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Dermatitis in the Mining Industry: Incidence, Sources, and Time Loss

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ABSTRACT. Occupational skin diseases and disorders are the most commonly reported nontrauma-related category of occupational illness in the United States, and mining has one of the highest incidence rates among all industries. The authors' objective in this study was to describe mining industry dermatitis incidence, sources of exposure, and resultant time lost from work. The authors reviewed *Mine Accident, Injury and Illness Reports*. From 1983 to 2002, the Mine Safety and Health Administration reported 975 cases of dermatitis in mines across the United States and its territories. Average annual incidence was 14.4 cases per 100 000 employees. Upper extremities and multiple body regions were most commonly involved. Twenty-five percent of miners with dermatitis lost at least 1 day of work. Exposure to plants, trees, and vegetation accounted for 24% of all cases. A greater understanding of this condition will assist health professionals in focusing on appropriate intervention strategies to reduce the occurrence of dermatitis and its associated morbidity in mine workers.

KEY WORDS: dermatitis, incidence, mining, time loss

Occupational skin diseases and disorders (OSDs) are the most commonly reported nontrauma-related category of occupational illnesses in the United States.[1] *Occupational dermatitis* can be defined as an inflammation of the skin derived from any source in the workplace; is characterized by reddening of the skin, scaling, edema, or blistering; and can be painful. Although *irritant contact dermatitis* and *allergic contact dermatitis* are the most common forms of occupational dermatitis, *photosensitization*, *urticarial reactions*, and *acne* are also included. The degree of irritant contact dermatitis depends on different factors, including type of irritant and site of contact with the irritant,[2] and does not occur as a result of cell-mediated immunity. Allergic contact dermatitis is a delayed hypersensitivity response that can result in inflammation following subsequent exposures.[2,3] Some substances can be both irritants and allergens.[3] Although occupational dermatitis is relatively common, it is generally underreported.[4] Furthermore, the disease is usually difficult to treat, and the prognosis is poor.[5,6] A review of studies revealed that only 50% or fewer of patients with occupational contact dermatitis had healed after several years of follow-up.[7] For these reasons, emphasis should be placed on prevention. Workplace interventions rely heavily on an intimate knowledge of the process and operating environments associated with a particular industry, as well as knowledge of the characteristics of the exposures causing disease within a given workforce.

Modern mining and mineral processing activities subject workers to a wide range of chemicals and materials that have the potential to induce or aggravate dermatitis. OSD rates in the mining industry have been reported to be among the highest across all industries, with an incidence of 51 cases per 100,000 mine workers.[1] In mining, dermatitis has been reported to account for approximately 70% of OSDs in the United States and upward of 80% in the United Kingdom.[5] However, it is often difficult to determine the causative factors of occupational dermatitis because the source of exposure may be multifactorial in nature and the extent of illness may differ in severity because of individual susceptibility.[8] In

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addition, published information that evaluates the sources and consequences of dermatitis in the mining industry is very limited. Our objective in this analysis was to provide descriptive information on the distribution of dermatitis in miners throughout the United States over the past 20 years. We also examined by job duty, by afflicted area of the body, and by the commodity being mined the extent of work days lost because of dermatitis, with an overall aim to aid occupational health and safety professionals in identifying potential areas of concern and prevention.

METHODS

Under the authority and mandate of the Federal Mine Safety and Health Act of 1977, the Mine Safety and Health Administration (MSHA) collects information annually on occupational injuries and illnesses in all regulated mines in the United States and its territories (http://www.msha.gov/). For this study, we obtained 20 years' worth of information (1983–2002) from the MSHA databases *Mine Accident, Injury and Illness Reports* (MSHA Form 7000-1) and the "Address, Employment" database. The information in these databases is submitted to MSHA by mine operators. Under the US Code of Federal Regulations (CFR 30 Part 50), mining companies are required to report to MSHA "any accident, injury, or occupational illness that occurs at or in conjunction with any activity at a regulated operation."[9] This information includes demographics on the injured or ill worker, such as age, sex, years of total mining experience, and years of experience at the current mine, as well as information related to the mine location, where the incident occurred (ie, underground, surface, plant or mill), days away from work, days of restricted work activity, source of the injury, body region(s) injured, and a narrative description of the incident.

