Archives of Environmental & Occupational Health, Vol. 60, No. 3, 2005

Dermatological Illnesses of Immigrant Poultry-Processing Workers in North Carolina

Sara A. Quandt, PhD; Mark R. Schulz, PhD; Steven R. Feldman, MD, PhD; Quirina Vallejos, MPH; Antonio Marín, MA; Lourdes Carrillo, BS; Thomas A. Arcury, PhD

ABSTRACT. The authors designed this study to assess skin ailments among male Latino poultry-processing workers in one plant in North Carolina. Because conditions in poultry plants expose workers to multiple agents affecting the skin, the number of skin ailments was expected to be high. A visual skin examination was conducted by a single board-certified dermatologist for 25 male workers. Dermatological Life Quality Index scores and self-reported skin treatment data were obtained through interviews. Each worker had at least one dermatological diagnosis. Infections were most common (onychomycosis, 76%; tinea pedis, 72%), followed by inflammatory diagnoses (acne, 64%). No workers had sought medical treatment. Dermatological Life Quality Index scores indicated impaired quality of life. Worker self-reports were not strongly associated with dermatologist diagnoses. Skin diseases are common among poultry workers and impact workers' quality of life; reasons for lack of medical care should be investigated.

KEY WORDS: dermatological illness, Hispanic Americans, poultry-processing workers, skin diseases

The poultry-processing environment exposes workers to a variety of agents that can produce dermatological injuries and illnesses. These include poultry excreta, feathers, and raw carcasses, as well as chemicals used for processing and sanitation, and the wet work environment in which temperatures vary from tropical to near freezing. Several recent reports[1,2] indicate that work-related dermatological injuries and illnesses are common. A community-based survey of 200 current poultry-processing workers in western North Carolina found that 22% reported experiencing rashes, dry skin, or other skin problems in the month prior to the study.[3] Nevertheless, there are few data collected by examination to substantiate these claims. Available statistics collected by the Bureau of Labor Statistics indicate a skin injury and illness incidence rate of 12.9/10,000 poultry workers[4]; however, these data underestimate the prevalence of skin disease: Only those problems attributed by both worker and management to poultry-processing work and those severe enough to result in the worker's missing work or seeking medical care are included.[5]

Poultry-processing workers today are largely minority and increasingly immigrant. Workers in this industry experience the sixth highest incidence rate of nonfatal occupational illness of any industry.[4] With the shrinking profit margins of poultry processing and the increasing vertical integration of the industry, working conditions and environmental stressors may be leading to increased rates of occupational skin injuries and illnesses among poultry-processing workers. Hazards relevant to such injuries and illnesses include live chickens (bites, scratches); chicken dander, feather, and feces; tools, including knives and scissors; water, chloramine, dry ice, and other chemicals; bacteria and fungi; and raw chicken. Because many workers in the industry are undocumented, they are unlikely to report

Sara A. Quandt is with the Division of Public Health Sciences, Steven R. Feldman is with the Department of Dermatology, and Quirina Vallejos, Antonio Marín, and Thomas A. Arcury are with the Department of Family and Community Medicine, Wake Forest University School of Medicine, Winston-Salem, NC. Mark R. Schulz is with the Department of Public Health Education, University of North Carolina at Greensboro. Lourdes Carrillo is with Centro Latino of Caldwell County, Lenoir, NC.

illnesses and injuries or to take time off work unless such problems are severe.[1]

Our goals in this study are to (1) assess the number and types of skin ailments in a sample of immigrant poultry-processing workers from Latin America who are working in North Carolina, (2) describe the medical treatment and self-care that poultry workers report for skin ailments, (3) describe the dermatological quality of life reported by workers, and (4) compare worker self-reports with dermatologist diagnoses of skin diseases.

