British Journal of Dermatology 2000; **142:** 1128–1134.

Surveillance of occupational skin disease: EPIDERM and OPRA

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Accepted for publication 20 January 2000

Summary Consultant dermatologists in the U.K. have been reporting to EPIDERM, a voluntary surveillance scheme for occupational skin disease, since February 1993; reporting by occupational physicians to the scheme began in May 1994 and was superseded in January 1996 by OPRA (Occupational Physicians Reporting Activity). Currently 244 dermatologists and 790 occupational physicians report incident cases to these schemes. During the 6 years to January 1999 a total of 12,574 new cases of occupational skin disease was estimated from reports by consultant dermatologists and 10,136 cases estimated from occupational physicians (since May 1994). The annual incidence of occupational contact dermatitis using data from both schemes was 12·9 per 100,000 workers. The incidence of contact dermatitis per 100,000 workers increased with age in men from 4·9 (age 16–29 years) to 6·6 (age 45–60 years); in women a higher rate (9·5) was apparent in the younger age group, with lower rates in older female workers. High rates in young workers were associated with wet work and in older workers with exposure to oils. For men, high rates of contact dermatitis were seen in reports from both schemes for chemical operatives, machine tool setters and operatives, coach and spray painters and metal workers. For women, high rates were found for hairdressers, biological scientists and laboratory workers, nurses and those working in catering. The most frequent agents for contact dermatitis were rubber chemicals and materials (14·1% of cases reported by dermatologists), soaps and cleaners (12·7%), nickel (11·9%), wet work (11·1%), personal protective equipment (6·2%), petroleum products (6·3%), cutting oils and coolants (5·6%), and epoxy and other resins (6·1%). In the 1608 estimated cases of skin cancer all but 4% were attributed to ultraviolet radiation. Cases of contact urticaria attributed to latex peaked in 1996, with a decline in cases since that time.

Key words: epidemiology, occupational contact dermatitis, occupational skin disease, surveillance

Skin disorders arising from occupational exposure are frequent, and they represent a substantial proportion both of the total burden of occupational disease and of the case load of many consultant dermatologists.[1–4] However, good estimates of the incidence of occupational skin disease are difficult to establish from the existing literature. Household surveys of self-reported occupational illness in the U.K. estimated a prevalence of 66,000 cases in 1995, a rate of 15 per 10,000 for those who have ever been employed.[1] Registers of occupational disease are kept in a number of countries. In Finland and Denmark, for example, all physicians are required to report any case in which they suspect an occupational aetiology and hence estimates in these countries are likely to be more valid than those based solely on cases reported for compensation. In Finland, 1097 cases of occupational dermatoses were reported in 1996, an annual incidence of 5·1 per 10,000 workers.[2] Reports from the Bureau of Labor Statistics (BLS) in the U.S.A., which bases its estimates on workplace surveys, indicate that skin diseases and disorders account for 14% of occupationally related illness in private industry, implicating skin disease as the second most common occupational disorder.[3] An estimated incidence rate for occupational contact dermatitis of 1·12 cases per 10,000 workers per year has been calculated based on BLS data.[3,4]

Despite published figures that indicate the magnitude of the problem, occupational skin disease is still likely to be under-reported. Factors responsible include

attribution to other disease processes or to exposures outside the workplace, and reporting discrepancies that arise from distinctions between observable vs. compensable skin disease. The perception that skin disorders are trivial because they are not life-threatening or do not preclude continued work may also contribute to under-reporting. Estimated morbidity from skin disease argues otherwise; in the U.S.A., 20–25% of individuals with occupational skin disorders lose an average of 11 days of work annually.[3]

Occupational skin disease has been identified as a priority area for research and prevention.[4,5] Because of the paucity of data on the incidence of occupational skin disease, surveillance efforts which can identify the incidence, distribution and determinants of occupational dermatoses are essential to inform preventive efforts. One such programme, the EPIDERM surveillance scheme, was initiated at the Centre for Occupational and Environmental Health at the University of Manchester in 1993 following pilot studies of feasibility.[5] This surveillance scheme uses the reporting model developed by the SWORD (Surveillance of Work-Related and Occupational Respiratory Disease) project;[6] consultant dermatologists and occupational physicians are asked to report skin disease which, in their clinical judgement, has been caused, or made worse, by work. EPIDERM and the related scheme for occupational physicians, OPRA (Occupational Physicians Reporting Activity) now form part of the surveillance scheme ODIN (Occupational Disease Intelligence Network) at the University of Manchester. This scheme comprises surveillance for communicable diseases (SIDAW), musculoskeletal disorders (MOSS), psychiatric illness (SOSMI) and hearing loss (OSSA), in addition to the EPIDERM and SWORD projects.[7] This paper presents the methods and results from the first 6 years (since January 1993) of the surveillance of occupational skin disease.

