DERMATOSES IN JUTE WORKERS

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Although skin changes in workers associated with the manufacture of various textiles, especially cotton, have been the subject of numerous communications (*e.g.*, Southam, 1927; Brockbank, 1941) there are few references in the literature to dermatoses in jute workers. Henry (1947) refers to one case of scrotal carcinoma in a jute worker out of a total of 1,421 notifications to the Factory Inspectorate. Even the standard textbooks on occupational diseases of the skin (Schwartz, Tulipan, and Peck, 1947; Prosser White, 1934) contain little information on this subject, and a paper on jute dermatitis in Indian workers (Curjel and Acton, 1924) describes only the follicular lesions of oil acne. There has not been, to our knowledge, any comprehensive survey of skin changes in jute workers.

One of us (J. K.) had noted certain changes on the exposed skin of elderly jute workers, and since the major part of jute manufacture in Britain is concentrated in or around Dundee, it seemed that a planned survey in this region would fill a gap in our knowledge and produce results of some value.

This study only refers to skin changes which may be associated with the manufacture of jute from its raw state as received in this country to the finished woven article. The principal difference between the manufacture of jute and that of most other fibres is that jute has to be treated with a mixture or emulsion of oil and water before it can be spun; the jute worker therefore is exposed to an unnaturally oily fibre in addition to any contact with oil used in lubricating the machinery. Up till about 25 years ago whale oil was used but since then varying proportions of mineral oil have been added and whale oil has been used less and less until the recent war years when its scarcity and high price stopped its use altogether. The oil is added to the jute fibre in the first stage of manufacture (known as "batching") when it is softened between rollers. It is then "prepared" by a carding process similar

to that used in the cotton and woollen industry; the "sliver" ribbon then goes through the "drawing" department in which it is thinned and elongated and is then "twisted" on to bobbins ready for spinning. Jute spinning, unlike cotton spinning, is done on frames with spindles revolving at the high speed of some 4,000 revolutions per minute. The spun yarn is wound either for the warp ("spool-winding") or for the weft ("cop-winding") and the "beamers" make the warp thread ready for the weavers. Woven jute is coarse material, used for a variety of purposes such as sacks or backing for linoleum. The woven cloth may be taken to the "sewing flat" for conversion into sacks or to the "calender" where it is folded, rot-proofed if need be, and otherwise prepared for the market. In one establishment we visited there was a tar house in which jute yarn was coated with tar for a special purpose. Terms used for other workers are self-explanatory. All had contact with jute except the office and canteen staffs.

Our investigation was divided into two main parts: (1) a clinical survey covering a period of one year (July, 1952 to August, 1953) of all new patients over the age of 16 attending the ordinary skin out-patients clinic of Dundee Royal Infirmary, the only centre for such clinics in the city; and (2) a field survey of all workers in seven jute mills and factories in the city.

Clinical Survey

The records were divided into three groups: (A) patients whose skin conditions were considered by us to be due to their present or past employment as jute workers; (B) patients who were or who had at any time been jute workers but who attended for skin conditions considered to have no connexion with such work; and (C) patients who had never been jute workers.

There are in Dundee (population about 180,000)

17,800 employed jute workers (7,600 men and 10,200 women). An estimate cannot be given of the numbers of local inhabitants who at some time or another have worked with jute.

The conditions found in Group A could be readily classified under three headings: (1) dermatitis of contact or infective origin, (2) oil acne, and (3) malignant or pre-malignant changes of the skin.

Table I correlates these dermatoses of jute workers with their sex, age, and mean years of employment in jute works.

TABLE I
RESULTS OF CLINICAL SURVEY OF DERMATOSES OF JUTE WORKERS

Dermatosis	Total	Male	Female	Mean Age in Years	Mean Years in Jute Industry
Dermatitis (contact or infective)	16	6	10	46.6	18.9
Oil acne	5	4	1	26.6	4.4
Pre-malignant or malignant changes	10	4	6	71.3	42.8
Total	31	14	17		

Dermatitis (Contact or Infective).—Sixteen patients, six men and 10 women, suffered from dermatitis but in no case was sensitization to jute itself proved by patch-testing. Seven women had dermatitis of the hands and forearms apparently due to friction from the rough jute aggravated by oil and dirt. Of the remaining three women, one had a contact dermatitis clearly due to disinfectant used in cleaning lavatories and another a contact eruption due to medicaments applied to a minor injury. A third, who had a previous history of contact dermatitis when working in a hat factory, developed dermatitis while collecting jute waste and rags.