METHODS

Recruitment

We recruited participants from a group of poultry workers living in western North Carolina. We recruited 25 workers employed at the local poultry-processing plant for a data-collection session that included both physical examination and an oral survey questionnaire. We recruited only male workers because our secondary purpose of the data collection was to standardize a data-collection procedure to be used with a predominantly male farmworker sample. We did not require that workers have any abnormal skin condition. Inclusion criteria dictated that the participants be of the male gender, immigrants to the United States, and working in the poultry-processing industry.

Data Collection

Data collection took place on a Sunday afternoon in February 2005, at a community site not associated with the local poultry-processing plant. We had participants recruited by trusted Spanish-speaking community members affiliated with a local workers' center. The number of participants was limited by the time needed to collect data and debrief participants with diagnoses requiring further treatment. Community members told workers that the presence of a skin problem was not a requirement to participate. We obtained informed consent from all persons who volunteered to participate. Each person received a $10 incentive for participating, and a meal was provided for all workers who attended the data-collection session. Participant recruitment and data-collection procedures were approved by the Institutional Review Board of Wake Forest University School of Medicine.

Each participant was first interviewed in Spanish by a trained bilingual interviewer. Interviewers collected demographic information (eg, age, ethnicity, educational attainment); occupational information (eg, current job); information regarding perceptions of the presence of cutaneous signs, symptoms, and specific skin ailments; information regarding the recent treatment of skin problems; and information from the Dermatological Life Quality Index (DLQI).[6] The DLQI is a 10 question, skin specific, health-related quality-of-life questionnaire designed to be completed quickly by persons 18 years or older; it was originally developed in English and has been translated and validated in multiple languages. The questions form 6 subscales for different areas of life (symptoms and feelings, daily activities, leisure, personal relationships, work and school, and treatment), and a total score. To ensure fidelity to the original DLQI, we received permission from Dr. Andrew Y. Finlay, its developer, to create a validated version by using the technique he requires for all new versions. (See the following Web site for further details: http://www.dermatology.org.uk/index.asp?portal/quality/dlqiinstruc.html.) Briefly, we undertook a series of interviews with persons in the target population to adjust vocabulary and idioms on the existing validated American Spanish DLQI to the local Spanish-speaking population. We then subjected this slightly revised version to back-and-forward translation. This version was submitted to Dr. Finlay and approved for use. For other questions on specific skin ailments, vocabulary came from extensive qualitative interviews conducted with Latino farmworkers in North Carolina, which included the elicitation of vocabulary by use of photographic prompts.[7–9] Following the interview, a single board-certified dermatologist examined the workers. Workers dressed in athletic shorts for this examination.

Measures

We used three different measures to describe the dermatologic health of the sample. First, the interviewer asked the poultry workers if they currently had any of a series of cutaneous signs, symptoms, and specific skin ailments with common names. Second, the examining dermatologist recorded specific dermatological diagnoses, which were rated as (1) nearly clear, (2) mild, (3) moderate, (4) severe, or (5) or very severe. We coded all dermatological diagnoses using a standardized form consisting of seven major categories: inflammatory, pigmentary, infectious, tumor, hair disorder, trauma, and other. Each category contained two or more specific diagnoses; completely benign, nonoccupational disorders such as dermatofibroma, benign nevi, keratosis pilaris, birthmarks, cysts and hemangiomas smaller than 1 cm, and androgenic alopecia were ignored. Finally, the interviewer asked the workers to complete the DLQI. We computed the DLQI subscales and total as recommended by Finlay and Kahn.[6] We scored each question from 0 to 3, and we summed the scores to produce subscale scores that ranged from 0 to a maximum of 6 (with the exception of the Work and School subscale and the Treatment subscale, which had a maximum of 3). The total scale score ranged from 0 (no impairment of life quality) to 30 (maximum impairment of life quality).