We estimated information regarding dermatitis rates in mining and mineral processing using online data from MSHA Form 7000-1. We queried each year's data set on the variable "nature of injury classification," which provides information that "identifies the injury in terms of its principal physical characteristics."[10] We selected the data in this analysis using the MSHA nature of injury code 190 (dermatitis), and we excluded injuries and occupational illness involving contractors and office employees. Under this injury code, we compiled new cases of dermatitis occurring over a 20-year period. The MSHA definition of *dermatitis* includes rashes and skin or tissue inflammations, including boils, that generally result from direct contact with irritants or sensitizing agents. This definition does not include skin or tissue damage resulting from chemical or thermal burns or from friction or impact injuries. In calculating the incidence of dermatitis, we used the new cases as the numerator and the total number of nonoffice employees working at the mines as the denominator. We derived this from data in the "Address, Employment" files. Only incidents that occurred at regulated operating mines and mineral processing facilities are included in MSHA databases and were therefore used in this study to calculate an annual incidence of dermatitis per 100,000 mine employees exposed. For purposes of comparison, we calculated and reported by the same method described for dermatitis cases the incidences of thermal and chemical burns.

Grouping employee populations by job title is a useful method for identifying probable exposures and determining the occurrence of dermatitis in a mine workforce. In this study, we classified job titles in 4 distinct groups: (1) support, (2) mining, (3) mechanic or repairman, and (4) other. A mining and engineering expert (one of the authors) established classifications on the basis of common categories used in the resource industry. These classifications are directly related to common unit operations and job responsibilities associated with mining, mineral processing, and operations support (eg, maintenance, construction or repair, and development). In this regard, specific job titles provide an indication of whether an operation is an underground or surface mine and of the type of processing method that is likely to be used. By reviewing job titles, we identified those possessing the greatest potential for chemical exposure. The source-of-injury classification identifies the object, substance, exposure, or bodily motion that directly produced or inflicted the reported injury. There must be a direct relationship between the source and nature of an injury.

To effectively evaluate lost work days relative to location of dermatitis on the body, the commodity being mined, and job title, we split data into a binary variable: those workers with dermatitis who missed no days of work and those with dermatitis who missed 1 or more days of work. We performed all data analysis using SPSS 12.0 (Chicago, IL) and STATA 8.0 (College Station, TX) statistical packages. We conducted chi-square analyses using Fisher's exact test to calculate probabilities among the objective variables. We made adjustments for multiple comparisons using a Bonferroni correction.

RESULTS

We initially analyzed data by year from 1983 to 2002. Over this period, the number of annual cases coded as dermatitis ranged from 0.11% to 0.29% of the total number of accidents, injuries, and illnesses reported. Over the study period, we considered 975 cases of dermatitis in miners in the United States and Puerto Rico. The incidence (per 100,000 employees) for each year of the study is shown in Table 1. During the same time period, we found dermatitis to be less frequent than the incidence of either thermal or chemical burns (Figure 1).

Of the 975 cases, 562 (58%) of the dermatitis cases were coded as an illness, of which 556 were OSD. The remaining 42% were coded as an accident or injury according to mine accident, injury, and illness report forms issued by MSHA (Form 7000-1, item 23). To ensure that these cases were correctly classified as dermatitis, we reviewed select

Table 1.—Dermatitis Incidence, 1983–2002

Year	Number of cases	Average number of nonoffice employees	Total number of nonoffice employee-hours	Nonoffice incidence (per 100,000 employees)
1983	25	372016	658576801	6.7
1984	24	386389	705125966	6.2
1985	23	374343	681203834	6.1
1986	33	355818	652474530	9.3
1987	67	346964	643932909	19.3
1988	81	351832	655908158	23.0
1989	109	357564	663165641	30.5
1990	61	362710	672381421	16.8
1991	94	347395	634542143	27.1
1992	54	335585	613090891	16.1
1993	44	319940	582104242	13.8
1994	47	329688	601769460	14.3
1995	41	322644	596961357	12.7
1996	37	317643	597075102	11.6
1997	59	323594	599461036	18.2
1998	50	319252	591908547	15.7
1999	44	315402	576691215	14.0
2000	36	310710	563782785	11.6
2001	20	310528	561667838	6.4
2002	26	294072	526026353	8.8
Average	49	337704	586377197	14.4

