

Postsorters' rubber fingerstall dermatitis

JYTTE ROED-PETERSEN¹, NIELS HJORTH¹, WILLIAM P. JORDAN² AND MANUEL BOURLAS²

¹Department of Dermatology, Gentofte Hospital, 2900 Hellerup, Denmark

²Department of Dermatology, Medical College of Virginia, Richmond, Virginia, USA

An outbreak of rubber fingerstall dermatitis in a Danish post office was found to be caused by minute amounts of isopropylphenyl-para-phenylenediamine (IPPD) in the fingerstalls. The presence of IPPD in the fingerstalls could not be explained by the manufacturer and had to be confirmed by gas chromatographic analysis.

Key words: Isopropylphenyl-para-phenylenediamine – occupational contact dermatitis – rubber.

Received for publication February 1, 1977

Post office staff have a lower incidence of hand dermatoses than any other Danish Union members (Arbejdsmiljøundersøgelsen 1974). Occupational dermatitis among postal employees is accordingly rare. Derivatives of mercaptobenzthiazoles in fingerstalls used by the Swedish postal authorities 10 years ago caused several outbreaks of allergic contact dermatitis (Eriksson & Östlund 1968). In Britain rubber band dermatitis among postsorters was traced to Vulcafor FN which is a mixture of benzthiazyl disulphide, hexamethylene tetramine and diphenylguanidine (Kirton & Wilkinson 1972). Printing dyes of stamps may contain chromium (Fregert et al. 1975), but whether this has given rise to occupational dermatitis is unknown. Para-aminobenzene in nigrosine base B has been reported as a cause of dermatitis from stamping ink (Braun 1974).

About 2,000 young girls employed by the Danish National Post Giro Office work all day with rubber fingerstalls on first and/or second fingers (Fig. 1). In spite of this

severe exposure, rubber dermatitis had been strikingly rare until autumn 1975 when, within 2 months, dermatitis under the fingerstalls developed in 51 (2.5 %) of the employees (Fig. 2).

Material and Methods

The study comprises 51 female employees with a clinical contact dermatitis from rubber fingerstalls. This was invariably localized on the dorsum and sides of the distal phalanx, while the volar aspect was spared. Five had previously had dermatitis (nickel dermatitis 1, primula dermatitis 1, previous hand eczema 2, atopic dermatitis in childhood 1). None had had a previous rubber dermatitis. Standard patch tests had been performed in two with negative results.

All subjects were examined by 2-day patch tests (Finn-Chambers® fixed with Scanpore® on the back). The patches were removed on day 2, readings were 20 min later and again on day 2 and day 4.

All were tested with 10×10-mm pieces

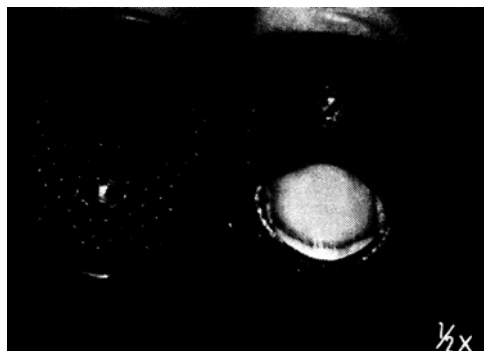


Fig. 1. Rubber fingerstalls.



Fig. 2. Rubber fingerstall dermatitis.

of the red rubber fingerstalls and with the dye and the mercaptobenzthiazole supplied by the manufacturer (Table 1). At the same time they were tested with five mixtures of rubber chemicals supplied by Trolab Laboratories, Hellerup, Denmark – mercapto-mix, carba-mix, black rubber-mix, naphthyl-mix, thiuram-mix (Fregert & Bandmann 1975) (Table 2).

They were further tested with the individual components of the black rubber-mix, two other types of rubber fingerstalls in use at the office, the dye identified in the rubber fingerstalls and a new supply of red rubber from the same manufacturer. The composition of the new batch was said to

be different from the rubber which caused the dermatitis.

Gas chromatographic analysis of the fingerstalls was performed at the Medical College of Virginia, USA. A 1.16-g fingerstall was extracted with 10 ml of methanol overnight. The solution volume was then reduced to 1 ml and a 2-microliter sample submitted for gas chromatographic analysis. The gas chromatograph was equipped with a $6' \times \frac{1}{8}"$ all-glass column packed with OV-22 and a flame ionization detector.

