REVIEW

Occupational Contact Dermatitis I: Incidence and Return to Work Pressures

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Since the passage of the United States Occupational Safety and Health Act (OSHA) in 1970, there have been extensive changes in United States workplaces that should have served to enhance the prevention of occupational skin disease (OSD). Analysis of skin diseases reported to OSHA (OSHA recordables) shows that the number of OSDs declined steadily from 1974 to 1983 to about half the previous annual incidence. After 1984, there was a modest resurgence peaking in 1994, with a subsequent decline. A similar but somewhat greater decline in the late 1990s has been observed for occupational respiratory diseases, diseases caused by toxic agents and for poisonings. Likely explanations for the trends in OSD are discussed; the initial decline probably reflected an improvement in workplace conditions, the later resurgence and decline may have been attributable to changes in recording behaviors and in worker's compensation. The decline in recorded OSD since 1996 has been fairly uniform in most major industrial sectors but has been less marked in agriculture, forestry, and fishing so that this sector has replaced manufacturing in recording the highest incidence rate. In 1999, the incidence rate of recorded OSD was 0.49 per 1,000 workers, which appears to grossly underreport the true incidence. OSD now constitutes about 10% of all occupational disease cases. Currently, there is increasing emphasis in corporate and occupational medicine on reducing costs and maintaining productivity as well as in preventing occupational injuries and diseases. This is shown by the trend for a greater proportion of workers with occupational conditions to return to modified duty positions rather than to be completely off work. Implications of this phenomena for management of OSD are discussed.

CONTACT DERMATITIS is a common and important condition in the occupational setting. This article uses the data reported to United States Occupational Safety and Health Act (OSHA) to describe changes in the incidence of recorded occupational skin diseases in the United States since 1972 and addresses implications of the prevailing occupational medicine paradigm of relating work, health, and productivity, to the management of occupational skin disease, particularly occupational contact dermatitis.

Incidence of Reported Occupational Skin Disease (OSD) and Disorders in the OSHA Era

The 1970 passage of the OSHA legislation was a defining moment in occupational health in the United States, because it presaged substantial changes in regulation, enforcement, and practices with the objective of preventing conditions such as occupational dermatitis.

The changes in workplace practices that should have helped reduce OSD have been extensive and in some cases revolutionary. Communication about the hazards to workers of substances used in the workplace has been greatly improved, because the OSHA hazard communication standard has regulated for the mandatory provision to workers and supervisors of information on composition, health hazards, and necessary precautions including the use of protective equipment and clothing. The combination of a much improved toxicologic data base for many commonly used substances, hazard communication, and the application of this knowledge in many workplaces has led to reductions in worker exposure and substitution for many of the most hazardous agents to the skin, including strong allergens.

Present day hygienic controls are considerably more sophisticated than those of the past. The practice and scientific basis for exposure assessment and control have improved, and quality control approaches and computerized process control have driven reduction in the emission of hazardous substances in many industrial settings. Modern manufacturing and material handling processes generally are cleaner than those used in the past. A greater range of personal protective equipment is available now than was available in 1970, along with improved information on the appropriate selection of impervious garments, such as gloves for work with particular substances and mixtures (excellent sources for this information include http://www-ehs.ucsd.edu/lab/glove.htm, http://www.pp.okstate.edu/ehs/LINKS/Ppe.htm, and http://www.cis.utk.edu/lppe.html). Better statistics and reporting systems are available through worker's compensation agencies, through OSHA, and through proprietary health and safety management systems to capture and measure skin occurrences of skin disease to highlight the need for preventive management. In 1970, the items listed previously would have constituted an excellent wish list for the capabilities that would make the industrial environment safe for the skin.

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Additionally, over the 1970-to-2001 timeframe, the demography of United States industry has changed so that the proportion of the total workforce employed in the manufacturing and agricultural sectors, those which have had the worst record for causing OSDs, has decreased, and there has been a counterbalancing increase in employment in the service sector, which, by-and-large, has had a lower rate of OSD. Moreover, a number of the dirtiest and most hazardous industries, particularly in manufacturing, have been exported to developing countries. Although this may cause increased problems in those countries, could be expected to reduce skin hazard in United States industry.