Materials and methods

In 1991, the Health and Safety Executive commissioned the British Contact Dermatitis Group, associated with the British Association of Dermatologists, to carry out a pilot scheme. New cases of occupational skin disease were reported at 3-month intervals by 17 consultants in dermatology located in major cities.[5] The scheme, now known as EPIDERM, was extended from January 1993 to include consultant dermatologists throughout the U.K. From May 1994, occupational physicians were invited to join the scheme. Both groups of reporters completed simple reporting cards at 3-month intervals.

In January 1996 the scheme was redesigned. Occupational physicians, many of whom also reported to SWORD, were asked to report all new cases of occupational disease, whatever the diagnosis, in one randomly assigned month each year. This reporting group now numbers 772. Medical inspectors for the Health and Safety Executive (currently 18) also report each month to OPRA. EPIDERM continues with 244 consultant dermatologists currently taking part. Late in 1995 a core group with a special interest in occupational skin disease was designated comprising 24 dermatologists, who report to the scheme monthly throughout the year. The remaining specialists were randomly assigned to one of 12 monthly samples and asked to report cases seen only during the calendar month to which they had been assigned. Reporters are asked to return cards even if they have no case to report. Reminders to return the card are made by telephone and fax. Although consultants are asked to report all new eligible cases seen during the month, the extent to which cases are missed is unknown.

The reporting card completed by consultant dermatologists specifies eight categories of skin disease: contact dermatitis, contact urticaria, folliculitis or acne, infective skin disease, mechanical or traumatic injury, conditions of the nails, neoplasia and other. Occupational physicians reporting to OPRA are simply asked to record the diagnosis, which is then coded using the International Classification of Diseases, 10th Revision (ICD-10). Details on each case, including date of birth, sex, abbreviated postcode, occupation, industry (since January 1996) and suspected agents are requested on the reverse side of each card. Physicians are asked to report any skin condition that was caused or made seriously worse by the patient's work. They are not asked to carry out tests over and above those judged necessary for clinical management. Physicians are asked to note positive patch test results only if in their judgement there is a clear association between workplace exposure to the antigen and the test result.

Reported occupation is coded to three digits and industry to two digits using classifications developed by the Office of Population Censuses and Surveys and the Central Statistical Office (now jointly the Office of National Statistics).[8,9] Substance coding is based on a scheme developed for internal use by the Health and Safety Executive and is performed independently by two research assistants. Duplicate reports are identified and

Table 1. Incidence and yearly rates of occupational skin diseases: estimates from dermatologists (February 1993–January 1999) and from occupational physicians (May 1994–January 1999)

	Dermatologists		Occupational physicians	
Disease category	Number	%	Number	%
Contact dermatitis	9937	79·0	8129	80·2
Contact urticaria	434	3·5	475	4·7
Folliculitis/acne	65	0·5	94	0·9
Infective	314	2·5	557	5·5
Mechanical/traumatic	200	1·6	118	1·2
Nail disease	67	0·5	71	0·7
Neoplasia	1608	12·8	24	0·2
Other dermatoses	1243	9·9	777	7·7
Total cases	12,574	(100·0)	10,136	(100·0)

eliminated by searching the database for initials, date of birth and postcode.

In the present report the incidence of occupational skin disease was calculated separately for dermatologists and occupational physicians by weighting individual reports by an appropriate multiplier (1 throughout for those reporting all cases seen over each 3-month period to December 1995 and each month thereafter; 12 thereafter for those who have reported only 1 month a year since that date). Denominators were obtained from the Labour Force Survey[10] which gives U.K. employment figures for occupation and industry by age, gender and region. Employment data from winter 1996–97 were used in calculating the figures presented here. Because of the start date in February 1993, all surveillance dates shown by calendar year (e.g. 1993) cover the 12 months from 1 February in that year to 31 January in the following year.

