

Incidence by occupation and industry of work-related skin diseases in the United Kingdom, 1996–2001

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Background	Work-related skin disease is common but few cases are documented in statutory reports or disability systems. Voluntary reporting by specialist physicians provides more complete information.
Aims	To summarize incidence rates of work-related skin diseases reported by consultant dermatologists and occupational physicians, with emphasis on contact and allergic dermatitis by occupation and industry.
Methods	Cases reported in 1996–2001 to the EPIDERM and OPRA national surveillance schemes were analysed by causal agent, occupation and industry, with incidence rates calculated against appropriate denominators.
Results	Average annual incidence rates based on data from dermatologists were 97 per million overall, 74 for contact dermatitis and 14 for neoplasia. The corresponding rates for occupational physicians were 623 overall, 510 and 2, respectively. For infective disease, the rates for occupational physicians were 28 compared to 2 for dermatologists. Contact dermatitis was most frequently attributed to rubber chemicals, soaps and cleaners, wet work, nickel and acrylics; most cases of contact urticaria were attributed to rubber chemicals or foods and flour. The pattern of incidence rates by occupation and industry was complex, but correlated with the probable type of exposure. Rates of contact dermatitis were highest among skilled workers in the petrochemical and rubber and plastic manufacturing industries, with machine operators and technical workers in metal and automotive industries also at increased risk. High proportions of cases attributed to rubber chemicals were in nurses and technicians in the health and social services.
Conclusions	These findings identify jobs and types of work where contact with causal agents is common and potentially preventable.
Key words	Industry and occupation; reported incidence; work-related skin disease.

Introduction

The evolution of the Occupational Disease Intelligence Network (ODIN), from its inception in 1996, was recently outlined in relation to the Surveillance of Work-

related and Occupational Respiratory Disease (SWORD) reporting scheme for work-related respiratory diseases, which itself began in 1988 [1]. In 1991, a pilot scheme, known as the OCC-DERM project, was initiated in Manchester by 17 consultants in dermatology who reported new cases of work-related skin diseases. In 1993, this project was extended to all consultant dermatologists and to interested occupational physicians throughout the United Kingdom; it was then renamed EPIDERM, with reporting procedures closely analogous to SWORD. Since 1996, with the creation of ODIN for all types of occupational diseases, the surveillance of work-related skin disorders has been based on continuing reports from a small core group of specially interested dermatologists, complemented by random sampling procedures for all other dermatologists and occupational physicians,

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described below. Analyses of data from the outset in 1991 to the end of 1998 have been published [2], and in more detail for contact dermatitis [3]. The present paper will deal only with the 6-year period, 1996–2001, with concentration on incidence rates by occupation and industry made possible by the present availability of separate denominators appropriate for both dermatologists and occupational physicians.

Methods

Reporting procedures in all seven schemes of ODIN are closely similar and, for EPIDERM, have already been fully described [2]. During the period 1996–2001, a high proportion of consultant dermatologists seeing adult patients in the United Kingdom, ~250 in total, have taken part either as core participants or within a randomly assigned monthly sampling scheme. The separate Occupational Physicians Reporting Activity (OPRA) has similarly entailed the participation, since 1996, of almost all the United Kingdom's 800 or so full- or part-time doctors working in industry. Both EPIDERM and OPRA have their own report cards, which allow all newly diagnosed cases of skin disease, which, in the doctor's opinion, were caused or made significantly worse by work, to be notified, together with sex, age, postcode, diagnosis, industry, occupation and suspected agents for each case.

For the calculation of incidence rates, Labour Force Survey statistics for the winter of 1999 [4] were used for the dermatologists' reports. For the data from occupational physicians, denominators obtained from a special survey made in 2001 were used, based on the 12% of UK employees which they serve [5]. Diagnoses of occupational physicians were coded using the International Classification of Diseases, 10th Revision, and occupation and industry using the Standard Occupational Classification (SOC) [6] and Standard Industrial

Classification (SIC) [7]. These were then recoded to the categories used in this and previous reports. Full lists of the SOC and SIC codes, with definitions, can be obtained from the authors on request.

