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Self-Reported Dermatitis and Skin Cancer in California Farm Operators

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Background *High rates of skin diseases and higher non-melanoma skin cancer rates have been reported in farmers.*
Methods *Self-report of dermatitis and skin cancer was among the information collected from 1947 California farm operators, mostly men, in a telephone survey. The majority of the farmers cultivated fruits, nuts, or other field crops.*
Results *Dermatitis was reported by 8.9% of men and 15.8% of women during the previous 12 months. In a logistic regression model, female gender (OR 2.0, 95% confidence interval 1.3–3.0) and respiratory atopy (OR 1.4, 1.01–1.90) were the only significant independent risk factors for reported dermatosis. There was significantly less reporting of skin cancer among field farmers when compared to others. Regular sunscreen use was reported significantly more often by women (42%) as compared to men (11%).*
Conclusions *More in-depth studies are needed to get information on the role of agrochemicals as risk factors for dermatitis and skin cancer.* Am. J. Ind. Med. 46:136–141, 2004. © *2004 Wiley-Liss, Inc.*

KEY WORDS: agriculture; epidemiology; questionnaire survey; respiratory atopy; sunscreen use; dermatitis; farming

INTRODUCTION

Farming in different areas of the world varies with respect to many factors including crops, animals tended, and chemicals used, but agricultural work is always associated with numerous skin irritants and allergens. Systematic registration of farmers' work-related skin diseases is done in few countries. In California, the highest rates of occupational skin diseases in the workers compensation system have been in farm workers [Mathias and Morrison, 1988]. Plants, agricultural chemicals (mainly pesticides), and food products have been the main causative agents of the occupational skin diseases [O'Malley and Mathias, 1988; Mathias, 1989]. The actual causal role is not determined in the California statistics, and thus the role of specific agents, e.g., pesticides, may well be overemphasized [Edmiston and Maddy, 1987].

Epidemiologic data on skin diseases among farmers are sparse. In a population of California tomato-, grape-, and citrus-workers, the overall reported prevalence of skin rash during the last 12 months was 12% [Gamsky et al., 1992], and the reported prevalence was highest in the grape workers. Skin rashes or irritation within the past 3 months were more often reported by California grape (52%) than tomato (19%) workers, but the prevalence of eczematous skin conditions on physical examination (10%) was similar in the groups [McCurdy et al., 1989]. In a study of Finnish farmers, (mainly dairy), the 12-month prevalence of dermatoses was 29% in women and 23% in men [Susitaival et al., 1994]. In the same study, a history of hand eczema was found in 42% of all those reporting dermatoses [Susitaival et al., 1995].

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The association of non-melanoma skin cancer with excess cumulative sun exposure and fair skin is well established [Scotto and Fraumeni, 1982; Green et al., 1988; Zanetti et al., 1996]. Diffey [1987] has estimated the cumulative incidence of non-melanoma skin cancer by the age of 70 to be 2–3% in indoor workers. The risk is up to five-fold higher in outdoor workers and in people who periodically sunbathe or who engage in outdoor activities closer to the equator [Diffey, 1987; Green et al., 1988; Ramani and Bennett, 1993]. Higher non-melanoma skin cancer rates have been associated with agricultural work and residence in rural areas [Blair, 1982; Schrijvers et al., 1994; Schouten et al., 1996]. Conversely, melanoma rates have been found to be lower in outdoor and agricultural workers compared to indoor workers [Garland et al., 1990; Fincham et al., 1992].

TABLE I. Prevalence of Self-Reported Dermatitis (Eczema or Rash During the Past 12 Months) in a Population of California Farm Operators (n = 1,947) by Gender, Age, and Respiratory Atopy, %

	Men N = 1,728	Women N = 196
Age (years)		
<40	6.7	25.0
40–60	8.2	15.4
>60	10.5	12.3
Respiratory atopy[a]		
Yes	10.5	20.3
No	8.1	13.9

[a]Report of asthma, hay fever, or other nasal allergy.

