INDUSTRIAL DERMATITIS IN THE COAL-MINER*

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A group of coal-miners who had been certified as suffering from industrial dermatitis in the past has been reviewed. The object was to assess the degree of recovery and the effect of the skin trouble upon working capacity. A record was therefore prepared for each miner indicating (a) whether he had returned to his pre-dermatitis work; (b) whether he had had any further spells of absence due to recurrence; (c) whether troublesome signs and symptoms persisted which required treatment by his general practitioner. Coal-miners fall naturally into three major occupational groups, namely, face-workers, those employed elsewhere underground, and surface workers. These groups differ mainly in their place of work, the natural hazards to which they are exposed, and their rates of pay. It is interesting to compare the course of dermatitis and the reaction of the individual to this disease in the three occupational groups. The initial incidence of the dermatitis and the pattern of its distribution on the skin differed between the three occupational groups. Subsequently, however, dermatitis in all three groups appeared to behave in a remarkably uniform manner. The significance of this uniformity in relation to the aetiology of dermatitis is discussed.

Material and Method

The main environmental features of five collieries situated within a radius of five miles are indicated in Table 1. They are all large collieries employing over 1,600 men, with shaft depths from 474 to 750 yards. The majority of the seams worked are 3 ft. 6 in. or more in height, and the dry-bulb temperatures of the return air range from 68° F. to 79° F.

In the period reviewed 330 coal-miners were certified as suffering from industrial dermatitis under the Workmen's Compensation Act, 1925, or the National Insurance (Industrial Injuries) Act, 1946,

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TABLE 1
MAIN ENVIRONMENTAL FEATURES OF COLLIERIES

Colliery	Average No. Employed in All Occupational Groups	Depth of Shaft (yd.)	Return Air Temperature (°F.)		Type of Mining	Seam Thickness (ft. in.)
			Dry Bulb	Wet Bulb		
A	1,637	716	79	71	50% power loading	Over 4 6
B	1,602	474	68	63	10% power loading	4 6 up to 1950 only then 3 0
C	1,703	721	72.5	68	11% power loading	3 6 up-wards
D	1,725	750	74	68	90% power loading	4 6 up-wards
E	1,600	550	72	68	66% power loading	4 6 up-wards

at these five collieries. Eighty-two (24.9%) had left the district, and no further information about them was available. Two hundred and forty-eight (75.1%) continued to work at the collieries; all were seen personally for this investigation.

The time from the onset of dermatitis to review of the case was from one to three years in 110 men (44.2%), four to 10 years in 120 men (48.2%), and 11 to 17 years in a small group of 18 men (7.6%).

TABLE 2
INCIDENCE OF DERMATITIS IN MAJOR OCCUPATIONAL GROUPS

Occupational Group	Specific Task	No. of Men with Dermatitis	Average No. at Risk	Rate per 1,000 at Risk
Coalface workers	Fillers	67	965	78.1
	Packers	25	590	42.3
	Rippers	41	590	69.5
	Deputies Shotfirers Others	32	1,180	27.1
	Total ..	165	3,325	49.6
Other under-ground workers	Haulage	31	1,160	26.7
	Maintenance (roads)	17	990	17.3
	Craftsmen	17	1,425	11.9
	Total ..	65	3,575	19.5
Surface workers	Total ..	18	1,720	10.4

Occupation at Onset of Dermatitis

Table 2 gives the numbers of dermatitis cases reviewed in each occupational group related to the number at risk and rates per 1,000 at risk calculated for the main tasks within each occupational group. For every surface worker two employed elsewhere underground and five coalface workers were affected.

Coalface Workers.—Of coalface workers, fillers and rippers are those most prone to dermatitis. Rippers in coalface headings and in the fast ends of the coalface were more commonly affected than those working in the roadway where it entered the face.

The principal causative factors appear to be large quantities of dust and sweating. Packers who work on the back shift are not exposed to the same high dust concentrations and urgency of actual coal getting as fillers and rippers, although the pack-hole is hot. Packers can, however, step into cooler conditions in a very short space and they are less prone to dermatitis than are fillers or rippers. Other coalface workers are also less prone than fillers or rippers, but the difference between the other faceworkers and packers is not marked.

Other Underground Workers.—Haulage workers and road maintenance men have a somewhat higher rate than the remainder of other underground

workers. This is probably explained by their exposure to coal dust at transfer and loading points, or to mixed dusts as the roadways are enlarged. In the miscellaneous group of craftsmen, pipe fitters and pump men predominate, possibly because they are frequently exposed to natural pit water which has a high chloride content.

Surface Workers.—In surface workers it is much easier to associate the occurrence of dermatitis with a particular incident or hazard, such as oil in the cutter-pick sharpener, carbon tetrachloride in coal preparation, and local heat in the stoke hole.