Results

Incidence rates

During the 6-year period, 1996–2001, 7319 new cases of work-related skin diseases were reported by dermatologists and 1240 by occupational physicians, with estimated totals, using the sampling fraction, of 15 756 and 11 910, respectively. However, as more than one diagnosis could be recorded for a given patient, the total number of estimated diagnoses was greater, 16 082 and 12 006, respectively. Of these, a small proportion (2.3%) was reported by government medical inspectors. Average annual estimates based on these figures are shown by diagnosis in Table 1, together with incidence rates per million employees at risk. In both EPIDERM and OPRA, contact dermatitis was by far the most common skin disease reported. Apart from the rarity of skin cancer in patients of working age seen by occupational physicians and of infective disorders by dermatologists, the distributions of diagnoses in the two data sets were fairly similar, with comparatively little, if any, important trends over the 6-year period. It should be mentioned, however, that the markedly lower rate by occupational physicians in the second period (1999–2001) was offset by a small increase by dermatologists. The incidence rates are about six times higher for diseases reported by occupational physicians than by dermatologists. Further analyses (data not shown) by age and sex indicated that in data from dermatologists, neoplasia were almost all in males >60 years of age, rates for contact urticaria in women were

Table 1. Estimated average annual incidence rates of work-related skin diseases reported by dermatologists and occupational physicians, 1996–2001

Diagnoses	Dermatologists						Occupational physicians					
	1996–98		1999–2001		1996–2001		1996–98		1999–2001		1996–2001	
	<i>n</i>	Rate per million	<i>n</i>	Rate per million	<i>n</i>	Rate per million	<i>n</i>	Rate per million	<i>n</i>	Rate per million	<i>n</i>	Rate per million
Contact dermatitis	1888	68	2191	79	2039	74	1851	576	1427	444	1639	510
Contact urticaria	84	3	110	4	97	4	113	35	85	26	99	31
Folliculitis/acne	14	1	17	1	16	1	18	6	8	2	13	4
Infective	75	3	34	1	54	2	93	29	88	27	90	28
Nail	6	0	21	1	14	1	8	3	12	4	10	3
Neoplasia	302	11	458	17	380	14	4	1	8	2	6	2
Traumatic	36	1	33	1	35	1	12	4	4	1	8	2
Others	48	1	44	1	46	1	185	58	87	27	136	42
All	2453	89	2907	105	2680	97	2284	711	1718	535	2001	623

twice those in men but rates for other diagnoses were fairly similar in men and women. Analyses by age were not possible on the data from occupational physicians as age was not recorded in their denominator, but rates for contact dermatitis were 40% higher in men and for contact urticaria again twice as high in women.

Causal agents

The agents reported as responsible for contact dermatitis and contact urticaria are presented in Table 2. As more than one agent was often mentioned in a given case, it can be seen that the numbers shown in this table considerably exceeded the annual average numbers in Table 1. Contact urticaria was far less frequently cited than contact dermatitis in both data sets, with rubber chemicals and foods and flour prominent in both diseases. Apart from an apparent increase in contact dermatitis, attributed by dermatologists to rubber chemicals and wet work, the percentage distribution of agents by type did not show any important change over the 6-year period studied (data not shown).

Among the 326 estimated cases of infective disorders reported by dermatologists, 35% were due to fungal infection and 20% due to other unspecified pathogens; 16% were viral warts or orf and 14% were attributed to insect bites or zoonoses. Among the 542 estimated cases reported by occupational physicians, 29% were due to insect bites or zoonoses, 18% were due to fungal infection, 16% were due to other pathogens and 7% were viral warts or orf. For folliculitis and acne, the most frequently reported agents by both dermatologists and occupational physicians were petroleum products, cutting oils and coolants; wet work was usually incriminated in mechanical, traumatic and nail complaints. Petroleum products were cited in only a very small proportion of skin neoplasia; almost all the remaining cases were attributed to sunlight.

