

## INVESTIGATION OF A METHOD FOR PREVENTING DERMATITIS FROM DRESS SHIELDS

LOUIS SCHWARTZ, M.D.

*United States Public Health Service, New York*

AND

GEORGE CLINTON ANDREWS, M.D.

*New York, N. Y.*

(Submitted April 7, 1938)

Dermatitis among wearers of rubber goods has often been reported. Osborne and Putnam (1) reported an outbreak of dermatitis among linesmen wearing rubber gloves to protect the hands from electricity, in which the authors proved that the irritant was an accelerator—tetramethyl thiuram disulphide. Dermatitis caused by other accelerators and anti-oxidants in rubber has been reported (2). In these cases the rubber was "heat-cured."

Obermayer (3) reported dermatitis from rubber gloves in which the irritation was caused by hypersensitivity to the chemical left on the gloves after curing with sulphur monochloride. Rattner (4) reported a similar case on the penis, caused by a condom. In the *Journal of the American Medical Association* (5) of January 29, 1938, there is a report of a case of dermatitis of the vulva and thighs which was thought to have been caused by a condom used by the woman's husband.

Schwartz (2) discusses the causes of dermatitis in rubber manufacture, naming accelerators and anti-oxidants as irritants in "heat-cured" rubber and sulphur monochloride as an irritant in "vapor-cured" rubber.

However, to our knowledge, dermatitis from dress shields has not been reported, although a query as to the possibility of dermatitis arising from dress shields was received by the authors from a manufacturer of the product.

The present report submits the results of our investigations in the case of a young woman who had a dermatitis in the axillae and on her back.

The patient had consulted a dermatologist for an eruption which had appeared in both axillae and for which an ointment was prescribed which did not benefit her. A later examination of some scrapings was said to reveal fungi and an ointment containing sulphur was prescribed which resulted in 'clearing up' the eruption. Two days after the eruption had disappeared, the patient used a deodorant (Odor-O-No Ice) in the axillae and the following evening she shaved the axillae and put on dress shields to go out for the evening, but before she shaved, she noticed that there was a slight rash remaining in the axillae. The next day the axillae were severely inflamed and the inflammation had spread down the arms and on the body; and did not 'clear up' for two months, during which time the condition would recur with increased severity under the dress shields whenever she wore them. The patient stated that she had used Odor-O-No Ice for a long time previously and with no ill effects. She stated that a rash would invariably develop after wearing any type of rubber materials, such as dress shields or sanitary belts.

At the present examination there was no eruption present and upon questioning, the patient stated she had not worn dress shields or elastic since a few weeks.

#### EXPERIMENTAL STUDIES

The patient was told to bring a piece of the dress shield and a piece of the elastic substance of the sanitary belt for testing. The dress shield consisted of two outer layers of pink silk with a thin layer of rubber between. She was "patch tested" with a piece of the black elastic substance from the sanitary belt, with a piece of the silk from the dress shield, with a piece of the rubber taken from the dress shield and with each of the above substances after they had been washed in a decidedly alkaline solution of soap and soda ash and rinsed with water. The patches were allowed to remain on for twenty-four hours and there were no reactions under any of them. In the meantime, she had not worn any dress shields but had used the Odor-O-No Ice and did not develop a dermatitis.

Thinking that perhaps changes in the pH of the patient's perspiration had an effect on the irritating properties of the rubber or silk in the dress shield, patch tests were again performed with the same materials—one series of patches being moistened with a markedly acid liquid (1 per cent acetic acid) and the other series

with a markedly alkaline fluid (0.5 per cent NaOH). No reactions resulted after twenty-four hours, so the patient was instructed to again wear the dress shields in order to see if she was still hypersensitive to them. She returned the next day with a marked dermatitis in both axillae and on the skin touched by the dress shields. This confirmed the fact that even though the parts composing the dress shields did not give positive reactions, the actual wearing of them accompanied as it was by friction of the swinging arms and by the perspiration, would cause a dermatitis. After a few days, when the dermatitis had cleared up, the patient was told to exercise so as to induce perspiration and the reaction of her perspiration was then taken with litmus paper and was found to be markedly acid, but it did not cause a reappearance of the dermatitis. Another patch test was performed with the same materials, this time soaked in perspiration taken from her axillae and no reactions occurred under these patches.