Distribution of Dermatitis on the Skin

The site of origin of the dermatitis, the sites to which it spread, and the sites of persistent skin trouble were recorded separately for each individual. The frequency with which each site was affected is expressed as a percentage of the total sites affected for each occupational group and the results are given in Fig. 1.

Some coal-miners were affected at several sites at the same time. The total number of sites affected, therefore, exceeds the number of men. The average number of sites affected per man indicates the approximate extent of the dermatitis and affords a useful index of comparison between occupational groups (Table 3).

FIG. 1.—Diagram illustrating sites of dermatitis by occupational groups.

TABLE 3(a)
SITES OF ORIGIN OF DERMATITIS

	Coalface Workers	Other Underground Workers	Surface Workers	Total
Number of skin sites affected	223	95	24	342
Number of men affected	165	65	18	248
Average number of sites affected per man	1.3	1.4	1.3	1.3

TABLE 3(b)
SITES OF SPREAD OF DERMATITIS

	Coalface Workers	Other Underground Workers	Surface Workers	Total
Number of skin sites affected	171	78	10	259
Number of men affected	99	42	8	149
Average number of sites affected per man	1.7	1.8	1.2	1.7
Proportion of men with spread of dermatitis (% of those originally affected)	60.0	64.6	44.4	60.0

TABLE 3(c)
SITES OF PERSISTENCE OF DERMATITIS

	Coalface Workers	Other Underground Workers	Surface Workers	Total
Number of skin sites affected	142	44	16	202
Number of men affected	118	37	10	165
Average number of sites affected per man	1.2	1.2	1.6	1.2
Proportion of men with persistence of dermatitis (% of those originally affected)	71.4	56.9	55.6	69.0

Original Site.—The distribution of dermatitis was not the same in the three occupational groups. The hands were more frequently affected in surface workers than in underground workers. The reverse was true for the legs and ankles. The chest, back, and shoulders were relatively more affected in the other underground workers group, while the arms were relatively less affected at the coalface. The flexures, battery, and belt areas were more frequently affected in coalface workers. The extent of the dermatitis, however, as indicated by the average number of sites affected per man, was similar in all three groups (coalface workers 1.3, other underground workers 1.4, and surface workers 1.3).

Sites of Spread.—This refers to the areas of skin

affected during the period following the origin at the site indicated. It does not include the site of recurrences. The sites of spread together with the sites of origin, therefore, indicate the extent of the initial attack of dermatitis. The same general pattern of distribution between occupational groups was present as in the original site distribution. Eleven coalface workers, five other underground workers, and two surface workers experienced generalized dermatitis not recorded in the table. Apart from these cases, 60% of all cases experienced some spread. Surface workers showed a somewhat lower tendency for dermatitis to spread (44.4%). If the extent of spread is compared in the occupational groups (Table 3b) by using the number of sites/number of men ratio, coalface workers (1.7) and other underground workers (1.8) both experienced more spread than surface workers (1.2).

When spread of dermatitis did occur in surface workers it was less extensive than in underground workers.

Sites of Persistence.—Some sites of the skin surface affected during the initial attack did not heal completely, leaving a chronic eczema. Others repeatedly broke down after recovery lasting at most a few weeks. On examination there was usually some form of dermatitis, and these sites were classified as persistent.

The overall distribution of the sites at which dermatitis persisted in each occupational group was similar to that of the sites of origin and spread. There was no special tendency for dermatitis to persist at any one site. Sixty-nine per cent. of the whole group of cases showed some persistence of dermatitis. There was a greater tendency to persistence among coalface workers (71.4%) than among other underground workers (56.9%) and surface workers (55.6%). The extent of the persistence on the skin surface was, however, less in underground workers; the ratio of number of sites affected to number of men was 1.2 for coalface workers and other underground workers compared with 1.6 in surface workers.

Conclusions

(1) The patterns of distribution of dermatitis in the three main occupational groups were broadly similar for sites of origin, sites of spread, and sites of persistence.

(2) The proportion of men who experienced some spread of dermatitis was less in surface workers than in underground workers.

(3) Surface and other underground workers showed less tendency to persistence than coalface workers.

(4) The extent of dermatitis at sites of origin was similar in the three occupational groups; surface workers had a less extensive spread but more extensive persistent sites than underground workers.

Subsequent History

Return to Pre-dermatitis Work.—Little information is available about the fate of the workman with industrial dermatitis after the initial attack. Morgan and Davies (1956*a* and *b*) reported that 68% of 26 cases reviewed 18 months after their first attack had returned to their former work. In the present group of 248 coal-miners, 139 (56.4%) returned to their former work. This proportion was maintained in the three main occupational groups. (Coalface workers, 90 out of 165 (55.7%), other underground workers, 40 out of 65 (61.5%), and surface workers, nine out of 18 (50%).)