One could reasonably expect that the net effect of these changes would have been a great reduction in the occurrence of OSD generally and of contact dermatitis in particular. The tools should now be in place for the low-hanging fruit of easily preventable OSD to have been virtually eliminated. Therefore, it seems an appropriate time to review trends in occupational disease to see if the hoped-for reductions have been achieved.

Information is available for the 1972-to-1999 period for the number of cases of OSDs or disorders reported to OSHA. Since 1984, the incidence rate per 10,000 employees calculated as

$$\frac{(\text{number of illnesses} \times 200{,}000)}{\text{total hours worked}}$$

has been published yearly. This data is shown in Figure 1.

The criteria used for reporting an injury or disease to OSHA have not changed since 1972.[1] Briefly put, OSHA requires that each employer records fatalities, injuries, and illnesses, provided that they are work-related and are new cases (including new events of acute, but not of certain chronic conditions). An injury or illness is considered work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness. To be recordable, a condition could result in: death or days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness.

A case also must be recorded if it involves a significant injury or illness, diagnosed by a physician or other licensed health care professional, even if it does not result in any of the above outcomes. There are substantial penalties for failure to report. Initially, data on all recordable cases was submitted to OSHA on Form 100, an annual log, and Form 101, an incident report. Since the late 1970s, a new version of the log, the OSHA 200 Log Form, has been used. Based on the criteria used by OSHA, virtually all diagnosed or treated OSD could be reportable by the employer.

Figure 1 shows that there were just over 89,000 recorded cases of OSD annually in 1973 and 1974 and that the number in 1999 was approximately halved at 44,600 cases. Since 1974, there was a reasonably steady decline in the number of cases to a record low in 1983. It seems reasonable to attribute this decline to an overall improvement in workplace health and safety over this period. Since approximately 1986, the number of cases rose again, as did the incidence rate, with both peaking in the 1992-to-1996 period, since which time there has been a fairly steep decline. To what can we attribute this rebound in recorded cases? There is no evidence, and it seems unlikely that conditions in workplaces dramatically declined during these years. On the other hand, this was a period during which the overall number of cases of reported occupational disease rose dramatically. The annual number and incidence rates for all occupational disease and for OSD from 1984 to 1999 are shown in Figure 2. Figure 2 shows a great increase in reported cases of occupational diseases occurred from 1986 to 1994, which was attributable mostly to the recognition and compensation of musculoskeletal disease, including carpal tunnel syndrome, which was attributed to repetitive strain or cumulative trauma at the workplace. The number of reported cases and the incidence rates for both skin diseases and musculoskeletal diseases have been on the decline since 1994. Much of the decline has been simultaneous with reform of the worker's compensation system. The most likely explanation both for the rise in recorded cases of OSD from 1986 and the subsequent fall is that it reflects general changes in worker's compensation policy and behavior as well as changes in behavior and fashion in recording cases on OSHA forms. It would be attractive to attribute the decline to the success of emphasis by employers on improving performance in regard to safety and health outcomes, to improved prevention practices or even to a historically buoyant economy during the late 1990s, but there is, as yet, little direct evidence to support any of these positions. Also, there are anecdotal reports that some employers during the last several years may have classified OSD cases as first-aid cases, treatable with steroid preparations that are now available over the counter (OTC). (Treatment with an OTC preparation can be considered a first-aid case not reportable to OSHA, but there seems to be no credible

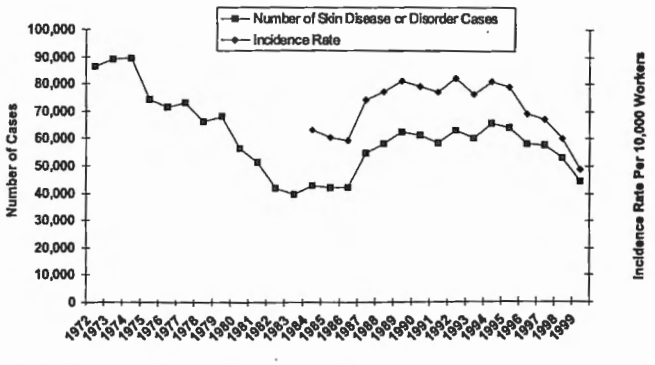

Figure 1. Reported cases and incidence rate of skin diseases/disorders US OSHA 1972-1999.