Analysis

We calculated frequencies, measures of central tendency, and measures of variability by using SPSS version 12.0 (SPSS, Inc.; Chicago, IL). We estimated odds ratios with 95% confidence intervals (CIs) to examine whether significant associations were present between specific skin disease categories and (1) age categorized into four groups

and (2) job categories (slaughter; cutting or packing; and maintenance, sanitation, or supervision). We examined the agreement between poultry worker self-diagnosis and dermatologist diagnosis for 5 common skin conditions: acne or folliculitis, melasma, warts, tinea pedis (foot fungus for the workers), and onychomycosis (nail fungus for the workers). For this analysis, we cross-tabulated the dermatologist diagnosis with the poultry worker self-diagnosis and calculated the following statistics: Spearman's correlation (ρ_s), percentage of agreement, percentage of agreement including only those data pairs in which at least one rater made a positive diagnosis, and kappa.

RESULTS

Respondents ranged in age from 19 to 51 years, with a median of 28 years. Only 2 had more than a primary education. Approximately half of the workers had been in the United States 6 years or less. Twenty-four workers were from Guatemala. Although all reported speaking Spanish, 23 also spoke one of several indigenous languages, and most claimed to understand little English. Eighteen workers (72%) were married or living as married, and the remainder were single.

Eighteen different jobs were reported; 7 workers reported working at 2 tasks and 2 workers reported 3 tasks. Of the jobs reported, 40% were in tasks related to slaughtering birds (hanging and plucking); 56% were in cutting and trimming chickens and packing them into trays for retail. The remaining 24% were involved with maintenance, sanitation, or supervision.

Overall, 22 workers (88%) reported one or more skin ailments (Table 1). Fungal infections were among the most common self-reported conditions, with 17 workers (68%) reporting foot fungus, 7 (28%) reporting nail fungus, and 6 (24%) reporting other skin fungus. Warts were reported by 4 workers (16%); 12 workers (48%) reported acne, and 10 (40%) reported dandruff. Calluses were reported by 9 workers (36%) and rashes by 7 (28%).

Of those reporting a skin ailment ($n = 22$), none had sought health care or a prescribed treatment for the condition. Over-the-counter creams, ointments, and fungal treatments were used by 41%; home remedies (including alcohol, lemon juice, hydrogen peroxide, and baking soda) were used by 32%; and bathing or showering were used by 68% to relieve symptoms.

All workers had at least one dermatological diagnosis as determined by the examining dermatologist. As shown in Table 1, infections were the most common conditions diagnosed on physical examination, including onychomycosis (19; 76%), tinea pedis (18; 72%), and warts (2; 8%). Inflammatory diagnoses were the next most common, including acne or folliculitis (16; 64%).

We examined these categories of skin conditions by worker age and current job category. Age was related only to pigmentary skin diseases. In our sample, those participants aged 30 years and older were 6.42 times (95% CI: 1.09, 37.7) more likely to have a pigmentary skin disease than those under the age of 30. Using the standard of an odds ratio with a 95% CI that does not include 1.0, we found that none of the 3 job categories was associated with any of the 7 categories of skin disease.

Table 1.—Self-Reported and Dermatologist-Diagnosed Skin Disease in 25 Self-Selected Poultry Workers in North Carolina, 2005

Skin disease	*f*	%
Self-reported		
Fungus on the feet	17	68
Acne	12	48
Dandruff	10	40
Calluses	9	36
Rash	7	28
Toenail or fingernail fungus	7	28
Fungus on the skin, not on feet	6	24
Warts	4	16
Melasma	4	16
Poison ivy	3	12
Sunburn	3	12
Tinea (versicolor)	2	8
Blisters	1	4
Dermatologist diagnosed		
Inflammatory diseases	17	68
Acne or folliculitis	16	64
Atopic dermatitis	2	8
Psoriasis	1	4
Pigmentary disorders	10	40
Melasma	9	36
Post-inflammatory pigment change	1	4
Infections	23	92
Onychomycosis	19	76
Tinea pedis	18	72
Wart	2	8
Tumors	1	4
Suspicious for malignancy; requires biopsy	1	4
Trauma	7	28
Scars	4	16
Traumatic skin lesion	2	8
Traumatic nail lesion	2	8
Other	1	4
Other nail change	1	4
One or more diagnoses	25	100