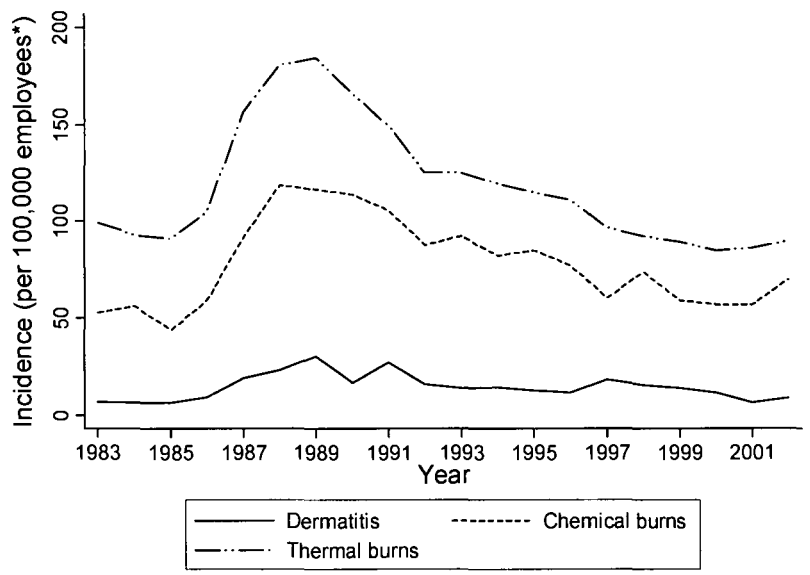

Fig. 1. Incidence of dermatitis and chemical and thermal burns, 1983–2002; for nonoffice personnel.

narrative sections, which showed that cases listed as an accident or injury were consistent with occupational dermatitis.

The average age of the population was 37.7 years (*SD* = 12.1) and ranged from 17 years to 89 years. Most cases took place at a mill or preparation plant, followed by open pit or strip mines (including their associated shops and yards), and then by underground mines. The remaining cases occurred where mine dumps or refuse piles were being reworked (culm banks), at mines using dredging operations, independent shops and yards, offices, and at other miscellaneous surface locations (Figure 2).

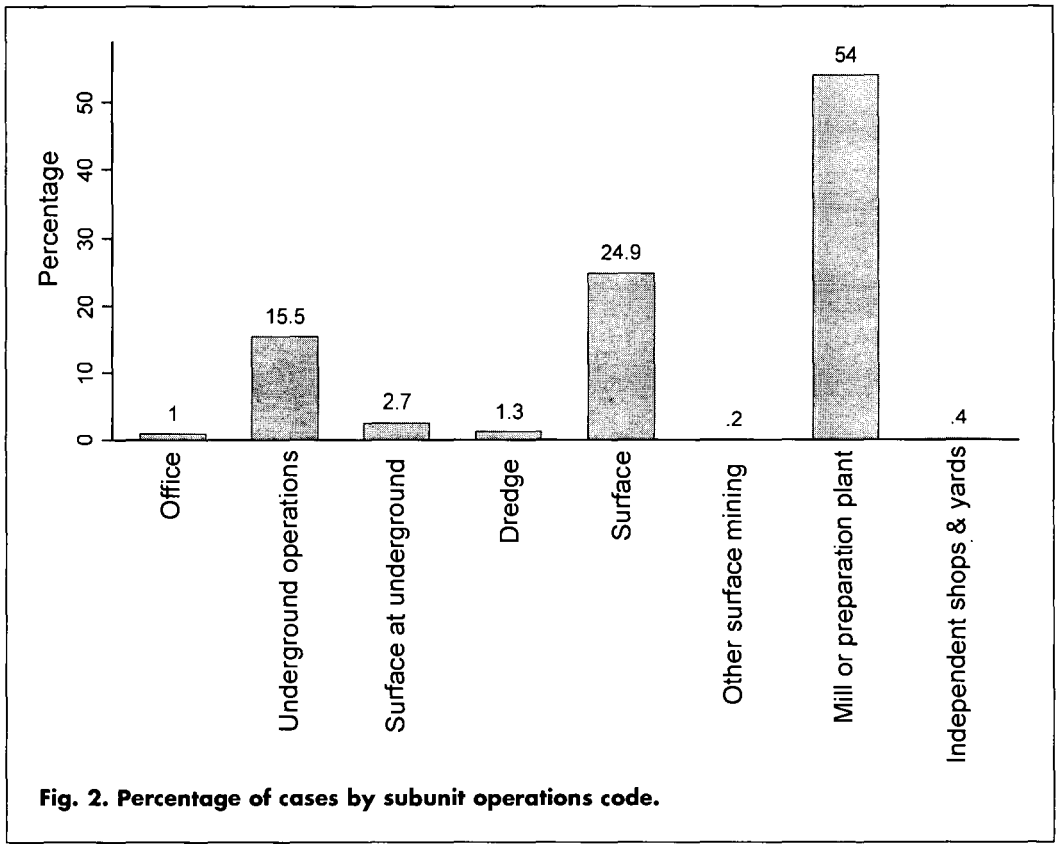

Fig. 2. Percentage of cases by subunit operations code.