Results

Approximately 70% of dermatologists who work with adult patients and who are on the Specialist Register of the General Medical Council report to EPIDERM. Comparable data are not available for OPRA as many reporting physicians are not on the register. Among those who do report, collaboration is high, with average monthly participation of 89·6% for the dermatologists and 89% for the occupational physicians for the most recent reporting years, 1997 and 1998. During the 6 years ending in January 1999, a total of 12,574 new cases of occupational skin disease was estimated from reports by consultant dermatologists. Data from the parallel reporting schemes for occupational physicians result in an estimate of 10,136 new cases in the period from May 1994 to January 1999. The number of cases reported annually by the two groups was thus very similar (2096 per year for dermatologists and 2134 for occupational physicians). Summary data on estimated cases are shown in

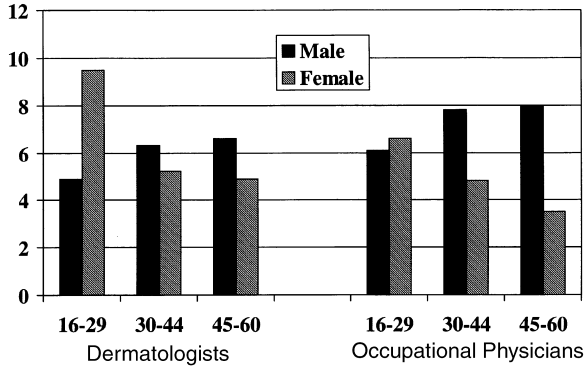

Figure 1. Rates of occupational contact dermatitis by age and sex, per 100,000 employed per year: dermatologists (February 1993–January 1999) and occupational physicians (May 1994–January 1999).

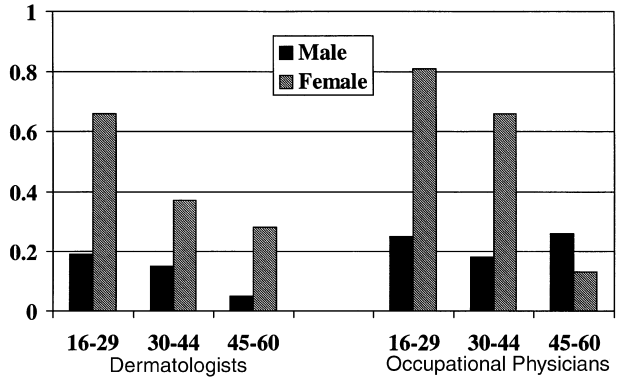

Figure 2. Rates of occupational contact urticaria by age and sex, per 100,000 employed per year: dermatologists (February 1993–January 1999) and occupational physicians (May 1994–January 1999).

Table 2. Rates per million workers per year of contact dermatitis attributable to selected agents by age and gender

	Wet work								Cutting oils and petroleum products							
	Dermatologists				Occupational physicians				Dermatologists				Occupational physicians			
	Men		Women		Men		Women		Men		Women		Men		Women	
Age (years)	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
16–29	121	4·7	398	18·2	92	4·5	218	12·6	211	8·1	18	0·8	279	13·6	35	2·0
30–44	118	3·6	231	8·8	66	2·6	119	5·7	423	13·0	24	0·9	430	16·8	30	1·4
45–60	55	2·3	161	8·1	34	1·8	34	2·2	394	16·7	20	1·0	382	20·5	26	1·7
Overall	294	3·6	790	11·6	192	3·0	371	6·9	1028	12·6	62	0·9	1091	16·8	91	1·7

Table 1. As more than one condition could be reported in a single patient, the sum of these figures is greater than 100%. The overall annual incidence of occupational contact dermatitis using data from both schemes was 12·9 cases per 100,000 employed.