SUBJECTS AND METHODS

The current study of self-reported dermatitis and skin cancer is a part of a larger study on health and illness among California farm operators [Schenker et al., 2002; Monso et al., 2003; McCurdy et al., 2004]. Interviews were conducted by experienced interviewers who underwent additional training for this study. The subjects of the study were primary farm operators of California farms producing at least $1,000 worth of agricultural products during the previous year. In 1993 a random sample of 4,500 farms was drawn from approximately 57,000 farms in the list of the California Agricultural Statistics Service. A total of 3,711 of the farm operators could be traced, and 2,422 were eligible (principal operator, >$1,000 in farm sales) for the study. Eighty percent of the eligible farmers (N = 1,947) completed a computer assisted telephone interview questionnaire utilizing closed ended questions [Frey, 1989.]. Of those not eligible, 1,042 no longer operated a farm, 134 had died, and 113 did not speak English.

The questionnaire included questions on demographics, farm characteristics, farm work, and health. The median area of cultivation was 60 acres and varied from 10 acres for nurseries to 500 acres in large mixed farms. Farms were classified (primary commodity) as 45% fruit and nuts, 13% livestock, 8% field crops, 4% vegetables/nursery, and 29% mixed farms. In some analyses farms were divided into small- and large-scale operations by quantity of production (e.g., large: >130 heads of cattle, >20 acres of fruit, or >90 acres of field crops). Respondents were also asked about the proportion of time doing fieldwork, pesticide handling (>30 days a year), dusty work, and sunscreen use.

Only 10% of the surveyed population were women, similar to the proportion of female farm owners/managers in the state. The mean age of the population was 52.7 years (range 27–82), and 15% were under 40 years of age (Table I). The age-distribution was similar in both sexes. Farmers tended to be younger in large-scale farming compared to small-scale farming, and in field crops farming compared to other commodities.

One-third of the farm operators had a non-farming job, and two-thirds had others working for them on the farm. Thirty-nine percent of the farm operators worked on average 20 hr per week or less on fieldwork. Less than one-fourth of the farm operators reported working with crops more than 2 hr a day (24% of men and 7% of women). The respective figures for working with livestock were more similar among the genders, and a higher percentage of women (18%) reported working with livestock over 2 hr per day as compared to men (14%). Minimal or no daily work with livestock was reported by two-thirds of farmers and almost one-third (27% of men and 56% of women) reported minimal or no daily work with crops. The amount of fieldwork varied from 0% among livestock operators to 60% for field crop operators. Less than a half of the farmers mixed or loaded pesticides, varying from 19% of livestock farmers to 56% for nursery farm operators.

Dermatitis, Skin Cancer, and Atopy

Questions on skin diseases in the interview were: 'During the past 12 months have you had dermatitis, eczema, or any other red inflamed skin rash?' and 'Have you seen a doctor or other health care provider about this skin condition?' An affirmative answer to the former defined a case of dermatitis in this study. Respondents were also asked if a doctor had ever told them that they had any of the following diseases: asthma, hay fever or seasonal allergies, or cancer. Those reporting cancer were asked to provide specific details. Ninety-seven respondents specified the cancer as skin cancer, basal cell cancer, or melanoma, and these were considered in this survey as skin cancer cases. Respiratory atopy was defined as a report of asthma, hay fever or seasonal allergies, and 31% of respondents fell into this category.

RESULTS

Dermatitis

The prevalence of reported dermatitis during the past 12 months was 8.9% in men and 15.8% in women (Table I). The prevalence increased with age in men ($P = 0.04$) but decreased in women. Subjects with a history of respiratory atopy had a higher prevalence of reported dermatitis ($P = 0.05$, Table I). Respiratory atopy was evenly distributed between the sexes, and the figure varied between 24 and 42% among farm types, and from 29 to 35% among three age groups (<40, 40–60, >60 years of age).

The prevalence of dermatitis varied by farm type (Table II) but was not statistically significantly at the 0.05 level. Prevalences in men were higher than average among fruit and field farmers, and lowest among vegetable and nursery farmers. The highest prevalence for men was reported for grape farmers (15.5% for small scale and 9.8% for large-scale grape farming), while for women the highest reported prevalence was in mixed farming (22%). The figures among women were generally higher than the highest prevalences of the males, but some subgroups were too small to estimate any prevalence (Table II). Those reporting more than 30% of their total working time in dusty work had higher prevalence of dermatitis than others ($P = 0.056$). The prevalence of dermatitis was not associated with the amount of reported fieldwork, work with cattle, or mixing or loading of pesticides.

In a logistic regression analysis only gender (OR for female/male gender 2.0, 95% CI 1.3–3.0) and respiratory atopy (OR 1.4, 95% CI 1.01–1.90) were significant in a model which also included age, dusty work, and farm type.