Results

All substances which appeared in the for-

Table 1. Components of the red rubber fingerstalls

The composition given by the manufacturer	Found by analysis
Mercaptobenzthiazole	Present
Vulcafor red A	Trace detectable
	Pigment orange 16
	Isopropylphenyl-p-phenylenediamine
Mineral oil	Present
Stearine	Zinc stearate present
Zinc dioxide	Not examined
Antilux (paraffin compound)	Not examined
Sulfur	Not examined
Raw rubber	Not examined

Table 2. Results of patch tests with rubber chemicals, dyes and fingerstalls in 51 patients with fingerstall dermatitis

Rubber chemicals	Positive	Negative
Black rubber mix 0.6 % pet.	51	0
Isopropylphenyl-p-phenylenediamine 0.25 % pet.	49	0
Phenylcyclohexyl-p-phenylenediamine 0.25 % pet.	39	10
Diphenyl-p-phenylenediamine	10	39
Mercapto-mix 2 % pet.	1	50
Carba-mix 3 % pet.	0	51
Naphthyl-mix 1 % pet.	0	51
Thiuram-mix 1 % pet.	0	51
Mercaptobenzthiazole (ICI) 2 % pet.**	1	50
Zinc stearate 2 % pet.**	0	51
Dyes		
Vulcafor red A 5 % pet.**	0	51
Pigment orange 16.5 % pet.	0	9*
Fingerstalls and new rubber material		
Red rubber fingerstall	51	0
New rubber material, red	51	0
Grey fingerstall	2	18
Red latex fingerstall	0	15

*All positive to isopropylphenyl-p-phenylenediamine.

**supplied by the manufacturer.

mulation supplied by the manufacturer gave negative patch tests reactions (Tables 1 and 2).

All patients with positive reactions to the red rubber fingerstalls also had a positive reaction to black rubber-mix. One was sensitive to mercaptobenzthiazole and mercapto-mix, while the three other mixes were negative throughout (Table 2).

In 49 cases the sensitivity to black rubber-mix was analyzed by testing with the individual constituents. A total of 49/49 had a positive reaction to isopropylphenyl-para-phenylenediamine (IPPD), while reactions to the other related constituents were much rarer. A new supply of the red rubber, stated to have a composition different from the eczematogenous supply gave positive reactions in 51/51. Patch tests with two other types of rubber fingerstalls gave two positive reactions to one of them.

Sensitivity to IPPD could be due to a primary sensitization with an azo dye used in the rubber fingerstalls. Preliminary tests with Vulcafor red A were negative, so if the sensitivity to IPPD should be secondary, the rubber fingerstalls must contain another dye than the Vulcafor red A stated by the manufacturer. The dye and the rubber fingerstalls were kindly analyzed by Imperial Chemical Industries Ltd., Application Research and Technical Service Department, Blackley, Manchester, England. The dye submitted for analysis by the manufacturer was, in fact, identical in reactions with Vulcafor red A (Rubine Toner B). However, the rubber fingerstalls appeared to be coloured in the main with a diazo organic orange pigment (Pigment Orange 16). As appears from Table 2, however, Pigment Orange 16 could not be the primary sensitizer since 9/9 gave negative patch test reactions.