Figure 1 shows incidence rates by age and sex for contact dermatitis. A progressive increase in rates of dermatitis is seen with increasing age in men in both reporting schemes. By contrast, a higher rate of contact dermatitis is apparent in women aged 16–29 years, with a decline in the older age groups. These patterns persist when results are standardized for the distribution by age within occupational groups, but inspection of rates by age within occupational groups suggests that men and women have similar patterns. Both male and female chefs and cleaners, for example, have higher rates of contact dermatitis in young workers than in older ones (39·5 and 65·8 cases per 100,000 workers per year in men and women, respectively, in the 16–29 year age group vs. 25·1 and 17·4 in those aged 30–45 years), whereas machine tool operators have, at least for men, steeply increased rates with age (36·3 cases per 100,000 workers per year aged 16–29 years, 47·4 for those aged 30–45 years, and 86·5 in the group aged 45–60 years). This suggests that the type of agent may be important. Table 2 shows the rates for contact dermatitis attributed to wet work and to work with cutting/cooling oils or petroleum products. It appears that it is the type of agent rather than gender that is significant in determining rates in different age groups.

Decreasing rates with age in women were also found with contact urticaria (Fig. 2), with a slight trend to

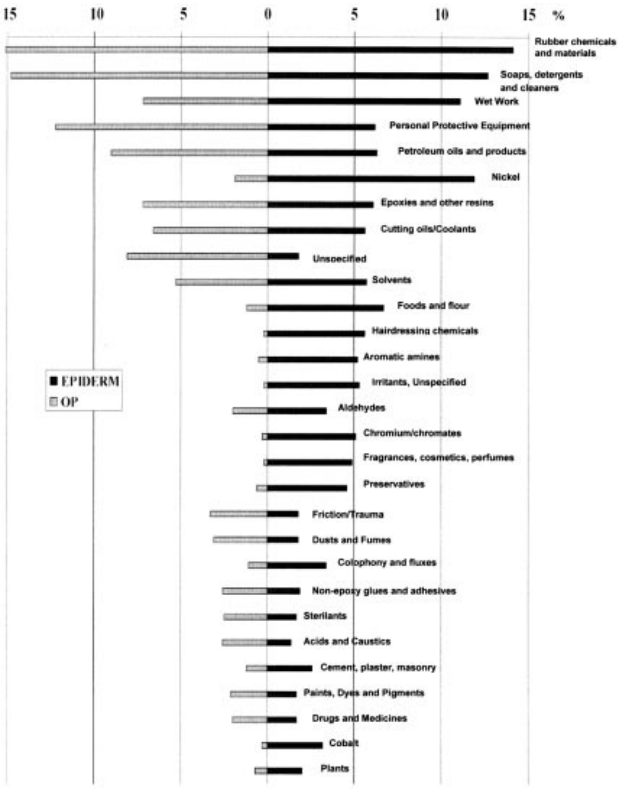

Figure 3. Occupational contact dermatitis: responsible substances identified by dermatologists (EPIDERM) and by occupational physicians (OP). Percentage of cases for each surveillance scheme.

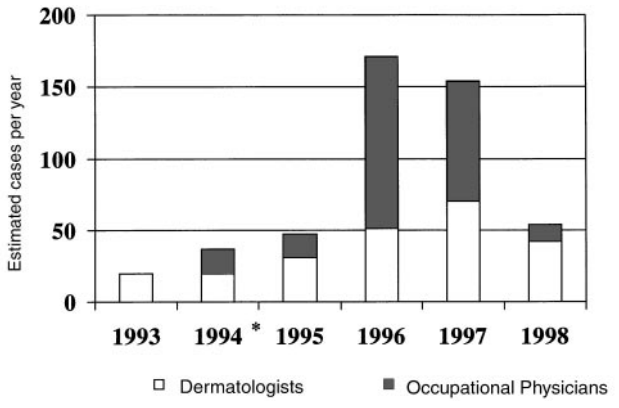

Figure 4. Contact urticaria attributed to latex in gloves. Yearly estimated cases from dermatologists and from occupational physicians. * For 1994, figures from occupational physicians include only cases from May, when reporting began, to January 1999.