Incidence rates by occupation and industry

In Tables 3 and 4 are compared the estimated average annual incidence rates of contact dermatitis and contact urticaria by occupation and industry, based on reports to EPIDERM by dermatologists and to OPRA by

Table 2. Agents most frequently reported as responsible for contact dermatitis and contact urticaria, 1996–2001

	Contact dermatitis ^a				Contact urticaria ^a				
	Dermatologists		Occupational physicians		Dermatologists		Occupational physicians		
	1996–98	1999–2001	1996–98	1999–2001	1996–98	1999–2001	1996–98	1999–2001	
1. Rubber chemicals and materials	267 (9)	377 (12)	313 (13)	234 (14)	65 (42)	78 (51)	76 (54)	29 (36)	720
2. Soaps and cleaners	252 (8)	235 (8)	276 (12)	195 (12)	2 (1)	5 (3)	4 (3)	4 (5)	486
3. Wet work	224 (7)	297 (10)	157 (7)	92 (6)	5 (3)	9 (6)	0 (–)	0 (–)	393
4. Resins and acrylics	137 (5)	160 (5)	143 (6)	101 (6)	0 (–)	5 (3)	4 (3)	4 (5)	277
5. Nickel	210 (7)	188 (6)	37 (2)	36 (2)	4 (3)	6 (4)	0 (–)	0 (–)	241
6. Petroleum and products	96 (3)	104 (3)	149 (6)	93 (6)	0 (–)	1 (1)	4 (3)	0 (–)	224
7. Cutting oils and coolants	102 (3)	86 (3)	114 (5)	82 (5)	0 (–)	0 (–)	4 (3)	0 (–)	195
8. Solvents and alcohols	116 (4)	77 (3)	93 (4)	48 (3)	4 (3)	1 (1)	0 (–)	0 (–)	169
9. Foods and flour	116 (4)	112 (4)	13 (1)	12 (1)	19 (12)	16 (10)	0 (–)	8 (10)	148
10. Preservatives	98 (3)	100 (3)	12 (1)	12 (1)	6 (4)	1 (1)	0 (–)	0 (–)	115
11. Chromium and chromates	101 (3)	114 (4)	2 (<1)	4 (<1)	1 (1)	1 (1)	0 (–)	0 (–)	111
12. Glues and paints	64 (2)	34 (1)	89 (4)	24 (1)	0 (–)	0 (–)	4 (3)	0 (–)	108
13. Aromatic amines (PPD)	94 (3)	98 (3)	0 (–)	20 (1)	1 (1)	0 (–)	0 (–)	0 (–)	107
14. Aldehydes	63 (2)	66 (2)	37 (2)	12 (1)	10 (7)	10 (6)	0 (–)	0 (–)	99
15. Fragrances and cosmetics	92 (3)	79 (3)	0 (–)	4 (<1)	8 (5)	3 (2)	0 (–)	0 (–)	93
16. Colophony and flux	65 (2)	79 (3)	24 (1)	13 (1)	1 (1)	2 (1)	0 (–)	0 (–)	92
17. Bleaches and sterilizers	36 (1)	43 (1)	60 (3)	40 (2)	0 (–)	0 (–)	0 (–)	0 (–)	90
18. Hairdressing chemicals	83 (3)	82 (3)	4 (<1)	0 (–)	1 (1)	1 (1)	0 (–)	0 (–)	86
19. Cements, plaster and masonry	51 (2)	41 (1)	21 (1)	21 (1)	0 (–)	4 (3)	0 (–)	0 (–)	69
20. Cobalt and compounds	64 (2)	55 (2)	8 (<1)	0 (–)	1 (1)	1 (1)	0 (–)	0 (–)	64
21. Acids and caustics	29 (1)	9 (<1)	48 (2)	21 (1)	0 (–)	0 (–)	0 (–)	0 (–)	54
Other agents	630 (21)	633 (21)	748 (32)	573 (35)	23 (7)	12 (8)	44 (31)	36 (44)	1350
Total	2992 (100)	3068 (100)	2350 (100)	1637 (100)	153 (100)	154 (100)	141 (100)	81 (100)	5289

PPD, *p*-phenylene diamine.