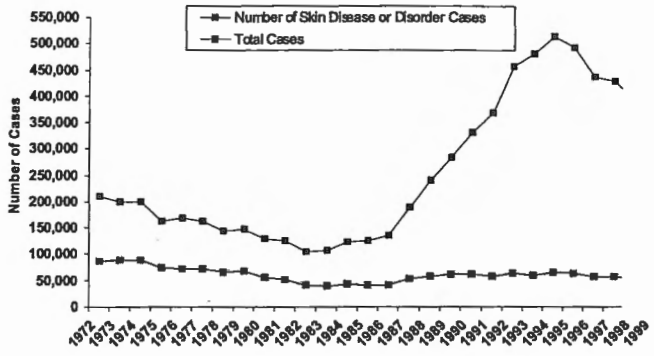

Figure 2. Annual total recorded illness and skin diseases/disorder cases US OSHA, 1984 to 1999.

data to determine how widespread such changes in recording habits may have been.)

The great increase in the number of recorded musculoskeletal diseases from 1986 to the present has seen OSD displaced from its historical status as the most frequent occupational disease. Accounting for about 40% of all occupational diseases during the first 15 years of OSHA, occupational skin disease now accounts for about 10% of occupational disease, despite the modest resurgence noted in the 1990s. This repositioning is virtually all accounted for by the growth in reported musculoskeletal disease attributed to cumulative strain or repetitive trauma.

Since 1992, the Bureau of Labor Statistics[2] has analyzed more of the data submitted on OSHA logs and incident forms so that, from that time (and particularly since 1995) more detailed information has been published using the OSHA database. The number and rates per 10,000 workers of several nonfatal occupational illnesses, occupational skin disease, respiratory conditions caused by toxic agents and poisonings, reported for the years 1992 to 1999, are shown on Table 1. The data in Table 1 confirms that the number of reported OSDs and disorders remained reasonably stable at between 7.6 and 8.2 cases full-time equivalent workers per 10,000 from 1992 through 1995. However, there was a sharp reduction both in the number of cases and the incidence rate commencing in 1996 and becoming most marked in 1999. As shown on Table 1, the decline in the incidence rate of reported occupational disease is not restricted to skin diseases and disorders but also is seen for the 2 other conditions that primarily result from chemical exposure in the workplace. If we compare the mean incidence rates for new occupational diseases for the 1992-to-1993 period and the 1998-to-1999 period, we find that there has been a 42% reduction in poisonings, a 39% reduction in respiratory conditions caused by toxic agents and a somewhat smaller 31% reduction in skin diseases and disorders.

There is a strong body of opinion amongst many industrial hygienists that the improvements made in industry in recent times have been more effective in reducing inhalation exposures rather than dermal exposures. Benford et al[3] state "As occupational exposure limits and improved control measures lead to decreasing atmospheric exposures, so the likelihood increases that dermal exposures will make a significant contribution to the overall systemic exposure to chemical substances at work." Using OSHA recordable illness data, there is some support for the contention that the workforce has become relatively safer with respect to inhalation rather than skin exposures.

The recent decline in OSHA recorded OSDs/disorders seems to have been widespread across industry sectors, as seen in Table 2, which compares data for 1995 and 1999. I have chosen 1995 for this comparison because it appears to be the first year for which strictly comparable data is available. It is seen that over this time the manufacturing, services, transportation and public utilities, and construction sectors have seen reductions of 30% to 40%. Mining has achieved an even greater reduction, which might be attributable to the marked attention given to reducing OSHA recordable injuries and illnesses in this sector. Although rates for agriculture, forestry, and fishing have improved somewhat, this sector has not shown the degree of reductions noted in many other sectors. Agriculture, forestry, and fishing are now unequivocally the industry sector with the highest incidence of OSHA recorded skin diseases and disorders. Wholesale and retail trade, and finance, insurance, and real estate (for which the incidence actually rose), did not show the improvements noted in

Table 1. Number of Reported Occupational Illness Cases and Rate Per Annum for 10,000 Full-Time Employees US Private Industry, 1992 through 1999