Table 3. Incidence and yearly rates of contact dermatitis by occupation for men: occupations with highest overall rates per 100,000 employed

	Dermatologists		Occupational physicians	
Occupation (SOC code)	Number	Rate	Number	Rate
Chemical, gas and petroleum plant operatives (820)	159	45	512	182
Assemblers and line workers for vehicles and other metal goods (851)	63	17	327	109
Machine tool operatives (840)	272	56	262	69
Glass product and ceramic manufacture (590)	35	20	112	82
Printers (561)	72	71	13	16
Machine tool setters and setter-operatives (519)	83	34	68	36
Coach and spray painters (596)	64	31	61	37
Other scientific technicians (309)	21	7	132	60
Metal and electrical goods inspectors and testers (860)	19	6	104	41
Metal working production (516)	363	16	462	26
All occupations	5295	6	5274	8

SOC, Standard Occupational Classification.

decreasing rates in men also. Overall, 31% of women and 30% of men with a diagnosis of contact urticaria were also reported to have contact dermatitis.

Skin neoplasia, diagnosed largely in elderly men, is seldom reported by occupational physicians who are in contact only with those in the working population. In reports received from dermatologists, 43·3% of the total estimate of 1608 cases were keratoses, 43·3% were basal cell carcinoma, 11·7% squamous cell carcinoma and 5·8% melanoma, with 3% unspecified as to type. Of all reported cancers, 95·7% were reported as having sunlight or ultraviolet radiation as a suspected cause, with more than three-quarters (78%) of such cases working in agriculture, construction or the armed forces. Other causes of skin neoplasia, each accounting for fewer than 1% of reported cases, included tar and tar pitches, mineral oils, infrared radiation, burns and trauma, cutting oils, ionizing radiation and bipyridyl/paraquat.

The occupations of workers with contact dermatitis reported in the two schemes are shown in Tables 3 and 4. The tables are arranged according to the occupations with the highest overall rates from both schemes combined. For men, high rates are seen in both schemes for chemical operatives, machine tool setters and operatives, coach and spray painters, and metal workers. Occupational physicians reported greater numbers of cases than dermatologists for vehicle assemblers, glass and ceramics workers, and scientific technicians, and higher rates are seen in reports from dermatologists for printers. This may in part reflect an unequal distribution of occupational physicians among industries. Further evidence for this is seen in Table 4, where the very high rates in hairdressers obtained via reports from dermatologists are not found in parallel figures from occupational physicians.

Agents reported as causes of occupational contact dermatitis are shown in Figure 3. More than one suspected agent may be reported or entered into the database. For example, a case of dermatitis might be due to both cleaners and wet work, or coded as arising both from rubber products and the use of personal

Table 4. Incidence and yearly rates of contact dermatitis by occupation for women: occupations with highest overall rates per 100,000 employed

	Dermatologists		Occupational physicians	
Occupation (SOC code)	Number	Rate	Number	Rate
Hairdressers and barbers (660)	764	120	23	5
Biological scientists and biochemists (201)	22	17	76	75
Routine laboratory testers (864)	28	34	34	52
Assemblers and line workers for vehicles and other metal goods (851)	31	35	24	34
Nurses (340)	563	20	614	28
Chefs and cooks (620)	235	29	32	5
Laboratory technicians (300)	45	16	38	17
Catering assistants (953)	186	17	97	11
Electronic equipment assemblers (850)	53	13	50	15
Kitchen porters (952)	124	21	24	5
All occupations	4625	7	2824	5

SOC, Standard Occupational Classification.

Table 5. Trends in reporting of responsible agents for contact dermatitis identified by dermatologists and by occupational physicians. Percentage of cases for each surveillance scheme for agents where total estimated cases > 100

	Dermatologists						Occupational physicians			
	1993–94		1995–96		1997–98		1995–96		1997–98	
Agent	No. of cases	% of total	No. of cases	% of total	No. of cases	% of total	No. of cases	% of total	No. of cases	% of total
Rubber	429	13·6	423	15·2	559	13·9	572	16·9	507	16·7
Soaps and cleaners	377	12·0	369	13·3	524	13·0	564	16·7	461	15·2
Wet work	297	9·4	304	11·0	508	12·6	226	6·7	302	9·9
Personal protective equipment	187	5·9	202	7·3	232	5·8	479	14·2	351	11·5
Petroleum and products	248	7·9	192	6·9	189	4·7	360	10·7	247	8·1
Nickel	420	13·4	338	12·2	432	10·7	63	1·9	73	2·4
Cutting oils and coolants	166	5·3	169	6·1	224	5·6	169	5·0	246	8·1
Epoxy and other resins	205	6·5	206	7·4	286	7·1	235	7·0	273	9·0
Solvents and alcohols	160	5·1	212	7·6	193	4·8	200	5·9	141	4·6
Aldehydes	114	3·6	80	2·9	140	3·5	72	2·1	61	2·0
Non-epoxy glues and paints	61	1·9	124	4·5	80	2·0	129	3·8	181	6·0
All other substances	1525	37·4	1089	30·0	1814	36·0	379	11·2	258	8·5
Total cases reported	3144	100·0	2774	100·0	4019	100·0	3376	100·0	3040	100·0