^aMean annual totals, with percentage distributions in parentheses.

Table 3. Estimated average annual cases and incidence rates per million of contact dermatitis and urticaria by occupation, 1996–2001

Occupational category	Contact dermatitis				Contact urticaria			
	Dermatologists		Occupational physicians		Dermatologists		Occupational physicians	
	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a
1. Managers and administrators	42	10	11	12	1	0	0	–
2. Professional	80	27	95	185	16	5	12	18
3. Associated professional and technical	259	92	297	1339	37	13	34	110
4. Clerical and secretarial	62	15	37	65	0	0	6	17
5. Craft and related	491	149	345	1505	8	2	6	35
6. Personal and protective services	395	130	116	145	19	6	6	25
7. Sales	48	21	16	34	1	0	2	11
8. Plant and machine operatives	318	127	440	1746	6	3	26	68
9. Others	307	144	270	441	7	3	6	11
10. Not known	37	–	12	–	2	–	0	–
Total	2039	74	1639	510	97	4	99	31

^aAverage figures and above are shown in bold.

Table 4. Estimated average annual cases and incidence rates per million of contact dermatitis and urticaria by industry, 1996–2001

Industrial category	Contact dermatitis				Contact urticaria			
	Dermatologists		Occupational physicians		Dermatologists		Occupational physicians	
	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a
1. Agriculture, forestry and fishing	50	120	1	369	1	1	0	–
2. Mining and quarrying	12	119	20	1370	0	0	2	136
3. Food and organic material manufacturing	152	101	86	574	4	3	14	94
4. Petrochemical, rubber and plastic manufacturing	128	153	299	1840	1	1	6	37
5. Metallic and automotive product manufacturing	354	139	536	3694	4	2	12	84
6. Utilities and construction	152	71	39	254	3	1	0	0
7. Health and social services	325	109	440	342	51	17	52	41
8. Others	749	44	193	148	32	2	13	9
9. Not known	117	–	25	–	1	–	0	–
Total	2039	74	1639	510	97	4	99	31

^aAverage figures and above are shown in bold.

occupational physicians. As already mentioned, the latter rates overall were some six times higher than the former, but it can be seen that in some industries and occupations, the difference was far greater. For contact dermatitis, rates based on data from dermatologists were highest in craft-related occupations and in the petrochemical, rubber and plastic manufacturing industries. The pattern of reports from the occupational physicians was similar, but more extreme and widely distributed. Thus, plant and machine operatives and associated professional and technical occupations have high rates in addition to craft-related occupations. Rates were also high in the metal and automotive product manufacturing industries and mining and quarrying, as well as in petrochemicals.

Moreover, categories shown to be at high risk by the occupational physicians had rates far in excess of average.

The distributions of the very much lower rates for contact urticaria are broadly similar, though the relatively high incidence for associated professional workers and the health and social services reported by dermatologists, and the wider range of industries implicated by occupational physicians, should be noted.

Agents

A further insight into the relationship between occupation and industry in contact dermatitis is given by analysis of the agents most frequently cited by dermatologists

Table 5. Estimated annual average number of reports by dermatologists of agents specifically related to contact dermatitis, by occupation and industry, 1996–2001