	Skin Diseases, Disorders		*Respiratory Diseases Caused by Toxic Agents*		*Poisonings*	
Year	*No.*	*Rate*	*No.*	*Rate*	*No.*	*Rate*
1992	62,900	8.2	23,500	3.1	7,000	0.9
1993	60,200	7.6	24,200	3.1	7,600	1.0
1994	65,700	8.1	25,300	3.0	7,200	0.9
1995	64,200	7.9	24,400	3.0	7,500	0.9
1996	58,100	6.9	21,700	2.6	4,800	0.9
1997	57,900	6.7	20,300	2.4	5,100	0.6
1998	53,100	6.0	17,500	2.0	5,100	0.6
1999	44,600	4.9	16,500	1.8	4,400	0.5

Table 2. Change in OSHA Recorded Incidence Rates for Occupational Skin Diseases and Disorders by Industry Sector US Private Industry, 1995 and 1999

Sector	*1995 Rate*	*1999 Rate*	*1999 Rate as a % of 1996 Rate*
All Sectors	7.9	4.9	62%
Agriculture, Forestry and Fishing	20.3	15.5	76%
Mining	3.3	0.7	21%
Construction	4.5	3.0	67%
Manufacturing	17.0	11.0	64%
Durable	19.2	12.3	64%
Non-Durable	14.0	8.9	64%
Transportation and Public Utilities	5.9	3.6	61%
Wholesale and Retail Trade	1.9	1.6	84%
Finance, Insurance and Real Estate	0.8	1.0	125%
Services	8.4	5.0	60%

other sectors, but these 2 sectors started from a low incidence rate base and continue to have relatively low rates of occupational skin conditions.

It seems certain that the officially recorded figures greatly underestimate the true prevalence of occupational skin disease.[4] Surveys of large groups of workers find a much higher prevalence of skin disease with 1-year prevalence rates in high-risk industries of between 5% and 20%.[5,6] This contrasts with the 1999 OSHA recordable skin disease incidence rate of 0.49 per 1,000 workers.

In any case, since the early 1970s we have seen a substantial reduction to about half the previous number of officially recorded cases of OSD. Over this period, substantial hygienic improvements have occurred in the workplace, which suggests that to make further gains we may need to become more sophisticated in our approach to prevention.

Work, Health, Productivity, and OSD

An improvement in United States working conditions, some reduction in the burden of occupational injury and disease, and the apparent ever-increasing costs for group-health and disability insurance, have seen a paradigm shift in occupational and corporate medicine. The emphasis has broadened from an almost exclusive focus on the prevention of illness and injury to a wider interest in the health and productivity of the workforce. The proposition is that with improved worker health comes increased ability to work effectively, productively and in the case of knowledge jobs creatively, and that by reduced health absences the time at work is increased.[7]

On the cost side, better workforce health should result in reduced costs for worker's compensation, disability, and possibly even group health insurance. The combination of reduced cost and increased productivity is seen as a recipe for organizational success. These relationships are shown schematically in Figure 3.

Requirements of the Americans with Disability Act of 1990 have reinforced the need for industry to make reasonable accommodations so that those with disabilities are able to contribute meaningfully to society through work. There are a number of implications of these changes for those who diagnose and treat skin disease.

The traditional approach in treating patients with severe OSD, as with other occupational injury and diseases, has included keeping the patient out of work until complete resolution has occurred. In recent years, the strong trend for all occupational conditions has been toward bringing patients back to work earlier, or even immediately, by modifying their job duties to eliminate those tasks that the injured or ill employee is incapable of performing or might delay healing or cause further injury. There are clear advantages for the employer (cost, productivity), the insurer (cost), and there can be advantages for the employee (retention of socialization to work, improved psychological state, income maintainance). The insurance cost savings is very substantial, and a rule of thumb for worker's compensation is that indemnity (wage replacement) is responsibility for 60%-65% of costs, and medical and associated treatments 35%-40% of total costs.