Dermatitis by Body Region

We categorized the data into 5 distinct categories: (1) lower extremities, (2) upper extremities, (3) trunk and head, (4) multiple body regions, and (5) unclassified. Figure 3 shows that the prevalence of dermatitis was highest for multiple body regions (41% of the cases reported) and the upper extremities (39%). Upper extremity dermatitis totaled 377 cases, with hand (n = 138), arm (n = 102), forearm (n = 32), and fingers–thumb (n = 21) accounting for more than 75% of the category. Trunk and head cases (n = 106) consisted mainly of face (n = 40), trunk (n = 13), eyes (n = 12), neck (n = 12), and head (n = 11). Of the 75 lower extremities cases, most occurred on areas of the foot, excluding ankles and toes (n = 21) and legs (n = 20). The remaining cases were categorized as occurring in multiple parts of the body (n = 398) or were unclassified (n = 19).

Dermatitis by Commodity Mined

We aggregated data into groups based on the type of mineral commodity being mined. The resulting 5 groups included coal, metal, nonmetal, sand or gravel, and stone. The largest percentage of dermatitis cases occurred in stone mining, followed in diminishing prevalence by metal, nonmetal, coal, and sand and gravel mines. Relative to incidence, however, nonmetal mining had the largest occurrence of dermatitis per 100,000 employees, followed by stone, metal, sand and gravel, and coal (Table 2).

Dermatitis by Job Title and Source of Chemical Exposure

Forty-two percent of the 975 cases occurred in individuals working in support roles. Of the remaining 58% of the cases, 18% were classified as mechanic or repairmen, 14% were directly associated with mine production, and 26% were individuals working in "other roles." A review of job titles indicated that 351 (36%) of the individuals with dermatitis performed tasks involving the potential for chemical exposure.

Eighty-five percent of all 975 dermatitis cases were coded by MSHA as having originated from 1 of the following 6 sources: (1) plants, trees, or vegetation (24.3%), (2) acids and alkalis (16.4%), (3) caustic chemicals and chemical compounds not elsewhere classified (NEC, 13.4%), (4) miscellaneous–NEC (12.1%), (5) coal and petroleum products–NEC (11.6%), and (6) pulverized minerals (fine particles, mine dust, 7.1%). Table 3 gives a breakdown of the most commonly occurring sources of dermatitis according to job title, commodity mined, and location on body.

Days Lost From Work

The data set included the following 2 variables referencing days lost from work: (1) the actual number of days and (2) the number of days of restricted work activity resulting from the dermatitis. The information on actual days lost from work indicated that 732 (75%) of the employees included in the database did not lose any days of work as a