Agents (as listed in Table 2)	Totals		Average annual number ^a																	
			Occupation								Industry									
			Managers and administrators	Professional	Associated professions/ technical	Clerical/ secretarial	Craft related	Personal and protective	Sales	Plant and mechanical	All others	Not known	Agriculture, forestry and fishing	Mining and quarrying	Food and organic manufacturing	Petrol, rubber, plastics	Metal/ automotive product manufacturing	Utilities/ construction	Health/ social services	All others
1. Rubber chemicals and materials	322	5	23	77	6	53	48		36	62	9	8		16	13	28	10	110	114	23
2. Soaps and cleaners	243		5	30		27	87		14	70				8	9	18	7	50	135	13
3. Wet work	261	5	12	68		25	94		8	42				13			6	87	142	
4. Resins and acrylics	149		5	7		65	6		47	12				11	20	63	22		24	
5. Nickel	199		5	17	21	17	57	22	26	26	5			8	8	28	8	21	115	10
6. Petroleum products	100					57			24	9				5	5	44	10		25	6
7. Cutting oils and coolants	94					32			38	17						69				15
8. Solvents and alcohols	96			7		41	9		30	8				12	17	36	6		17	
9. Foods and flour	114			5		18	52		12	18				26					76	
10. Preservatives	99		6	21		23	21		19	7				9	5	17	8	29	23	8
11. Chromium and chromates	108			5		53	7		19	20						28	44		20	5
12. Glues and paints	49		5			18			19					6		21	8		10	
13. Aromatic amines (PPD)	96					8	66		12	6					6	7			71	
14. Aldehydes	65		9	12		10	12		8	7				7		8		19	19	
15. Fragrances and cosmetics	86	7		13		7	30			13	5					8		16	48	7
16. Colophony	72	5			7	29	5		10	6		5		7		19	12	7	10	10
17. Bleaches and sterilizers	40			24			8											28	8	
18. Hairdressing chemicals	83					6	75												77	
19. Cement, plaster and masonry	46					26				10							32		5	
20. Cobalt and compounds	60					23	6		11	9						17	11		18	
21. Acids and caustics	19								7										7	
Other agents	631	13	27	101	22	177	80	16	107	83	7	35		59	54	103	43	113	200	21

^aLess than five reports per annum are not shown; 50 or more reports per annum are shown in bold.

Table 6. Estimated annual average number of reports by occupational physicians of agents specifically related to contact dermatitis, by occupation and industry, 1996–2001

Agents (as listed in Table 2)	Totals Average annual number ^a																			
	Occupation										Industry									
	Managers and administrators	Professional	Associated professions/ technical	Clerical/ secretarial	Craft related	Personal and protective	Sales	Plant and mechanical	All others	Not known	Agriculture, forestry and fishing	Mining and quarrying	Food and organic manufacturing	Petrol, rubber, plastics	Metal/ automotive product manufacturing	Utilities/ construction	Health/ social services	All others	Not known	
1. Rubber chemicals and materials	274		22	134	8	34		34	38					22	22		201	24		
2. Soaps and cleaners	235		16	36	38	37		32	62	10		7	6	75			77	68		
3. Wet work	125		10	34	22	20		12	24				26	10			66	18		
4. Resins and acrylics	122				47			55	14			8	31	71	8					
5. Nickel	37							17	12			10		12					8	
6. Petroleum products	121				55			41	17			10	19	66	8			13		
7. Cutting oils and coolants	98				32			20	40					81					7	
8. Solvents and alcohols	71				34			20	9				23	32	8					
9. Foods and flour	13											7								
10. Preservatives	12				6							8								
11. Chromium and chromates	3																			
12. Glues and paints	57				28			20				8	16	28						
13. Aromatic amines (PPD)	10							6					8							
14. Aldehydes	25				6			10						6			10			
15. Fragrances and cosmetics	2																			
16. Colophony	19				14									11						
17. Bleaches and sterilizers	50			24		12			6				6				38	6		
18. Hairdressing chemicals	2																			
19. Cement, plaster and masonry	21				7				8		8								6	
20. Cobalt and compounds	4																			
21. Acids and caustics	35				20			8					22	10						
Other agents	661	7	62	142	34	98	24	6	222	64		6	42	154	208	15	163	58	0	

^aLess than five reports per annum are not shown; 50 or more reports per annum are shown in bold.