Of the six cases of dermatitis in men, three were attributed to medicaments applied to minor injuries, one was caused by paraffin used in cleaning machinery, and another by a rot-proofing solution. The remaining man had an infective dermatitis of the hands and had previously suffered from seborrhoeic dermatitis of the scalp.

Oil Acne.—It is popularly considered that oil acne is an inevitable occurrence at some time or other in jute workers and it is disregarded unless severe in degree or infected. Only five patients, four men and one woman, required treatment at the Skin Department for this condition during the year.

Two male patients (batchers), whose clothing became saturated with oil, had oil acne affecting the arms, legs, and genital region. One man had, in addition to oil acne of the forearms, a severe acne vulgaris of the back and chest and the fourth man exhibited marked peri-orbital comedone formation. The single female case occurred in a young weaver and the lesions were confined to the forearms.

Pre-malignant and Malignant Changes.—The malignant and pre-malignant conditions found in the 10 patients shown in Table 2 require more detailed consideration because they have not hitherto been considered occupational hazards among jute workers. It will be noted that all six female patients were, or had been, jute spinners; two of them had had multiple carcinomata. The four men had been in more varied types of employment in jute works; in two cases the site of the carcinoma was the scrotum. Of the 10, eight showed degenerative changes of the skin such as atrophy, pigmentation (dark, patchy and readily distinguishable from freckles), keratoses, purpura, and telangiectases affecting the face, forearms, and hands. Such changes have been apparently regarded

TABLE 2
MALIGNANT AND PRE-MALIGNANT CONDITIONS IN JUTE WORKERS

Case No.	Age	Sex	Years in Jute Industry	Occupation	Diagnosis	Skin Changes	Site of Epithelioma
1	81	F	58	Spinner	Keratosis	A Pig K*	Has had several facial carcinomata removed
2	60	F	40	Spinner	Epithelioma	A Pig K C T	L. hand; had previous epithelioma L. forearm
3	62	F	49	Spinner	Epithelioma	A Pig K C	Intradermal carcinoma R. forearm
4	78	F	37	Spinner	Epithelioma	A Pig K C Pu T	R. forearm
5	80	F	50	Spinner	Epithelioma	A Pig K C Pu	R. forehead
6	90	F	22	Spinner	Epithelioma	A Pig K C	R. forearm
7	88	M	52	Batcher	Epithelioma	C	Arm
8	51	M	34	Batcher	Keratosis	Pig K FP	Epithelioma of scrotum in 1950
9	49	M	32	Foreman	Epithelioma	C	Scrotum
10	74	M	54	Spinner Maintenance engineer	Epithelioma	A Pig K C	Face

*A = atrophy, Pig = pigmentation, K = keratoses, C = carcinoma, Pu = purpura, T = telangiectases, FP = follicular plugging.

as more or less normal senile changes and one of the main objects of our investigation was to find out whether or not they are connected with employment in jute works and, if so, why they occur. Similar changes were found in 60 (20.2%) of 297 patients who were or had been jute workers (groups A and B), while of the 466 patients in Group C not employed in the jute industry, only 23 (4.9%) showed such changes. Of these, 19 had been engaged in outdoor occupations with exposure to the sun and four had, in addition, history of exposure to other carcinogenic agents, three being engineers and one a gas worker. It is interesting to note that the Chief Inspector of Factories (1954) in his annual report for 1952 attributes an average of 28 cases of carcinoma per annum in Britain to exposure to mineral oil during the years 1948-52. Our finding of eight cases of carcinoma during the year under review suggests that such lesions have not hitherto been attributed to mineral oil in the jute industry.

The remainder of our investigation was therefore

devoted to a study of oil acne and degenerative (pre-malignant) changes.