Comparisons of the workers' self-reported skin conditions for 5 of the most common skin conditions with those of the dermatologist are presented in Table 3. Although there is good overall agreement (indicated by percentage of agreement), this is driven largely by agreement when the condition was absent. When either the worker or dermatologist rated the condition as present, there was poor agreement except for acne and tinea pedis. For the current sample, the kappa for tinea pedis is substantially less than that for acne or folliculitis, even though the respective percentage of agreements and the percentage of agreements for cases in which at least one rater made a positive diagnosis are similar. This is because the percentage of agreement due to chance is greater for tinea pedis (57.9%) than for acne or folliculitis (49.4).

As shown in Table 3, total DLQI scores ranged from 0 to 13, with a mean score of 3.72 (± 3.78). The Symptoms and

Table 2.—Reliability of Self-Diagnosis Versus Dermatologist Diagnosis for Presence of Five Skin Diseases

Disease	*N*	ρ_s	Presence: % agreement	No. of workers*	Presence: % agreement among cases†	κ
Acne or folliculitis	25	0.55	19/25 = 0.76	17	11/17 = 0.65	0.53
Melasma	24	0.35	17/24 = 0.71	10	3/10 = 0.30	0.30
Warts	22	–0.10	17/22 = 0.77	5	0/5 = 0.00	–0.08
Tinea pedis	25	0.34	18/25 = 0.72	21	14/21 = 0.67	0.34
Onychomycosis	25	–0.07	9/25 = 0.36	21	5/21 = 0.24	–0.04

Note. Numbers are < 25 when workers responded "don't know" in the self-diagnosis.
*This is the number of workers with a positive diagnosis by at least 1 rater.
†This is the agreement among cases in which at least 1 rater made a positive diagnosis.

Table 3.—Dermatology Life Quality Index Subscale and Total Scores

Scale	Range	Median	*M*	*SD*
Symptoms and feelings	0–4	2.00	1.60	1.41
Daily activities	0–2	0	0.48	0.71
Leisure	0–4	0	0.52	1.09
Personal relationships	0–2	0	0.20	0.58
Work and school	0–3	0	0.64	0.86
Treatment	0–2	0	0.28	0.54
Total	0–13	3.00	3.72	3.78

Note. Sources are Morganton, NC, poultry workers, February 2005; $n = 25$.

Feelings subscale had the highest mean (1.60 ± 1.41). Twenty-eight percent of respondents scored 3 or 4 (out of a possible 4) on the Symptoms and Feelings subscale.

Discussion

Skin disease is a common problem in this sample of male immigrant poultry workers in North Carolina, as indicated by both self-reports and examination by a board-certified dermatologist. Few comparative data exist to place these findings in perspective. This is because many studies are based on dermatology patient populations (eg, Burzykowski and colleagues[10]), rather than the general population. Another fact that complicates comparisons is that skin diseases tend to be nonrandomly distributed across the population. Data reviewed and summarized for professional dermatological associations in the United States[11] report that acne is most common in teenagers, with virtually 100% affected, and that onychomycosis affects 12% of the US population. In the current study, 64% of workers were diagnosed with acne, 76% with onychomycosis, and 72% with tinea pedis. Thus, fungal infection rates appear to be high, but acne rates may simply reflect the age group studied.

Having the skin exam performed by a specialist allowed us to capture all skin conditions that were present at the time of the exam. A comparison of worker and dermatologist ratings showed relatively poor agreement, except for acne. This is not surprising, if we consider that few of these workers probably ever had a skin examination by a dermatologist. It is also well recognized that lay and professional interpretations of symptoms differ substantially for many conditions.[7–9] These findings indicate the need for professional diagnoses, rather than self-report, in future studies designed to assess skin disease prevalence in immigrant poultry workers.