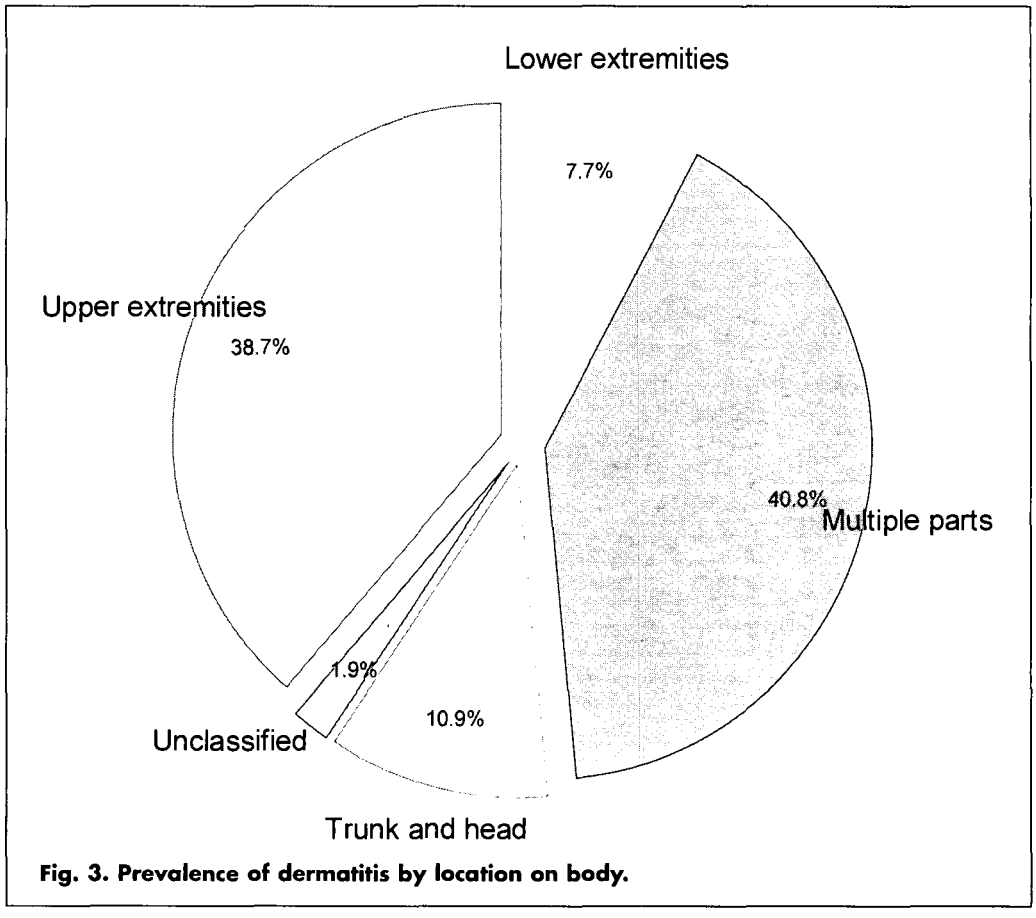

Fig. 3. Prevalence of dermatitis by location on body.

Table 2.—Dermatitis Cases by Commodity Mined (Canvas)

Major group	*n*	%	Average number of nonoffice employees	Incidence (per 100,000 employees)	Subunits of major group
Nonmetal	181	19	526,921	34.4	Clay (fire, common), feldspar, magnesite, shale (common), barite, fluorspar, potash, boron minerals, trona, sodium compounds, phosphate rock, salt (rock, evaporated), gypsum, talc (soapstone and pyrophylite), mica, perlite
Stone	433	44	1,339,687	32.3	Granite (dimension, crushed and broken), limestone (dimension, crushed and broken), marble (crushed and broken), sandstone (crushed and broken), traprock (crushed and broken), cement, lime
Metal	199	20	809,207	24.6	Iron ore, copper ore, lead and/or zinc ore, gold (lode and placer), silver ores, aluminum ore, molybdenum, mercury, uranium, vanadium, rare earths, alumina (mill)
Sand and gravel	54	6	684,122	7.9	
Coal	108	11	2,384,514	4.5	Anthracite, bituminous

direct result of their dermatitis, whereas 243 mine employees (25%) lost at least 1 day of work (Table 4). Fifty (5%) lost 1 day, 74 (8%) lost 2 to 5 days, 48 (5%) lost 6 to 10 days, and 71 (7%) lost 11 or more days. In the most extreme case, 1 individual lost 359 days of work.

When we considered the data by body region, the proportion of employees who missed at least 1 day of work because of dermatitis on their lower extremities was higher than the number for upper extremities ($p = .015$), although this result lost statistical significance after we adjusted for multiple comparisons. The proportion of workers who lost a day or more of work due to dermatitis on multiple regions of their body was significantly higher than for those with dermatitis on their upper extremities ($p = .005$).

Considering the data by commodity mined, 44% of workers in sand and gravel mines had lost 1 or more days due to

Table 3.—Number and Percentages of Cases of Dermatitis From Common Sources by Body Region, Commodity, and Job Title