Skin Cancer

Five percent of farm operators reported having had a skin cancer, and the figure was the same in both genders. Reporting of skin cancer was strongly associated with age (Table III). Regionally, the fewest skin cancers were reported in the mountain region (2.5%) while in the Sacramento Valley, Central Coast, and Southern California the prevalence of reported skin cancer was over 6.0%. There was no association of any work factors (e.g., the amount of current fieldwork, the current use of pesticides) with the reporting of skin cancer. No association could be detected with the amount of reported current daily hours in the sun. There was significantly less reporting of skin cancer among field farmers when compared to others (Table III). In a logistic regression model, age and farm type were significant risk factors for skin cancer, but farming region was not a risk factor (Mountain-North Coast, Central Valley, Central Coast, Southern California).

Over a third of women (37%) compared to 13% of men reported no or minor (<100 hr per year) outdoor farm activities. These figures were reversed (14% of women and 33% of men) when reporting farm work for more than 4 hr daily out in the sun during the past year. Sunscreen use was reported significantly more often by women (42% ''more than half of the time in the sun''), as compared to men (11%). Sunscreens were used more than half of the time in the sun by 59% of those with the report of skin cancer as compared to 29% of those with no report [Schenker et al., 2002].

TABLE II. Reporting of Dermatitis ('Eczema or Rash During the Past 12 Months') in a Population of California Farm Operators (N = 1,947) by Gender and Farm Type

Dermatitis	Fruit	Livestock	Field	Mixed	Vegetables + nursery
Men					
%	10	8.3	9.9	7.7	4.2
N	800	206	141	519	72
Women					
%	9.1	18	1/6[a]	22	3/13[a]
N	77	49	6	49	13

[a]N.

DISCUSSION

Dermatitis

The studied population (farm operators) was very diverse as to the variety of commodities and the amount of actual fieldwork reported. The low proportion of women reflected the proportion of women farmers in California. Another limitation in the study was that only the 12-month occurrence of dermatitis was enquired about, thus leaving the study without information on the location, duration, or nature of the skin condition. The skin condition was ultimately defined as ''any red inflamed skin rash,'' here called dermatitis, which allows respondents to include a wide variety of conditions from actual dermatitis (eczema) to acne and skin infections. The prevalence of reported dermatitis was lower among males than among females, corresponding to two other farm work associated studies [Gamsky et al., 1992; Susitaival et al., 1994]. The prevalence was lower than the 12-month prevalence of 'dermatoses' reported by Finnish farmers in 1979 [Susitaival et al., 1994]. However, prevalence of dermatitis in the present study was about the same by gender as the 12-month prevalence of hand dermatoses (16% for women and 7% for men) reported by Finnish farmers [Susitaival et al., 1994]. The proportion of those who had consulted a health care provider for the dermatitis corresponded to the respective number in the same Finnish study. The high prevalence in women under 40 years of age is

TABLE III. Reporting of Skin Cancer Among California Farm Operators, by Gender, Age, and Farm Type, %

	N	All	Field[a] N = 233	Fruit N = 877	Livestock N = 255	Mixed N = 569
Men	1,751	5.0				
Women	196	5.1				
All	1,947	5.0	0.4	5.6	5.9	5.6
Age						
<40	300	1.0	0	1.6	0	1.1
40–60	900	3.9	0	4.7	5.0	4.1
>60	747	7.9	1.7[b]	7.9	8.4	9.8

[a]Field—includes also nursery (N = 65) and vegetable farming (N = 20).
[b]One case.

similar to the hand dermatosis prevalence among women in other studies [Agrup, 1969; Coenraads et al., 1983; Kavli and Førde, 1984; Meding and Swanbeck, 1987; Susitaival et al., 1994].

Those reporting respiratory atopy, especially among women, also reported dermatitis more often than those without respiratory atopy. This is consistent with several other studies [Nilsson, 1986; Meding and Swanbeck, 1990; Gamsky et al., 1992; Kristensen, 1992; Susitaival et al., 1994]. The total impact of atopy on the dermatitis cases of this survey cannot be estimated without information on skin atopy (childhood or atopic eczema), a major risk factor for hand dermatitis [Rystedt, 1985; Nilsson, 1986; Meding and Swanbeck, 1990; Kristensen, 1992; Susitaival et al., 1994; Nilsson and Knutsson, 1995].