Persistence of Dermatitis.—Of the 139 men who returned to their former work, 78 (56.1%) had had no further trouble with their skin (Table 4). Of the 109 who did not return to their former work, 47

TABLE 4

RETURN TO FORMER WORK RELATED TO PERSISTENCE OF DERMATITIS AND MAIN OCCUPATIONAL GROUPS

Occupational Group	Returned to Former Work		Not Returned to Former Work		Total	
	No. of Dermatitis Cases	No. Free from Dermatitis	No. of Dermatitis Cases	No. Free from Dermatitis	No. of Dermatitis Cases	No. Free from Dermatitis
Coalface workers	90	51 (56.6)*	75	30 (40.0)	165	81 (49.0)
Other underground workers	40	22 (55.0)	25	13 (52)	65	35 (53.8)
Surface workers	9	5 (56)	9	4 (44)	18	9 (50)
Total ..	139	78 (56.1)	109	47 (43.1)	248	125 (49.1)

*Percentages in brackets.

(43.1%) had had no further trouble. In all, 125 (49.1%) of the 248 were trouble free at the time of review, and they appeared to be evenly distributed among the main occupational groups.

Recurrent Spells of Absence due to Dermatitis.

Records were available of subsequent spells of absence lasting more than three days due to dermatitis (Table 5). One hundred and sixteen (46.4%) of the 248 coal-miners experienced such spells. The proportion of recurrences in each occupational group was similar: 74 (44.3%) of the 165 coalface men, 32 (49.7%) of the 65 other underground workers, and 10 (55.6%) of the 18 surface men. Those who returned to their former work were then separated from those who did not in order to assess

TABLE 5

RETURN TO FORMER WORK RELATED TO RECURRENCE OF DERMATITIS AND MAIN OCCUPATIONAL GROUPS

Occupational Group	Returned to Former Work		Not Returned to Former Work		Total	
	No. of Dermatitis Cases	No. of Men Experiencing Recurrences	No. of Dermatitis Cases	No. of Men Experiencing Recurrences	No. of Dermatitis Cases	No. of Men Experiencing Recurrences
Coalface workers	98	44 (49.9)*	67	30 (44.7)	165	74 (44.3)
Other underground workers	42	24 (61.5)	23	8 (35)	65	32 (49.7)
Surface workers	12	8 (67)	6	2 (33)	18	10 (56)
Total ..	152†	76 (50.0)	96	40 (41.7)	248	116 (46.4)

*Percentages in brackets.

†One hundred and fifty-two returned initially to their former work and 13 were found alternative work after a recurrent spell, leaving 139 as in Table 4.

the effect of this factor. Seventy-six (50%) of the 152 who returned to their pre-dermatitis work had a recurrence as against 40 (41.7%) of the 96 who did not return to their previous work. The incidence of recurrences was, therefore, only slightly reduced among those who found alternative employment. Of those who did not return to their former work, there was less likelihood of recurrence among surface and other underground workers than among coalface men. A change of work among coalface men did not appear to affect the incidence of recurrences appreciably (Table 5). Hellier (1958) similarly notes that in the case of primary irritants an employee who has developed dermatitis cannot escape by changing his work and advises that it might be better for him to continue in a job he knows rather than turn to fresh work where the chances of relapse may be almost as great.

Continued Treatment by General Practitioner.

Eighty-seven (36.6%) of the 248 coal-miners reviewed were still visiting their general practitioner for treatment at the time of review. The proportion in each occupational group was generally similar, namely, 55 (33%) of the 165 coalface men, 25 (38%) of the 65 other underground workers, and eight (44%) of the 18 surface men.

Summary

Two hundred and forty-eight coal-miners are reviewed from one to 17 years after the onset of industrial dermatitis. Of these 49.1% were trouble free and 46.4% had had a recurrent spell away from work due to dermatitis. Of those affected, 56.4% returned to their pre-dermatitis work. Return to former work did not appear to affect the chances of recurrence appreciably.

Coalface workers, especially fillers and rippers, were affected more commonly by initial attacks than other underground and surface workers. The probability of return to pre-dermatitis work and the persistence of dermatitis were broadly similar in the three main occupational groups.

Certain patterns of distribution of dermatitis on the skin of the body distinguished the main occupational groups in the initial attack. Similar patterns were evident in those with persistent dermatitis.

Adverse environmental factors may have accounted for the initial preponderance among coalface workers and determined the pattern of distribution

on the body. Environmental factors did not, however, appear to affect the spread or persistence of the disease. Once initiated, dermatitis appeared to run a uniform course irrespective of occupational group or environment. The established patterns of distribution on the skin of the body do, however, persist.

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