Category	Plants, trees, other vegetation		Acids and alkalis		Chemicals and chemical compounds		Coal and petroleum products		Pulverized materials		Miscellaneous		Other	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Body Region														
Lower extremities	3	4.0	18	24.0	6	8.0	15	20.0	4	5.3	10	13.3	19	25.3
Upper extremities	67	17.8	64	17.0	62	16.4	64	17.0	14	3.7	50	13.3	56	14.8
Trunk and head	19	17.9	17	16.0	18	17.0	13	12.3	10	9.4	8	7.5	21	19.8
Multiple regions	140	35.2	60	15.1	43	10.8	19	4.8	40	10.1	47	11.8	49	12.2
Unclassified	8	42.1	1	5.3	2	10.5	2	10.5	1	5.3	3	15.8	2	10.5
Commodity														
Coal	23	21.3	11	10.2	17	15.7	23	21.3	4	3.7	10	9.3	20	18.5
Metal	14	7.0	18	9.0	40	20.1	32	16.1	10	5.0	41	20.6	44	22.2
Nonmetal	38	21.0	41	22.7	30	16.6	9	5.0	12	6.6	34	18.8	17	9.3
Sand and gravel	18	33.3	1	1.9	8	14.8	10	18.5	1	1.9	3	5.6	13	24.0
Stone	144	33.3	89	20.6	36	8.3	39	9.0	42	9.7	30	6.9	53	12.2
Job Title														
Support	144	35.1	69	16.8	29	7.1	30	7.3	30	7.3	54	13.2	54	13.2
Mining	34	24.3	19	13.6	14	10.0	19	13.6	13	9.3	12	8.6	29	20.6
Mechanic/repairman	22	12.7	22	12.7	29	16.8	42	24.3	11	6.4	23	13.3	24	13.8
Other	37	14.7	50	19.8	59	23.4	22	8.7	15	6.0	29	11.5	40	15.9
Total Cases	237	24.3	160	16.4	131	13.4	113	11.6	69	7.1	118	12.1	147	15.1

Table 4.—Dermatitis Cases and Days Lost, by Commodity Mined, Job Classification, and Location on Body

Category	0 Days lost	≥1day(s) lost	Percentage with days lost	Cumulative number of days lost
Body Region				
Lower extremities	50	25	33.3	254
Multiple regions	282	116	29.1	1295
Trunk and head	84	22	20.8	115
Upper extremities	300	77	20.4	1683
Unclassified	16	3	15.8	14
Commodity				
Sand and gravel	30	24	44.4	187
Coal	65	43	39.8	822
Stone	325	108	24.9	1282
Metal	152	47	23.6	716
Nonmetal	160	21	11.6	401
Job Classification				
Mechanic/ repairman	122	51	29.5	954
Mining	100	40	28.6	400
Other	187	65	25.8	1191
Support	323	87	21.2	871

dermatitis, more than in any other commodity considered. This was followed by mine workers in coal, stone, metal, and nonmetal. Proportionally, more individuals missed 1 or more days of work because dermatitis in sand and gravel mines than in stone ($p = .003$), metal ($p = .004$), and nonmetal ($p \leq .001$) mines. Proportionally, more coal workers than stone-mine workers ($p = .003$), metal workers ($p = .004$), and nonmetal workers ($p \leq .001$) missed 1 or more days of work. Last, proportionally more workers in the stone-mining industry missed 1 or more days than did nonmetal workers ($p \leq .001$), and metal mines had proportionally more employees who missed more than 1 day than did nonmetal mines ($p = .003$).

We also considered the data by job title. Fifty-one (30%) mechanics or repairmen, 40 (27%) washing and cleaning plant operators, and 4 (31%) oilers or greasers lost 1 or more days of work because of their dermatitis, compared with 86 of 408 mine personnel (21%) in support roles and 40 of 135 production miners (30%) who missed 1 or more days of work. Comparing days lost among workers with different job titles, the proportion of mechanics and repairmen losing 1 or more days of work was higher than the proportion of support workers ($p = .042$); however, statistical significance was lost after adjusting for multiple comparisons.

COMMENT

A goal of the US 2010 Healthy People Objectives is to reduce the national incidence of OSDs to no more than 46 cases per 100,000 full-time workers.[1] This study demonstrates that the average annual incidence of dermatitis in the US mining population from 1983 to 2002 was 14.4 cases per 100,000 employees, ranging from 6.1 cases in 1985 to 30.5 in 1989. A Finnish study of allergic contact dermatitis found carpenters to have an incidence of 36.6 cases per 100,000 workers per year between 1974 and 1999, for which the carpenters' prognoses were poor.[11] Established registries in German construction industries showed an increase in OSD cases from 1990 to 1999, with an overall incidence of 51 cases per 100,000 employees.[12]

In a study using data from the Bureau of Labor Statistics (BLS), Lushniak found the incidence of OSD in the mining industry to be 51 per 100,000 employees.[1] However, because the findings from this analysis of MSHA data show an incidence of 14 per 100,000 employees, reporting bias may be a concern. Neither the BLS survey nor the MSHA reporting scheme completely cover the mining population. The BLS data emanate from a survey of occupational injuries and illnesses based on a statistically designed probability sample rather than from a census of the entire working population. Also, BLS may have different criteria for defining dermatitis than does MSHA, because it required no clinical evaluation. Given the nature of this study, assessing the magnitude of reporting bias was not feasible.