Field Survey

The fact that such changes are almost entirely confined to the face, neck, forearms, and hands made investigation easy and a large number of workers could be readily examined without interfering with their work. The seven jute firms visited were selected from those which offered us facilities as being examples of establishments of different sizes situated in various parts of the city.

Table 3 shows a summary of the findings in 3,023 employees examined. An unexpected finding was that the occurrence of degenerative changes in the skin was more widespread than had been anticipated, being found amongst workers in all departments except those in canteens and offices. It must be stated, however, that the degree of change was in most cases slight; spinners undoubtedly showed the most marked changes and, another unexpected

TABLE 3
FIELD SURVEY OF SEVEN JUTE FIRMS SHOWING NUMBERS, MEAN AGE, EXPOSURE YEARS, AND CLINICAL SKIN CHANGES OF EMPLOYEES IN EACH DEPARTMENT

Department	Nos.	Mean Age in Years	Mean No. Years' Exposure	Pre-malignant Changes	Oil Acne	Both Changes	No Changes
Batching	95	43.3	16.8	7 (7.4%)	32 (33.7%)	1 (1.1%)	55 (57.8%)
Preparing	331	41.6	16.3	25 (7.6%)	92 (27.7%)	1 (0.3%)	213 (64.4%)
Spinning	309	39.6	18.0	49 (15.9%)	40 (12.9%)	—	220 (71.2%)
Winding	219	42.0	19.9	21 (9.6%)	34 (15.5%)	1 (0.5%)	163 (74.4%)
Dressing	90	42.0	15.5	5 (5.6%)	14 (15.5%)	—	71 (78.9%)
Weaving	1,184	37.3	16.2	85 (7.2%)	176 (14.9%)	—	923 (77.9%)
Sewing flat	79	31.9	10.1	1 (1.3%)	6 (7.6%)	—	72 (91.1%)
Calender and lapping ..	267	43.9	16.8	18 (6.8%)	30 (11.2%)	—	219 (82.0%)
Warehouse	10	38.2	16.9	—	3 (30.0%)	—	7 (70.0%)
Transport	19	45.5	16.8	1 (5.3%)	2 (10.5%)	—	16 (84.2%)
Tar house	8	42.0	9.5	1 (12.5%)	1 (12.5%)	—	6 (75.0%)
Mechanics	257	44.2	15.1	6 (2.3%)	35 (13.6%)	5 (2.0%)	211 (82.1%)
Electricians	6	34.3	9.5	—	—	—	6 (100%)
Office staff	130	31.6	11.5	—	—	—	130 (100%)
Canteen staff	19	42.6	5.2	—	—	—	19 (100%)
Total	3,023	39.6	16.2	219 (7.2%)	465 (15.4%)	8 (0.3%)	2,331 (77.1%)

TABLE 4
OIL ACNE AND PRE-MALIGNANT CHANGES IN JUTE WORKERS IN ALL DEPARTMENTS

Age Groups	15-24 years	25-44 years	45-59 years	60+ years	Total
<i>Males</i>					
Normal	146 (70.2%)	295 (71.9%)	282 (74.8%)	125 (82.8%)	848
Oil acne	62 (29.8%)	111 (27.1%)	73 (19.4%)	11 (7.3%)	257
Pre-malignant changes ..	—	4 (1.0%)	17 (4.5%)	14 (9.3%)	35
Both changes	—	—	5 (1.3%)	1 (0.6%)	6
Total	208	410	377	151	1,146
<i>Females</i>					
Normal	310 (76.7%)	684 (86.7%)	446 (77.9%)	43 (38.4%)	1,483
Oil acne	94 (23.3%)	80 (10.1%)	33 (5.8%)	1 (0.9%)	208
Pre-malignant changes ..	—	25 (3.2%)	92 (16.1%)	67 (59.8%)	184
Both changes	—	—	1 (0.2%)	1 (0.9%)	2
Total	404	789	572	112	1,877
Total	612	1,199	949	263	3,023

finding, cop-winders also showed marked degenerative changes, although spool-winders were not unduly affected.