protective equipment. Trends in the reporting of agents are shown in Table 5. The pattern with contact dermatitis appears rather stable over the 6 years of reporting, although the attribution to wet work has risen with time, and that for petroleum products and perhaps nickel has fallen. Trends in the attribution of contact urticaria to latex are also informative. Figure 4 shows a steep rise and rapid fall in the incidence of latex urticaria reported by both sets of physicians.

Discussion

Using the model for occupational surveillance developed by the SWORD project, EPIDERM and more recently OPRA have been successful in developing statistical data on occupational skin disease in the U.K. Response to the surveillance scheme on the part of dermatologists and occupational physicians has been encouraging, and 6 years into the scheme, monthly reporting remains near 90%. Reports of skin disease comprise the second largest percentage of reports to ODIN (22% of the total estimated cases, second only to musculoskeletal injury), underlining its importance as a cause of occupational morbidity.

The scheme, in using reports from specialist physicians in multiple centres, seeks to avoid the under-ascertainment that may occur if employers do not report cases, or if reporting of only compensated cases is made.[11] Only cases that come to the attention of dermatologists or occupational physicians will be reported, however, with cases treated by a family physician or an occupational nurse escaping the surveillance net. As in other surveillance schemes, estimates of occupational morbidity remain substantially below those obtained in household surveys and by self-reports from workers.[1] Surveillance figures are therefore best considered as one element informing an overall picture of incidence, as true comparison with other sources across countries and across reporting schemes is difficult.

Some particular advantages are present in this reporting scheme. Specialist referral centres have been the source for case series demonstrating the hazards of particular occupations, such as hairdressing,[12] and specific sensitizing agents, including nickel and resins.[13,14] Through compiling aggregate results from multiple centres, ODIN can reduce the potential bias that may result from concentration of particular industries or processes in a single region. Greater capture of dermatological conditions for the purpose of overall surveillance is achieved by using two distinct sets of reporting physicians. Dermatologists will see a greater proportion of patients who are self-employed or work for smaller industries than will occupational physicians, whose caseloads originate in organizations of sufficient size and means to support occupational health and safety programmes. The inclusion of hospital-based dermatologists, who see workers from a broader range of work sites, will help to overcome the limitations of studies which are based on workplace surveys.[3] The cases seen by the two groups of reporters are also likely to differ in severity, with more intractable cases being referred by the family

physician, or indeed the occupational physician, to a consultant dermatologist.

Contact dermatitis is by far the most commonly reported occupational skin disease in this and other studies. Previous reports have suggested that prevalence is higher in women than in men and in older than younger workers.[11,15–17] In the current data, incidence rates were greater in women only in the youngest age group (those under 30 years) and an increased rate with age was seen only in men. Inspection of the data suggests that this pattern reflected the types of agents to which men and women were exposed. Women were more likely to have dermatitis attributed to wet work, with young age of onset, and men to oils and related substances which appear to be a greater hazard in older workers, perhaps as a result of longer exposures.

Examination of trends in reporting shows relatively little change in the proportion of cases of contact dermatitis by responsible agent. Current patterns of the contribution of specific agents to dermatitis remain broadly similar to those seen at the beginning of the scheme. An entirely different pattern is seen in contact urticaria arising from latex, which increased markedly during the period covered by the scheme, and has just as quickly declined. The increase in incidence of contact urticaria attributed to latex reflects a parallel increase seen in cases of asthma reported to SWORD to 1997.[18] The more recent decline, presumably reflecting the use of non-latex or unpowdered gloves and better work practices, is not yet evident in SWORD asthma cases.[19]

The extent of information collected by this scheme makes it perhaps the most complete source of information available on work-related dermatoses at a national level.[11] Participation of specialist physicians in the scheme remains stable, with a consistently high rate of response permitting analysis of trends and hence the effectiveness of control measures. In this way, surveillance through the EPIDERM and OPRA schemes can play a part in the effort to reduce work-related skin disorders.