The MSHA data used in this study were limited to activities directly under the regulatory authority of MSHA. This factor is particularly relevant in mineral processing, mine and resource development, and value-added processes that occur at or adjacent to mine sites where, under specific circumstances, the Occupational Safety and Health Administration (OSHA) possess primary regulatory oversight. An example is sand and gravel operations that have cement premix or asphalt plants onsite. As a consequence, data derived from accidents, injuries, and illnesses at these operations may not be included in the MSHA databases or, therefore, in this study. In addition, mining data for coal, metal, and nonmetals presented in this study may differ from mining industry data published by the BLS because of the classification scheme used. Published data from the BLS include oil and gas extraction, whereas the MSHA data excludes oil and gas extraction because the regulatory authority is delegated to OSHA. It should also be noted that MSHA only records occupational data that is reported. In some cases, occupational illnesses may not be reported because the illness is not diagnosed until years after exposure, by which time the exposed worker(s) may have changed jobs or left the workforce. Such factors may relate to underreporting and help explain differences in incidence found in other studies. The greatest limitation of this database—one that is common with most occupational databases—is that demographic and employment information on workers with no incidents of accidents, injuries, or illnesses is not recorded. This denies the chance for a direct comparison of demographic and work history information between those with and without disease.

The concern with underreporting in the workplace is complicated by the varied types of contact dermatoses. Although it was not possible to differentiate cases into allergic or irritant contact dermatitis from the information provided

in the databases, previous research indicates that people with allergic contact dermatitis have a greater tendency to look for medical treatment, take sick leave, and suffer permanent disability than do those with irritant contact dermatitis.[13] It is also known that individuals with mild irritant contact dermatitis seldom report any ailment or seek any medical treatment. According to Chew et al,[14] the morphological variety of contact dermatitis presents a diagnostic and classification challenge, often resulting in the inability to distinguish irritant contact dermatitis from allergic dermatitis, frequently leading to misclassification.

Eighty-five percent of the cases in this study were related to the following 6 primary sources coded by MSHA: vegetation, acids or alkalis, chemicals or chemical compounds, coal and petroleum products, pulverized minerals, and miscellaneous material. The high incidence of occurrence attributed to exposures to acids or alkalis and chemicals or chemical compounds by mine workers (30%) is consistent with findings from published studies from other industries. For example, in a study of servicemen in Singapore, researchers found that the most common vocations associated with OSD were vehicle repair or maintenance (48%) and food handling (19%).[15] Individuals in these jobs are exposed to a wide variety of chemicals and chemical compounds, including petroleum products, solvents, and synthetic lubricants. A study of worker compensation claims in Ohio from 1988 to 1992 similarly showed that chemical agents (as a group) were the most frequent cause of occupational contact dermatitis (32.2%), whereas vegetation was associated with 14.3% of the other cases.[16]

The irritancy of a particular substance depends on its ability to remove the surface lipid layer or produce cellular damage.[17] Although mine employees are exposed to a multitude of potentially irritating substances associated with OSDs, including specific types of rock minerals, processing reagents, chemical compounds, and acidic or alkaline water, vegetation proved to be the most prominent source of OSD in the MSHA database. This was somewhat surprising given the sterile nature of most operating surface pits and underground mines. With the exception of development and reclamation, most phases of mine operations restrict the growth of vegetation around active production and processing areas because of regulations governing safety and fire prevention, as well as a host of other engineering and operational concerns. Furthermore, the absence of topsoil and the nature of most mining disturbances discourage the growth of most forms of vegetation. That said, the exposure of surface workers responsible for site and facilities maintenance to plants like poison ivy and oak, may account for some small percentage of the total OSD cases. Unfortunately, there is no data to support this conclusion. The historic use of timber for rock and roof support in underground mines also presents another possible source of OSD. As a percentage of the total mining industry, however, the number of miners exposed to sawdust and foreign vegetation through the use of timbered supports is extremely small. This is particularly true given the increasing prevalence of shotcrete and other support technologies in underground metal or nonmetal mining. As such, the potential opportunities for mine employees to contract OSDs from exposures to vegetation would seem to be severely limited. The data, however, contradict this presumption. It is conceivable that these exposures are nonoccupational or are exacerbated by the workplace environment, because responses can often be delayed. This finding deserves additional evaluation in future studies to help determine specific exposure scenarios.