(Table 5) and occupational physicians (Table 6). It should be remembered that more than one agent was often reported in contact dermatitis, especially if associated, for example with wet work. Interpretation is helped by considering first the figures in bold for agents reported 50 or more times per annum, in columns which identify the main agents responsible by occupational and industrial categories. Some indication of the extent to which occupation and industry are linked is then obtained by inspecting the rows for each specific agent. For example, in Table 5 (for dermatologists), rubber chemicals and materials are those most frequently linked with associated professional and technical workers and with the health and social services and resins and acrylics with craft-related jobs and with metal and automotive product manufacture. In Table 6 (for occupational physicians), these and other similar associations can be seen.

The data on which Tables 5 and 6 are based can if required be analysed in full detail to provide the relative frequency of any specified agent held responsible for contact dermatitis in a given job and/or industry. Tables 5 and 6 are illustrative only of this potential.

Discussion

The most important finding was that incidence rates were six to eight times higher when based on reports from occupational physicians than from dermatologists. This was true for all main diagnoses except neoplasia. It is probable that only the more serious cases are referred to clinical specialists, and also that the populations served differ enormously in terms of age, sex, industry and occupation.

It is rare that workers have sufficient disability to gain Disablement Benefit, and as relatively few apply, figures from this source are of limited value. Similarly, under-reporting of skin disease statistics by employers under present regulations is substantial. The EPIDERM and OPRA figures are probably the best source of information on the incidence of occupational dermatoses in the United Kingdom. Even so, figures presented in this paper inevitably underestimate total incidence as not all sufferers of occupational dermatoses see an occupational physician or dermatologist and not all cases seen will be recognized (or reported) as work related.

The eight categories of industry and nine of occupation used in this paper are too broad to do more than give an idea of the level and pattern of risk. However, when taken together and linked to the agents responsible, for contact dermatitis at least, the data can be more clearly interpreted. For example, rubber chemicals were the most frequently reported cause of contact dermatitis. A high proportion of reports from both dermatologists and occupational physicians were of cases among employees in the health and social services or 'all other

industries' (Tables 5 and 6). The data on occupation suggest that in the former, the persons affected were nurses or technicians and in the latter, skilled workers in a variety of trades. These observations indicate not only where the main risks from rubber chemicals have occurred but also the extent to which other occupations and industries are affected. Greater insight can be obtained if necessary, if the second and third digits of the SIC and SOC are used, to identify priority problems more precisely.

The classification of agents incriminated in dermatitis, shown in Table 2, was not wholly satisfactory. All 22 categories, including the miscellaneous 'others' group, comprised numerous specific substances and proprietary products. The same classification had been used in our two previous publications [3,4], and although recoding for the entire 6 years might have been possible, it would have been extremely difficult. In distinguishing between agents responsible for contact dermatitis and urticaria, it would have been useful to separate, for example, between 'solvents and alcohols' (Group 8) and between acids and caustics (Group 21).

A further problem difficult to resolve resulted from reports of cases with more than one diagnosis, particularly where more than one agent was listed. Thus, in Table 2, some agents for contact dermatitis may also have been shown as causing urticaria, or vice versa. With rubber chemicals, for example, it is probably the latex protein which causes the urticaria, whereas chemical additives account for the dermatitis. Similarly, for foods and flour and other groups of agents, the mechanisms may vary. However, only 2% of cases reported by dermatologists (and <1% of those reported by occupational physicians) were given more than one diagnosis, and limiting the analysis to those with a single condition confirmed that the relation between agents and diagnoses in Table 2 was not a result of this artefact.

It is beyond the scope of this paper to infer means by which these extremely common occupational disorders can be prevented. Surveillance schemes can identify the industries and occupations at high risk, and eventually reflect the success or otherwise of control measures. They can also provide a base for more detailed studies of factors affecting susceptibility and prognosis and of important social questions concerning selection for further employment.

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Conflicts of interest

None declared.

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