The skin diseases reported and observed in this study include those that could have both occupational and nonoccupational origins. For example, wet conditions in the processing plants[2] could contribute to foot and nail fungus. This might be exacerbated by factors associated with the poverty experienced by these immigrant workers: crowded living conditions, shared bath facilities, inadequate access to laundry, and perhaps lack of proper footwear. No contact dermatitis was observed. This may be because of the transient nature of this condition; data were collected on a Sunday afternoon, when workers had been off the job for almost 2 days.

The high levels of skin disease are reflected in the scores on the DLQI. It is instructive to compare the scores observed here with those summarized in a review of 10 years' experience with the DLQI.[12] The DLQI has been used with a number of patient populations; as might be expected, their mean DLQI scores are highly variable, ranging from around 5.5 for studies of tinea to 7.5 for studies of occupational contact dermatitis and 11.9 for studies of acne. In contrast, the mean DLQI is generally below 1 for nonpatients in the general population. The DLQI has not been used with a population of nonpatient immigrant workers to permit a direct comparison; however, the mean DLQI score of 3.72 is considerably higher than the general population mean, but below the patient means reported by Lewis and Finlay.[12]

Hongbo and colleagues[13] used a global skin assessment item to assign descriptors to DLQI scores. Using their scale, we find that 40% of the DLQI scores in the present study indicate no effect of skin ailments on quality of life, 28% a small effect, 24% a moderate effect, and 8% a large effect. Thus, it appears that the aspects of quality of life measured in this scale do resonate with workers.

None of these workers reported seeking care for their skin problems. This is consistent with other studies in vulnerable

populations (eg, migrant farmworkers[8,14] and homeless persons[15]), which find competing priorities and lack of access to care to be deterrents to treatment. The fact that none of the workers had sought treatment for skin disease, despite the high proportion who had skin diseases and the fairly frequent use of home and over-the-counter remedies, is noteworthy. Further research is necessary to determine the barriers to professional care. These might include lack of access to care caused by financial, language, and scheduling barriers, as well as fear of seeking care caused by concerns about immigration status. Like many rural communities, the study community has limited resources for low-income patients. The local public health department does not have an adult clinic. The one "free" clinic sees patients only 2 half-days per week; there are so many patients vying for the limited number of appointments that they are filled by lottery.

This study has a number of limitations. Skin examinations included only a visual assessment of skin diseases. A definitive diagnosis of onychomycosis would require microscopic examination or culture of nail clippings. Although the proportion of workers with skin disease is much higher than that reported by the Bureau of Labor Statistics,[4] it is difficult to compare the two data sources because the latter includes only diseases that are reported and result in work time lost by the worker or the worker's seeking medical treatment. The sample we used was nonrandom and small. Although participants were recruited without regard for skin ailments, those with such problems may have been more likely to agree to participate. Ideally, a sample drawn from the poultry-worker population at one or more plants would be used; however, researchers do not have access to the plants in the study region. Additional data would have helped in an interpretation of the findings. In particular, duration of employment in the poultry industry and temporal associations of symptoms and poultry-processing work would help in the attribution of skin ailments to occupational exposures. Finally, there is no comparison or control population. However, figures are presented from several population surveys for comparison.

Despite these limitations, this study adds to the scant literature on dermatological diseases among poultry workers. As poultry processing continues to be largely the domain of immigrant workers, further research to document the health and safety issues in this population is important for eliminating disparities in dermatological health. In particular, prospective research to trace the development of skin disease and to try to separate skin ailments of occupational origin from others would produce important results.

* * * * * * * * * * *

This research was supported by Grant R01-ES012358 from the National Institute of Environmental Health Sciences and Grant R25-OH008335 from the National Institute for Occupational Safety and Health.

The authors acknowledge the assistance of Dr. Rita Pichardo and Rose Marín with data collection and Gerell Smith with data analysis.

Requests for reprints should be sent to Sara A. Quandt, Division of Public Health Sciences, Wake Forest University School of Medicine, Winston-Salem, NC 27157.