Another interesting facet of this study was the disparity in OSD rates between different mineral commodities (Table 2). In a descriptive analysis such as this, it is usually difficult to ascertain with any certainty why 1 commodity possesses a lower OSD rate than another. Although there are a multitude of possibilities, a potential explanation is that certain mineral commodities occur in deposits that are economically conducive to specific mining and processing methods. For example, the vast majority of copper mined in the United States is extracted from large, highly mechanized surface operations. Depending on the ore type, these operations use fairly standardized processing techniques and reagents. As such, it would be expected that the types of exposures would be similar between different copper operations. These economic deposits are usually irregularly distributed in specific geographic areas of the country (eg, copper in Arizona and Utah, gold in Nevada, and zinc in Alaska and Missouri). The impact of this concentration of production for select minerals might indirectly influence OSD rates as a result of regional variations in environmental factors (eg, ecosystems, weather, and native plant species). Another potential explanation is the inherent chemical composition of specific ores. The host geologic structures might also play a contributing role in these different rates.

Days lost from work can be a strong indicator of the severity of an occupational injury or illness. Many factors influence the length of time lost from work for a given injury or illness, including administrative factors (eg, eligibility for time off), variability in recommendations from healthcare providers, flexibility of the job, and personal issues. It is likely that dermatitis cases are similarly predisposed.[1] Among all cases of people with dermatitis in this study, 25% lost 1 or more days because of dermatitis. In a retrospective study of occupational contact dermatitis performed in the United Kingdom,[18] the following 3 factors independently predicted time off from work: age, a diagnosis of allergic contact dermatitis, and having had a "medicolegal assessment," a term that the authors did not define.

Other documented known risk factors include race, sex, skin type, presence of other skin problems, allergies, cleanliness or hygiene, and seasonal variations.[16] Studies are often limited by the absence of a uniform case definition, and the diagnosis of dermatitis relies heavily on the judgment of medical and safety professionals.

It is well documented that the prevalence and incidence of occupational dermatitis is underreported and, moreover, that

those who suffer from the disease can have poor prognoses if the condition is not identified accurately and early.[5,6] According to Boeniger, "the costs associated with dermatitis can include medical treatment, lost time, reduced productivity, loss of skilled labor, retraining, reduced earnings, workers' compensation claims and additional administrative duties."[19] For those with dermatitis, the impact of the disease has been shown to affect the social and emotional well-being of some individuals.[4,6] Better prevention, information on the workplace environment, and return-to-work policies can substantially improve productivity and lessen the economic impact on both the employer and employee, as well as improve the psyches of those who suffer from the disease.[4]

It is important to evaluate sources of dermatitis and how those sources vary among the types of commodities mined, different job functions, and the areas of the body most prone to affliction. This information is essential to permit mining companies and regulators to establish better engineering and administrative controls and to facilitate interventions, such as changes in work practices, personal protective equipment, and education or training, in efforts to eliminate exposures responsible for OSDs. Many of these potential interventions simply reflect minor changes in current employee policies and company operating procedures, including mandating the use of gloves and long-sleeved shirts, promulgating standard operating procedures that limit dermal exposures, promoting good personal hygiene such as regular laundering of work clothes, and providing employees with clean water and soap for washing near work areas. A key element to reducing exposures is the dissemination of information about OSDs to mine workers during periodic training or education activities and through the formal integration of revised work practices and procedures into a mine's health and safety policies.

Although most mining operations are extremely adept at hazard recognition (identification) and control, OSDs represent a common affliction that is not well addressed by mine regulators and the resource industries. The significant percentage of cases resulting from exposure to plants, trees, and vegetation suggests a route of prevention through enhanced workplace education of miners. An improved understanding of how dermatitis originates among miners, including the effects of chemical and environmental exposures, could lead to intervention strategies that reduce dermatitis as well as the economic and personal problems associated with the disease.

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