In a logistic regression model, female gender and respiratory atopy were the only significant risk factors for reported dermatosis. There were no significant differences in the reporting of dermatoses by farm type and most work factors. Dusty work and pesticide handling were associated with somewhat higher prevalences of dermatitis. A more powerful study may have found some of these differences to be statistically significant. Almost half of the farmers, 60% of those reporting and 42% of those not reporting dermatitis, were concerned about skin problems in farming. More studies are needed to characterize the specific skin diseases and their risk factors in California farming.

Skin Cancer

The highest prevalence figures for current skin cancer (2.3–4.6%) come from Australia [Marks et al., 1983; Green et al., 1988]. There are very sparse epidemiological self-report data on skin cancer in the literature. In Holland in 1991, a similar self-report method to the present survey ('any chronic disease' – 'cancer' – 'skin cancer') was used to detect the 5-year prevalence of skin cancer in a large general population sample [Schrijvers et al., 1994]. The results in that study were compared to the data in the cancer register. The 5-year prevalence of skin cancer was 0.3% (non-melanoma 0.2%, melanoma 0.06%) according to the self-report, while in the register it was 0.8% (0.7, 0.1%, respectively). More than three-quarters of the non-melanoma skin cancers and half of the melanomas were not reported by this method. Underreporting was clearly higher among men than women, old as compared to young, and rural as compared to urban subjects [Schrijvers et al., 1994]. On the other hand, the same study found the specificity for cancer reporting to be high (99.5%) which implies that there should not be much over-reporting of cancer.

The self-reported lifetime skin cancer figures in California farm operators (5%) are more than 10-times higher than the 5-year figures in the Dutch study (0.3%). The findings of Schrijvers et al. [1994] imply that the skin cancer figures in this study are most probably under-estimations. Based on the Schrijvers et al. [1994] findings, we could estimate the figures of this study being up to double in women (10%) and triple (15%) in men. The prevalence in men has in many studies been higher than in women [Kricker et al., 1990; Schrijvers et al., 1994], which was not the case in this study. The more pronounced under-reporting by men would also be in line with the fact that men reported more outside activities and less sunscreen use as compared to women. Reporting of skin cancer was highly correlated with age, an association that is clear in other studies [Green et al., 1988], even though underreporting in older age was also seen in the Dutch validation study [Schrijvers et al., 1994].

There was no association of sun exposure or work parameters with the reporting of skin cancer. The work or sun exposure information concerned the past year's activities only. Long time exposure history would have been vital in studying the possible occupational causes of skin cancer. The region had some but not significant impact. Areas with the most skin cancer reports, Central Valley and Southern California, also have a lot of sunshine. It is possible that self-selection resulted in less sun-exposed jobs for farmers with more sensitive skin or a history of skin cancer.

We did not obtain detailed prior work histories, but it is unlikely that prior work was a significant contributor to cancer in this population. Farming is a very stable occupation. The majority of farmers in this sample grew up on a farm, and the average years farming was over 30.

Sunscreen use was clearly more common among those with a history of skin cancer (38 vs. 13% ''more than half the time'') but still more than 40% of these people did not use sunscreens at all [Schenker et al., 2002]. The use was lower than sunscreen use in Australian beachgoers [Foot et al., 1993] but comparable to Australian market-attendees [Whiteman et al., 1994]. There are no great differences in the amount of sun exposure in different farm types of California. Field crop farmers tend to have tractors with cabins more often than others, which offers one explanation for the lower skin cancer reporting by field farmers.

The differences in the reporting of skin cancer among women by farm type, mainly the small figure (one case) in field farming, remain obscure in this study, and may be associated with under-reporting. It is unlikely that a selection bias exists for field farming but not for other farm types. One explanation could be a possible role of specific chemicals used now or earlier in other than field farming. Specific chemicals can be hypothesized as being factors or cofactors in skin cancer development. Unfortunately, skin cancer is a disease that has a long latent period and often slow progression, and thus many years may pass after a possibly relevant exposure before the cancer is detected. For example, arsenic elevates the risk of skin cancer up to 60 years after the exposure. Arsenic-containing pesticides were used up to the 1970s, e.g., in wine growing, and they have also been known to contaminate ground waters [Peoples et al., 1979; Pershagen, 1981]. In order to get information on the hypothesized role of agrochemicals as skin cancer risk factors, more in-depth studies are needed.

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