

A DERMATOSIS FOUND IN SCRAP RUBBER MILLERS

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In industrial countries, the incidence of occupational skin disease is high. Most of the total annual injury benefit for all prescribed occupational diseases in Britain is due to occupational dermatitis. While Singapore is in the throes of industrialisation, occupational skin diseases may not be as widespread. However, they are present in a number of industries among which is the scrap rubber milling process. This paper seeks to describe the condition and mention some of the predisposing factors of the disease. The study has been made from observations in one large rubber milling factory in Singapore.

PREVALENCE

It has been observed by management, workers and inspectors of factories that those labourers who work on rubber milling machines, often suffer from a skin condition over those parts of their limbs, particularly hands and feet, which have been constantly exposed to the watery process. The condition has been named by lay people as "Singapore Foot" because of its resemblance to the dermatomycosis.

Out of a total of 30 scrap rubber millers examined, 24 showed signs of the condition varying in severity. They ranged from a mild erythema in early cases to those with gross erosions of the stratum corneum and brittle nails. Of the 6 who did not have any clinical evidence of the disease, 3 were relief workers *i.e.* they worked only when some of the regular millers were absent because of illness or for other reasons.

THE CLINICAL CONDITION

Most of the workers often noticed that after working on the rubber milling machine for the initial 3 or 4 days, they first feel a sensation which they described as the "bite" of the rubber water. This is not so much a pain as a sensation of tightness of the skin, especially over the palmar aspects of the hands and feet. The tightness is felt after cessation of work, especially at nights.

If one looks at the hands and feet at this stage, the skin shows a mild erythema mainly on the pressure areas. There is no desquamation or ulceration of the epidermis.

As the millers continue working for some time, the next stage is marked by a wrinkling and thickening of the skin. The colour now changes gradually from red to white. The sensation of tightness now gives way to an itchy feeling. Later, the skin becomes macerated and erosion takes place.

The main lesions as described by Polunin (1961)* consisted of circular erosions of the superficial layers of the stratum corneum. (Fig. 1) On the hands, they were most marked in the region of the flexures of palms and fingers, at times in the inter-digital spaces. (Fig. 2) They were commonly bisected by these flexures suggesting that the lesions had started as a single point on the flexure and spread centrifugally. The lesions were often confluent, producing a pitted appearance. (Fig. 3) The base was red and dry and when the lesions were active, they might be tender. No fluid was exuded. A chronic paronychia was commonly seen, some with deformity, thickening and ridging of the nails and separation of the free border of the nails from the thickened nail bed. (Fig. 4)

Polunin had also found that if a slice of skin was cut free-hand with a razor blade to include the edge of one of the skin lesions, a dense pallisade-like mass of fungal hyphae could be seen which was invading the normal areas of skin. To the naked eye, the invaded areas appeared abnormally opaque.

The majority of workers have mild affectations and were able to continue working. Only a few have been incapacitated and forced to cease milling.

It had been noticed by the workers themselves and confirmed by observations that at the start of the week, the condition was mild, but towards the end of the week, the skin over the exposed parts deteriorated. With the rest over the week-end, the skin usually recovered.

*Personal Communication



Fig. 1 Circular erosions.



Fig. 4. Chronic paronychia.



Fig. 2. Lesions on flexures of hand.



Fig. 5. Machines and floor are continually wet.



Fig. 3. Confluent lesions giving a pitted appearance.

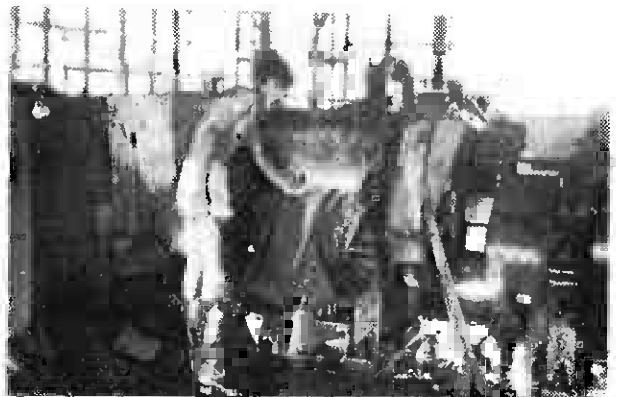


Fig. 6. Continuous flow of water over rollers.

BIOPSY

A biopsy taken for microscopic examination revealed that hyperkeratosis with acanthosis and few aggregates of chronic inflammatory cells were present in the dermis. The histological picture was non-specific.