Acknowledgments

The authors are grateful to the EPIDERM and OPRA participating physicians, with special thanks to those on the steering committees. Thanks are also due to the project research assistants, Yiqun Chen and David Holt, and to the project secretaries, Lisa Humphries and Sue Whittaker. The ODIN surveillance schemes, including EPIDERM and OPRA, are supported in part by a grant from the Health and Safety Executive.

References

1 Health and Safety Executive. *Self-Reported Work Related Illness in 1995.* Norwich: HSE Books, 1998.
2 Karjalainen A, Aalto L, Jolanki R *et al. Occupational diseases in Finland in 1996. New cases of occupational diseases reported to the Finnish Register of Occupational Diseases*. Helsinki: Finnish Institute of Occupational Health, 1998.
3 US Bureau of Labor Statistics. *Nonfatal occupational illnesses by category of illness, private industry 1992–95*. Washington DC: US Department of Labor, 1997.
4 Burnett CA, Lushniak BD, McCarthy W, Kaufman J. Occupational dermatitis causing days away from work in U.S. private industry, 1993. *Am J Indust Med* 1998; **34**: 568–73.
5 Cherry NM, Beck MH, Owen-Smith V. Surveillance of occupational skin disease in the United Kingdom: the OCC-DERM Project. *Proceedings of the 9th International Symposium in Epidemiology in Occupational Health*. NIOSH Publication 94–112. Cincinnati: USDHHS, 1994; 608–10.
6 Meredith SK, Taylor VM, McDonald JC. Occupational respiratory disease in the United Kingdom 1989. *Br J Ind Med* 1991; **48**: 292–8.
7 Cherry N. Recent advances: occupational disease. *Br Med J* 1999; **318**: 1397–9.
8 Office of Population Censuses and Surveys. *Standard Occupational Classification.* London: HMSO, 1990.
9 Central Statistical Office. *Indexes to the Standard Industrial Classification of Economic Activities 1992.* London: HMSO, 1993.
10 Office for National Statistics. *Labour Force Survey Winter 1996.* London: The Stationery Office Publications Centre, 1997.
11 Smit H, Coenraads PJ, Emmett E. Dermatoses. In: *Epidemiology of Work-Related Diseases* (McDonald JC, ed.). London: BMJ Publishing Group, 1995; 143–64.
12 Sutthipisal N, McFadden JP, Cronin E. Sensitization in atopic and non-atopic hairdressers with hand eczema. *Contact Dermatitis* 1993; **29**: 206–9.
13 Shah M, Lewis FM, Gawkrodger DJ. Nickel as an occupational allergen. A survey of 368 nickel-sensitive subjects. *Arch Dermatol* 1998; **134**: 1231–6.
14 Bruze M, Fregert S, Zimerson E. Contact allergy to phenol-formaldehyde resins. *Contact Dermatitis* 1985; **12**: 81–6.
15 Fregert S. Occupational dermatitis in a 10-year material. *Contact Dermatitis* 1975; **1**: 96–107.
16 Coenraads PJ, Nater JP, van der Lende R. Prevalence of eczema and other dermatoses of the hands and arms in the Netherlands. Association with age and occupation. *Clin Exp Dermatol* 1983; **8**: 495–503.
17 Patil S, Maibach HI. Effect of age and sex on the elicitation of irritant contact dermatitis. *Contact Dermatitis* 1994; **30**: 257–64.
18 Ross DJ, Keynes HL, McDonald JC. SWORD '97: surveillance of work-related and occupational respiratory disease in the UK. *Occup Med* 1998; **48**: 481–5.
19 Meyer JD, Holt D, Cherry NM, McDonald JC. SWORD '98: surveillance of work-related and occupational respiratory disease in the UK. *Occup Med* 1999; **49**: 486–9.