Table 4 shows the incidence of oil acne and pre-malignant changes in all male and female jute workers according to age groups, while Fig. 1 expresses these findings graphically for men and women. Men are more frequently affected by oil acne than women but the reverse is true of pre-malignant changes, and while oil acne is less frequently found in the higher age groups, pre-malignant

FIG. 1.—The percentage of oil acne and pre-malignant changes observed in 3,023 jute workers in different age groups (see Table 4).

nant changes increase in frequency with age, especially in women. It is a striking fact that in only eight instances were oil acne and pre-malignant changes found in the same person and five of these were elderly mechanics whose work with machinery had brought them especially in contact with oil. Neither the degree of contact with oil nor the skin changes obviously due to oil appear to explain entirely these pre-malignant changes.

The degree of pre-malignant changes amongst spinners and their apparent proneness to develop

FIG. 2.—Jute spinner aged 62 showing moderate pre-malignant changes (Case No. 3, Table 2).

carcinomata call for further examination of the figures for the spinning department.

Three photographs of typical changes found in spinners are shown in Figs. 2, 3, and 4. These are so

FIG. 3.—Ex-jute spinner aged 81 showing marked pre-malignant changes (Case No. 1, Table 2).

FIG. 4.—Wrist of female ex-jute spinner aged 75 showing pre-malignant changes and an epithelioma.

recognizable that in general hospital wards amongst patients over 50, spinners can often be readily identified at a glance. The ordinary attitude to such changes was well shown in one establishment visited, where we were shown pensioners of the firm who had happened to call that day to collect their money. Bringing forward the first old lady the works nurse remarked, "Well, this one anyway has nothing wrong with her skin", but a glance at her face correctly identified her as an old spinner.

Table 5 shows the findings in the workers in the spinning departments. The numbers of men engaged

there are small, few of them were actually spinners, and too much cannot be drawn from their findings; but amongst the women, both spinners and others engaged in this department, the figures for pre-malignant changes are high so that in numbers as well as in degree, female workers in this department were found specially affected by pre-malignant changes.

Table 6 shows a similar table for cop- and spool-winders, all women. While the numbers are smaller than for spinners, statistical appraisal shows that cop-winders are more liable to develop oil acne than spool-winders or female spinners and that both cop-winders and female spinners are more liable to develop pre-malignant changes than spool winders. These differences are difficult to explain but it can be pointed out that both spinning and cop-winding are carried out at high speed and the workers' arms and hands near the rapidly moving machinery can be contaminated by oil thrown off in minute droplets either from the prepared fibre or from the machinery itself.

During this field survey only two cases of dermatitis were detected. A spool winder had a mild

TABLE 5
OIL ACNE AND PRE-MALIGNANT CHANGES IN JUTE WORKERS IN SPINNING DEPARTMENT

Age Groups	15-24 years	25-44 years	45-59 years	60+ years	Total
<i>Males</i>					
Normal	11 (57.9%)	12 (63.2%)	7 (53.8%)	1 (100%)	31 (59.6%)
Oil acne	8 (42.1%)	5 (26.3%)	5 (38.5%)	—	18 (34.6%)
Pre-malignant changes	—	2 (10.5%)	1 (7.7%)	—	3 (5.8%)
Both changes	—	—	—	—	—
Total	19	19	13	1	52
<i>Females</i>					
Normal	20 (87.0%)	116 (81.7%)	49 (66.2%)	4 (22.2%)	189 (73.5%)
Oil acne	3 (13.0%)	18 (12.7%)	1 (1.4%)	—	22 (8.6%)
Pre-malignant changes	—	8 (5.6%)	24 (32.4%)	14 (77.8%)	46 (17.9%)
Both changes	—	—	—	—	—
Total	23	142	74	18	257

TABLE 6
OIL ACNE AND PRE-MALIGNANT CHANGES IN FEMALE WINDERS* DIVIDED INTO COP-WINDERS AND SPOOL-WINDERS

Age Groups	15-24 years	25-44 years	45-59 years	60+ years	Total
<i>Cop-winders</i>					
Normal	6 (66.7%)	19 (57.6%)	16 (51.6%)	—	41 (54.7%)
Oil acne	3 (33.3%)	10 (30.3%)	5 (16.1%)	—	18 (24.0%)
Pre-malignant changes	—	4 (12.1%)	9 (29.0%)	2 (100%)	15 (20.0%)
Both changes	—	—	1 (3.3%)	—	1 (1.3%)
Total	9	33	31	2	75
<i>Spool-winders</i>					
Normal	11 (91.7%)	35 (100%)	24 (82.8%)	1 (50.0%)	71 (91.0%)
Oil acne	1 (8.3%)	—	3 (10.3%)	—	4 (5.1%)
Pre-malignant changes	—	—	2 (6.9%)	1 (50.0%)	3 (3.9%)
Both changes	—	—	—	—	—
Total	12	35	29	2	78

*The above figures refer to winders only and do not include 66 workers engaged in other duties in this department.