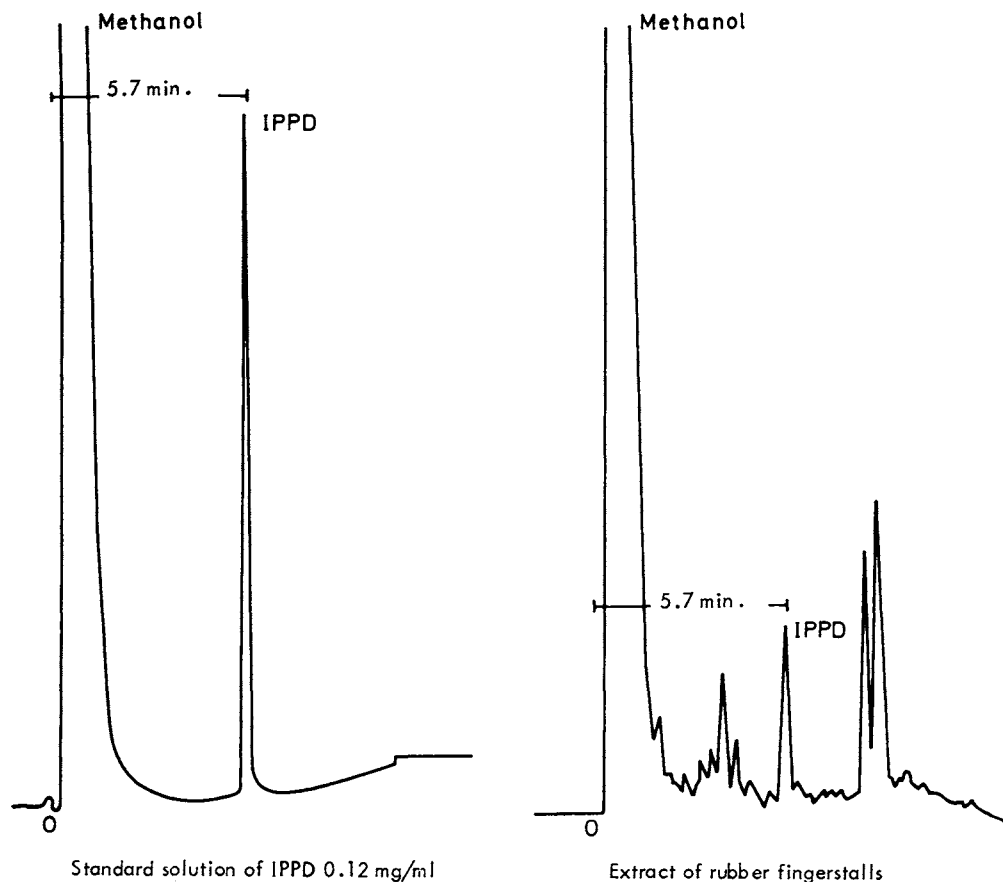


Fig. 3. Gas chromatograph of fingerstall extract. Peak at 5.7 min corresponds to IPPD.

IPPD tends to impart a grey or blackish tinge to rubber. The red rubber, which caused the dermatitis, had a bright hue and was not darkened by exposure to UV light. In spite of this we had to assume, based on the patch test findings, that the rubber fingerstalls must somehow contain IPPD or some related substance.

Gas chromatographic analyses at the Medical College of Virginia showed that the retention time (5.7 min) of IPPD from a standard solution is coincident with a peak in the chromatogram of the fingerstall solution (Fig. 3). This finding was later con-

firmed by the Rubber and Plastics Research Association, Shawbury, Shrewsbury, England. The concentration of IPPD in the fingerstalls was found to be 0.01 %.

Comments

An incidence of dermatitis of 2.5 % of employees within a few months would barely be noticeable in individual post offices. Because the cases occurred in a staff of 2,000 in an office with an efficient management and a hard-working Safety Committee, measures could be taken to stop the "epidemic"

immediately. In other branches of the General Post Office new cases cropped up during the following year in spite of warnings issued to all concerned.

All patients sensitized to the rubber fingerstalls were sensitive to IPPD. In view of the uniformity of this pattern of sensitivity, the IPPD reactions could hardly be due to a cross sensitization from a rubber dye. In spite of this we took pains to patch test both with the dye which the manufacturer had allegedly used and with the dye he actually used. Since these were negative we had to assume that the rubber fingerstalls contained IPPD in spite of the manufacturer's denial. His denial could not shake our assumption since at that time it was known that he had used a pigment which was different from the one supplied by him. Eventually the gas-chromatographic analysis confirmed that minute amounts of IPPD could be detected in the fingerstalls. A content of 0.01 % IPPD was sufficient to sensitize. The origin of the IPPD remains unexplained. It could have been added by negligence if the mercaptobenzthiazole (MBT) and/or zinc stearate used by the manufacturer had been kept in a container previously used for IPPD. The MBT and/or zinc stearate supplied by the manufacturer should have the same contaminants as those used for the rubber fingerstalls – if the samples were at all appropriate. Anyhow, the samples supplied gave negative patch test reactions in patients with rubber fingerstall dermatitis. Traces of IPPD may have occurred in some of the other supposedly inert components (Table 1) which were not tested. The IPPD might also derive from scrap rubber milled into the unvulcanized rubber material. Scrap rubber would facilitate the vulcanizing process by reducing the risk of bubbles in the final product. The occurrence of scrap rubber can usually be detected by examination with a lens or slightly higher magnification. The surface of rubber material should be

uniform. If scrap rubber is present, it will break the uniform surface. Scrap rubber was not found.

Many countries are planning a declaration of the contents of industrial products, cosmetics, etc. The present paper shows that such measures will hardly be effective unless adequate laboratories can control the contents listed. It is also obvious that a compulsory declaration would seem to be of little value unless misleading statements are considered a criminal offence.

Acknowledgment

Our thanks are due to engineer, dr. techn. T. Grenness for analyzing the fingerstalls for contents of scrap rubber.

References

- Braun, W. (1974) Contact dermatitis from a stamp ink of the German Post Office. *Symposium on Contact Dermatitis, Gentofte, Denmark, October 1974*. Summary in *Cutis* (1976) 18, 651.
- Eriksson, G. & Östlund, E. (1968) Rubber bank note counters as the cause of eczema among employees at the Swedish Post Giro Office. *Acta Dermato-venereologica* 48, 212–214.
- Fregert, S., Gruvberger, B. & Mitchell, J. C. (1975) Chromate in postage stamps. *Contact Dermatitis* 1, 328.
- Fregert, S. & Bandmann, H.-J. (1975) *Patch Testing*. New York: Springer-Verlag.
- Kirton, V. & Wilkinson, D. S. (1972) Rubber band dermatitis in Post Office sorters. *Contact Dermatitis Newsletter* 11, 257–260.
- Anno 1974: Arbejdsmiljøundersøgelsen, rapport no. 2 ed. Arbejdsmiljøgruppen, Socialforskningsinstituttet, Copenhagen K, 198–199.

Address:

Department of Dermatology
Gentofte Hospital
2900 Hellerup
Denmark