CIRCUMSTANCES OF EXPOSURE

The working environment is watery. The machines and floors are continually wet. (Fig. 5)

(a) MILLING PROCESS

The object of such a milling process is to roll the coagulated lumps of scrap rubber into sheets. The type of rubber used in most factories here is called scrap rubber and is the latex which has coagulated on the trees without reaching the latex cups. Such scrap rubber has been graded as Class II in contrast to the first quality latex rubber. Naturally, scrap rubber are of different sizes and shapes and have embedded dirt, sand and small stones.

(b) MILLING MACHINE

The machine consists essentially of two rough-cut pattern rollers revolving at different speeds (usually at a gearing of 18 teeth in one roller and 22 of the other) and propelled by diesel. The aim is to produce a tearing and shredding of the scrap rubber mass when pressed between the rollers. Over the rollers water is continuously being poured from a pipe overhanging the machine. (Fig. 6) The water removes not only the embedded dirt after the shredding and tearing but also much of the protein and non-rubber matter contained in the latex and gradually transforms the cheesy mass into rough sheets of wet rubber.

(c) WATER USED

In the factory investigated, the water is obtained by means of a pump from a nearby river and stored in a cement pool. It is then carried by pipelines to the factory for use. At best the water is murky, containing particulate and organic matter, sometimes foul-smelling. The machines and floor of the milling factory is always wet when work is in progress.

(d) WORK

The majority of workmen do not use gloves or boots while working at the mills. The few who wear some protecting appliances only put on boots. They feel that these protecting devices are

encumbrances and they prefer to work with bare hands and feet.

In the milling process, a worker first gathers with his hands the lumps of scrap rubber which has been hardened and mixed with dirt, sand, stones and bark of wood. He places them on the ledge between the rollers, and then directs the lumps to be pressed while water is being showered over the rollers. The pressed cheesy mass appears at the lower end of the machine. He then picks this up again and feeds it together with more lumps between the rollers. He repeats this process for 18-20 times before a proper sheet is produced. Thereafter the sheets are sent to another shed to be dried and packed.

(e) DURATION OF WORK

It will be seen from the above description that the workers' hands and feet are exposed to water continuously while he mills the scrap rubber. A miller works on an average of eight hours at a stretch each day and for five-and-a-half days per week. Those who are more industrious work overtime and on Sundays.

PREDISPOSING FACTORS

There are a number of factors which taken in combination would produce the dermatosis:

WATER

Water appears to be the one single factor which has an important role in the causation. Prosser White (1934) has stated that in the industrial sense, water is the most common single injurious agent acting on the skin. Against it the skin's greatest defence is the secretion of sebum. The effects of prolonged soaking of the hands and feet are first observed on palms and soles. Maceration and softening early become apparent on these surfaces because of the absence of waxy protecting coating found on other parts of the derma.

In other occupations or related situations where the victims' limbs are constantly wet *e.g.* fishmongers, washerwomen, rattan washers or orang seletar, similar dermatoses are present. However, in pineapple workers the lesion is not seen. (Polunin).

CHEMICALS OR ACIDS

It is believed that the lesion could be due to the continuous wetting by a dilute acid solution which had been used for coagulating the scrap rubber.

FUNGUS

Polunin has shown in his free hand razor slices the presence of fungal hyphae. Culture of scrapings grew a number of genera of fungi probably contaminants. No single "causative" organism has so far been found, although the evidence suggests that fungi can play an important part in the development of the lesions.

HOME CURES

It was interesting to note that the workers considered that the skin disease was associated with the "rubber water" during the milling process. New millers working in the same factory did not suffer from the disease. They themselves noticed that when they ceased work over the weekend or when they were on sickness absence, their skins rapidly recover the normal texture.

There were 2 types of local applications commonly used by the workmen themselves and could be easily obtained from any Chinese medicine shop.

- a) Labelled as "The Snow Plasterer or Ointment". This is a coloured ointment. The chemical constituents were said to be:

White Petroleum Jelly	-	70.2%
Boric Acid	-	12.2%
Zinc Oxide	-	17.1%
Mercurous Chloride	-	0.5%

Each day after work, a worker with dermatosis would rub the ointment into the skin. A small tin cost only 30 cents.

- b) Solution of Potassium Aluminium Sulphate in Vinegar.

This was the most widely used local application. The solution is saturated and rubbed into the affected portions of the skin daily after work. Most workers assert that they become better with this treatment.

PREVENTION AND TREATMENT

The best form of treatment in cases with gross lesions was to stop work. The skin would improve in a matter of a few weeks.

Anti-fungal agents could be used although the causative organism has not been certainly established.

Analgesics should be given in cases where pain was present.

Prevention essentially consisted of reducing the prolonged contact of water to the exposed parts of the hands and feet by use of rubber boots or gloves. However, in the hot climate these protective clothing become encumbrances to the workers during the work. Barrier creams could be used to some benefit.

The disease did not appear to be chronic and would heal easily once the worker laid off for a period.

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