TABLE 7

NUMBERS, MEAN AGE, EXPOSURE YEARS, AND CLINICAL SKIN CHANGES OF EMPLOYEES IN EACH DEPARTMENT OF ONE FLAX FIRM

Department	Nos.	Mean Age in Years	Mean No. Years' Exposure	Pre-malignant Changes	Oil Acne	No Changes
Batch-blending	18	38.8	16.1	1 (5.6%)	1 (5.6%)	16 (88.8%)
Preparing	85	38.3	12.3	—	10 (11.8%)	75 (88.2%)
Spinning	78	38.7	15.7	4 (5.1%)	11 (14.1%)	63 (80.8%)
Winding	79	34.3	13.3	2 (2.5%)	2 (2.5%)	75 (95.0%)
Dressing	46	35.1	17.1	1 (2.2%)	5 (10.9%)	40 (86.9%)
Weaving	145	37.4	17.4	6 (4.1%)	14 (9.7%)	125 (86.2%)
Calender & lapping ..	43	42.1	15.4	—	3 (7.0%)	40 (93.0%)
Warehouse	18	43.1	18.4	—	2 (11.1%)	16 (88.9%)
Dye house	5	50.6	23.2	1 (20.0%)	—	4 (80.0%)
Cleaning squad	12	35.0	9.0	—	4 (33.3%)	8 (66.7%)
Mechanics	89	41.7	13.9	2 (2.2%)	15 (16.9%)	72 (80.9%)
Electricians	13	27.6	6.3	—	—	13 (100%)
Joiners	18	43.2	12.2	—	—	18 (100%)
Painters	11	40.1	12.0	—	—	11 (100%)
Office staff	7	24.6	3.9	—	—	7 (100%)
Total	667	38.1	14.7	17 (2.5%)	67 (10.0%)	583 (87.5%)

dermatitis of the backs of the hands which was said to be worse in summer and was probably due to sunlight. A sack machinist had a mild friction dermatitis of the tips of the fingers.

Flax Survey

A certain amount of flax manufacture is carried on in Dundee and the opportunity was taken to visit one of the largest flax works in the city. There is very little movement of workers between flax and jute works so that comparable figures could be obtained for two different textile industries in the same city. The results are shown in Table 7. It should be noted that in this establishment a certain amount of hemp is occasionally manufactured and this is treated with oil emulsion, as is jute; flax requires no added oil in its manufacture.

A comparison between Table 4 and Table 7 shows that the incidence of pre-malignant changes is far less in the flax than in the jute industry. For example, the incidence amongst spinners is 5.1% for flax as against 15.9% for jute, and for the whole industries, 2.5% for flax compared with 7.2% for jute. The flax industry also has a lower incidence of oil acne, 10% as compared with 15.4% in the jute industry. No flax worker showed both changes.

Five workers in the "drawing" department complained of roughness and dryness of the hands after cleaning their machines with paraffin, evidently due to its degreasing action on the skin. Two workers in the preparing department complained of irritation of the skin of the forearms after handling hemp. This was apparently due to the coarse texture of the raw hemp.

Discussion

The results of the survey show that jute workers

are especially prone to degenerative changes of the skin on exposed areas. Employees in other industries presented comparatively little evidence of degenerative changes and when such changes were present a potential carcinogen, such as sunlight, oil, or both, could be implicated.

Such degenerative changes on the hands, arms, or face seldom cause danger to life. The carcinomata are of low malignancy, radio-sensitive, and usually at a site where simple excision is possible. Where an existing keratosis progresses to carcinoma while the subject is still at work, the time lost because of treatment is negligible.