E-mail: squandt@wfubmc.edu

* * * * * * * * * * *

References

1. Government Accountability Office. Workplace safety and health: Safety in the meat and poultry industry, while improving, could be further strengthened. Washington, DC: US Government Accountability Office, 2005 (GAO-05-96).
2. Human Rights Watch. *Blood, Sweat, and Fear: Workers' Rights in US Meat and Poultry Plants*. New York: Human Rights Watch: 2004.
3. Quandt SA, Grzywacz JG, Marín A, et al. Occupational illnesses and injuries among Latino poultry workers in western North Carolina. *Am J Ind Med*. 2006;49:343–351.
4. Bureau of Labor Statistics. Bureau of Labor Statistics Data, Occupational Injuries and Illnesses: Industry Data for 2004. US Department of Labor. Available at: www.bls.gov/iif/oshwc/osh/os/ostb1482.pdf. Accessed December 7, 2005.
5. Azaroff LS, Levenstein C, Wegman DH. Occupational injury and illness surveillance: conceptual filters explain underreporting. *Am J Public Health*. 2002;26:1421–1429.
6. Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI)—a simple practical measure for routine clinical use. *Clin Exp Dermatol*. 1994;19:210–216.
7. Vallejos QM, Marin AJ, Feldman SR, et al. Spanish dermatological vocabulary used by Mexican workers. *Dermatology Online J* [serial online]. 2005;11(2):32. Available at: http://dermatology.cdlib.org/112/resources/dictionary/vallejos.html. Accessed March 7, 2005.
8. Arcury TA, Vallejos QM, Feldman SR, Quandt SA. Treating skin disease: self-management behaviors of Latino farmworkers. *J Agromedicine*. 2006;11:27–35.
9. Arcury TA, Vallejos QM, Marín AJ, Feldman SR, Smith G, Quandt SA. Latino farmworker perceptions of the risk factors for occupational skin disease. *Am J Ind Med*. 2006;49:434–442.
10. Buzykowski T, Molenberghs G, Abeck D, et al. High prevalence of foot diseases in Europe: result of the Achilles Project. *Mycoses*. 2003;46:496–505.
11. *The Burden of Skin Diseases*. Cleveland, OH, and Washington, DC: Society for Investigative Dermatology and American Academy of Dermatology Association, 2005.
12. Lewis V, Finlay AY. 10 years experience of the Dermatology Life Quality Index (DLQI). *J Invest Dermatol Symp Proc*. 2004;9:169–180.
13. Hongbo Y, Thomas AL, Harrison MA, Salek MS, Finlay AY. Translating the science of quality of life into practice: what do Dermatology Life Quality Index scores mean? *J Invest Dermatol*. 2005;125:659–664.
14. Grzywacz JG, Quandt SA, Arcury TA, Marín A. The work–family challenge and mental health: experiences of Mexican immigrants. *Community, Work and Family*. 2005;8:271–279.
15. Raoult D, Foucalt C, Brouqui P. Infections in the homeless. *Lancet Infect Dis*. 2001;1:77–84.

Reuss, Vicki A. (CDC/NIOSH/EID)

From: Bennett, William D. (Bill) (CDC/NIOSH/EID)
Sent: Monday, January 22, 2007 6:13 PM
To: CDC Library Requests CIN/TAFT
Subject: FW: What's new for 'niosh grants 2006' in pubmed (Week of Jan. 15)

I would like to get a copy of this. I could not find in on-line.

1: Quandt SA, Schulz MR, Feldman SR, Vallejos Q, Marin A, Carrillo L, Arcury TA. Related Articles, LinkOut

Dermatological illnesses of immigrant poultry-processing workers in North Carolina.
Arch Environ Occup Health. 2005 May-Jun;60(3):165-9.
PMID: 17153089 [PubMed - indexed for MEDLINE]

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?CMD=search&DB=pubmed