. Tests were read after 20 min. Control reactions were subtracted from allergen test readings in reporting the size of the reaction. No control reactions were positive. Reactions were graded + to ++++.

RESULTS

Table 1 lists the results of the allergy questionnaire for the 74 patients with cancer and the 86 patients who formed the control group. There was a 15-fold increase in the prevalence of atopy in the control group ($p < 0.01$).

Studies of the immediate-type hypersensitivity reaction in the cancer patients yielded only 2 subjects who had positive skin tests to the group of regionally significant allergens. One of the subjects with a positive skin test also had hay fever by history, and thus the total prevalence of atopy in the cancer population by allergic questionnaire and by immediate-type hypersensitivity reaction was 3% as compared with the 15% prevalence in the control group. This difference is striking and highly significant ($p < 0.01$).

DISCUSSION

Our data show that a population of cancer patients had a decreased prevalence of atopy when compared with an age-

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[2] E. W. Fisherman. The Relationship of Atopy to the Incidence and Survival of Cancer Patients, presented at the Chicago Symposium on Neoplasm Immunity: Mechanism, 1975.

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Table 1
Prevalence of atopy in cancer and control groups as assessed by clinical history

Atopy	Cancer patients (74 patients)	Control patients (86 patients)
Asthma	0	0
Hay Fever	1	7
Allergic urticaria	0	6
Eczema	0	0
Total patients with atopy	1 (1%)	13 (15%)

matched control population. We further compared our cancer patients and our control patients with published estimates of atopy in the general population. The most complete study that estimates the prevalence of atopy by history in a general population is the Tecumseh, Mich. study (3). Six thousand nine hundred ninety-five persons were interviewed and examined. The cumulative prevalence of atopy in this population was 20%, which compares well with the 15% prevalence in our control population and is strikingly different, compared with the cancer patients. Our control group and cancer group were age-matched. In the Tecumseh study, the cumulative prevalence in the 50- to 60-year age range was 16.5%. Again, this compares well with our 15% prevalence. Finally, there is no sex difference with regard to prevalence of atopy in the Tecumseh, Mich. study.

Barbee examined immediate skin test reactivity in a general population (2). He also used the standard prick-test method in testing 3,101 subjects in Tucson, Ariz. He reported a prevalence of 34%. This prevalence rate is similar to the 30.9% reported in college freshman (6) and to the 28.6% in the series of Curran and Goldman (4). The prevalence of immediate skin test reactivity in these population samples is markedly different from the 3% prevalence in our population of cancer patients.

Since Fisherman's pioneering work in 1960 (5), many investigators have noted that patients with cancer have a decreased prevalence of atopy and it has been suggested that atopy may influence the development of cancer. Fisherman studied 1185 patients with cancer and 295 patients without cancer who formed an age-matched control group. He found a 3.2% incidence of atopy in a cancer population and a 12.9% incidence in his control group. These results are comparable to ours. He also studied over a 15-year period a group of patients with both atopy and cancer and noted a 3-fold increase in survival time of the atopic over the nonatopic matched cancerous patients. Also, the immediate-type hypersensitivity reaction was markedly depressed in cancer patients as compared with normal controls, and patients who had both atopic histories and cancer observed a remission of atopic symptoms 4 or more years prior to the development of cancer.

In 1969, Ure (12) studied 140 patients on a gynecology ward. She found a 20% incidence of atopy and a 28% incidence of cancer in this patient population; however, the atopic group and the cancer group were mutually exclusive. Similar results were found by Mackay in London, comparing 150 subjects with cancer and 150 subjects who formed an age and sex matched control group (2). Alderson (1) followed 765 men and 1127 women with asthma over a 20-year period and noted that deaths from cancer were reduced in this patient population. Recently, Jacobs *et al.* (7) measured circulating IgE levels and found these to be low in patients with malignant disease.

Contrary to these results, McKee *et al.* (9), in a double-blind study of 403 preoperative patients, found no significant difference in the prevalence of atopy in patients with cancer. Shapiro *et al.* (11) in analyzing data collected in the Boston collaborative drug surveillance program found a 7.1% incidence of allergy in the cancer patients and a 6.6% incidence in the controls. These authors claim that biased history taking may account for the contradictory findings; however, Alderson followed his subjects prospectively and Jacobs relied on determinations of IgE levels. We included skin testing in our evaluation of the patients with neoplastic disease to further decrease the possibility of bias.

Our data and the data of other investigators suggest that atopy may indeed protect against the development of cancer. The mechanism by which this occurs is most certainly immunological but is still undefined. Meers (10) has suggested that the high circulating levels of IgE antibody found in atopics may interact with tumor-specific antigens and may aid in the destruction of neoplastic cells. Much work in recent years has been directed at enhancement of delayed-type hypersensitivity; perhaps, future effort should concentrate on manipulation of the immediate-type hypersensitivity reaction.

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