Scrotal carcinoma, however, presents a more serious clinical problem. The Cancer Register of the Region (population 400,000) records seven cases during the last four and a half years. Of these, three cases (two of which are mentioned in our survey) occurred in jute workers while two of the remaining cases were exposed to oil and one to tar.

We have found it difficult to estimate how long the workers must be exposed to risk before degenerative skin changes occur. O'Donovan (1929), in a report on cancer of the skin due to occupation, has suggested that 20 years' contact with mineral lubricating oils is necessary for the development of carcinoma. Henry (1947) reports latent periods of four, eight, and nine years following exposure to shale or mineral oil but these latent periods must be regarded as exceptionally short. The fact that the minor degenerative changes are accepted as "normal" by the jute workers makes duration almost impossible to assess. We can, however, point to cases in which the exposure has been in the range of 10 to 15 years before marriage, after which the subjects left the industry. Twenty to thirty years later they can be identified as former spinners

by the degenerative changes which are then present.

In the present state of our knowledge it is not possible to say whether batching oil or lubricating oil is responsible; nor can one estimate the part, if any, played by the jute itself. One of us (J. K.) with an experience of 30 years' practice in Dundee, considers that there is no apparent increase in the incidence or severity of these changes during the time that whale oil has been replaced by mineral oil in the "batching" process. In view of the findings of this study, many years must elapse before any change will become clinically apparent. Recent work by Cruickshank and Squire (1950) has demonstrated that similar lesions are found in the exposed skin of engineers who use "cutting oils", and Smiley (1951), in a paper on the skin hazards of ropemaking, mentions keratoses and carcinomata in elderly female workers.

With regard to prevention, the working conditions in the local jute industry have greatly improved in the past few years and this may well lead to a diminution of the incidence of these changes in future. If in fact the nature of the oils used in batching or in lubrication can be proved to be the factor or one of a combination of factors, then it would be pertinent to suggest that substitution of a non-carcinogenic white oil might afford a complete or partial solution. Moreover the use of barrier creams and attention to the method of skin cleansing as suggested by Cruickshank (1948) are obviously important.

Reasonable personal hygiene even at present reduces the morbidity from oil acne to a negligible minimum but the high incidence revealed in the field survey does indicate heavy exposure with inadequate removal after work.

Dermatitis, as we have shown, is a minor hazard in jute workers and when it did occur was not caused by sensitization of the skin to jute though the coarse nature of the fibre was a factor in some cases.

Summary

The results of these investigations indicate:—

- (1) That dermatitis is not a serious hazard in the

jute industry. We found no evidence of sensitization to jute.

- (2) That oil acne is common in jute workers.

- (3) That degenerative changes in the exposed skin are common in jute workers, especially elderly female operators, particularly spinners.

- (4) That these degenerative changes may progress to squamous cell carcinoma in a few cases.

- (5) That isolated cases of carcinoma of the scrotum have been found in male jute workers.

- (6) The significance of these findings is discussed and a brief outline of possible preventive measures is given.

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REFERENCES

- Brockbank, E. M. (1941). *Brit. med. J.*, 1, 622.
 Chief Inspector of Factories (1954). Annual Report for 1952, p. 152. H.M.S.O., London.
 Cruickshank, C. N. D. (1948). *British Journal of Industrial Medicine*, 5, 204.
 —, and Squire, J. R. (1950). *Ibid.*, 7, 1.
 Curjel, D. F., and Acton, H. W. (1924). *Indian J. med. Res.*, 12, 257.
 Henry, S. A. (1947). *Brit. med. Bull.*, 4, 389.
 O'Donovan, W. J. (1929). *Arch. Derm. Syph., Chicago*, 19, 595.
 Schwartz, L., Tulipan, L., and Peck, S. M. (1947). *Occupational Diseases of the Skin*, 2nd ed. Kimpton, London (*passim*).
 Smiley, J. A. (1951). *British Journal of Industrial Medicine*, 8, 265.
 Southam, A. H. (1927). *Brit. med. J.*, 1, 366.
 White, R. Prosser (1934). *The Dermatogoses*, 4th ed. Lewis, London (*passim*).