Functional goals for reducing the impact of occupational disease can be defined as maximizing the earliest attainment of full function, maximizing productivity while returning of full function, minimizing the time lost from work, and maximizing modification or removal of the factors that caused the disease.[7] To show recent trends, Figure 4 shows the strong national trend in United States private industry from 1981 through 1999 toward the provision of modified duty, rather than time off work in the manufacturing sector.[2]

Pressures for early return to the job pose a particular challenge in occupational dermatology. After dermatitis, skin takes some time to be restored to normal, and apparent visible healing precedes histologic or biochemical normality. Although a blanket prohibition from any work may be difficult to sustain, if a patient is to make an early return to work, necessary work restrictions must be carefully formulated. The way forward in this important task may lie in using the techniques of risk assessment to characterize

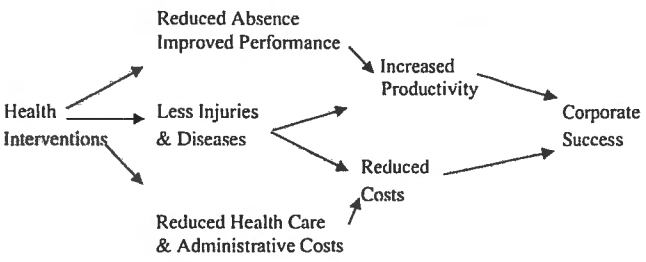

Figure 3. Health, productivity and organizational success relationships.

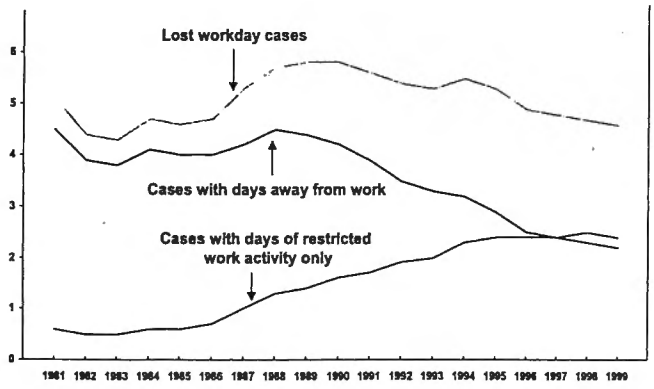

Figure 4. Lost workday case incidence rates (per 100 full time workers) for injuries and illnesses combined, US manufacturing, 1981-1999. Source: Bureau of Labor Statistics, U.S. Department of Labor, December 2000

risks of work and to better define safe conditions of exposure.

Those with atopic skin (and respiratory) problems can pose particular difficulties. Physicians can be asked to define, in measurable terms, exactly what would constitute a safe environment before a patient can return to work or so that the employer can meet his or her perceived obligation under the Americans with Disabilities Act to provide a workplace that meets the requirement to reasonably accommodate an employees pre-existing disability. In the current state of knowledge, this can be an almost impossible task, because an atopic can be abnormally sensitive to environments that are ordinarily considered benign. In these circumstances, the physician and patient may have to resort to trial and error to discern the environmental conditions in which the individual is asymptomatic. It can be difficult to precisely define that environment in advance. This produces a circular logic as a safe environment is defined by the fact that the atopic will not react in that area. In these circumstances, if the employer is not willing to work with the employee and their physician to use some reasonable trial and error to find a safe work location, a frustrating impasse can arise.

The concern of insurers and employers about absence from work has led to a greater use of Independent Medical Examinations (IMEs) and other case-management techniques to ensure that productivity losses are reduced to a reasonable minimum and that treatment is acceptable and reasonable. These techniques have proven so successful in improving outcomes in occupational injury and disease that they are now increasingly applied to better manage disability and improve return to work even where the illness is nonoccupational. In these cases, interventions including physician review are considered when recovery and return to work are not meeting established guidelines. Where the issue is one of skin disease, there is a need to address whether the patient is able to work, and to address necessary work restrictions and feasible job modifications. Both treating practitioners and physicians performing IMEs would be advantaged by an improved scientific information base and a better conceptual framework for judgments about return to work issues. It would be most unfortunate if the end-result of return to the job pressures were a greater incidence of chronic persistent dermatitis. A companion paper explores issues of risk assessment and prognosis of OSD.[8] There is an important need for research addressing the success of different strategies for return to work in OSD with respect to cost, productivity and health outcomes including the prevention of persistent postoccupational dermatitis.

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