Bearing in mind Obermayer's findings, the patient was told to wash new dress shields in a markedly alkaline solution of soap and soda ash (sodium carbonate), followed by rinsing with water, then dry them and wear them. She did this and no dermatitis developed. Since then, she has been washing all newly purchased dress shields in this solution before wearing and has worn them without any inconvenience.

#### DISCUSSION

Thin rubber goods, such as are contained in condoms, dress shields and surgeons' gloves, are usually vapor-cured by one of the following methods:

1. Rubber is mixed with some of such compounds as zinc oxide, titanium oxide, zinc sulphide, barium sulphate, magnesium carbonate and dyes, and is then milled so as to incorporate them thoroughly into the rubber. The milled rubber is then dissolved in naphtha. The solution is placed in trays in which the desired forms, made of metal or porcelain, are dipped. A coating of rubber is deposited on the forms and they are taken out to dry and then re-dipped as many times as is required to obtain the desired thickness of rubber. The forms with the rubber deposited on them are then dipped into a covered tank containing a solution of sulphur monochloride in carbon bisulphide and allowed to remain a short time, less than one minute. They are then taken out, dried in a drying chamber, after which they are powdered with soapstone and hand-rolled off the

forms. The girls performing this last operation at times suffer from dermatitis of the hands caused by remains of the curing solution on the rubber.

2. After the rubber is compounded and formed, it is placed in perforated drums revolving in a closed wooden cabinet. Under the drums are placed pans of sulphur monochloride. The pans are heated so that the vapor given off penetrates the perforations in the revolving drums and comes in contact with the rubber. After about a half hour, when the sulphur monochloride has entirely evaporated, an exhaust fan attached to the enclosed wooden cabinet is put into operation which exhausts the gas from the apparatus. A pan is then filled with a solution of ammonia, placed under the drum and heated. The released ammonia gas penetrates the perforations in the revolving drum, comes in contact with the rubber and neutralizes any remaining hydrochloric acid on the rubber which had formed during the exposure to the sulphur monochloride. When the ammonia solution has entirely evaporated, it is exhausted from the apparatus and the completely cured rubber is taken from the drum. If the neutralization with the ammonia is not complete, then there is left on or in the rubber a certain amount of hydrochloric acid which is a potential irritant. Dermatitis occasionally occurs among girls in the factory handling such rubber for inspection purposes.

When such rubber goods reach the consumer, the remaining acid, aided by the heat, moisture and friction incident to wearing, is apt to irritate the skin. Washing with an alkaline solution neutralizes the acid and thus prevents dermatitis.

In the case reported here, patch tests failed to produce a reaction, probably because the elements of heat and friction are not present in the patch test. The perspiration of the patient soaked through the outer silk covering of the dress shield and came in contact with the sulphur monochloride cured rubber. It seems probable that the perspiration soaked out of the rubber the acid irritant remaining on the rubber and this being rubbed into the skin by the friction of the arm movements, caused the dermatitis.

However, since all patch-tests were negative, the rôle of the ingredients of the silk covering, or of the combination of such ingredients and those of the rubber, could not be adequately studied.

Nevertheless our investigations permit the following practical conclusions:

Manufacturers of sulphur monochloride cured rubber goods, which are to be worn next to the skin, should not only carefully neutralize with ammonia vapor the sulphur monochloride remaining on the rubber, but they should soak such rubber in a mild

alkaline solution for a sufficient length of time to remove from it all traces of sulphur monochloride or hydrochloric acid.

In cases in which there is a tendency to dermatitis, the wearers of such new rubber goods as dress shields, sanitary belts, etc., should first wash the articles in an alkaline solution of soap and soda ash (sodium carbonate), or soap and ammonia, before wearing.

## REFERENCES

- (1) OSBORNE, EARL D. AND PUTNAM, EDWIN D.: Industrial Dermatoses with Special Reference to Allergy and Mycotic Dermatitis. *J. A. M. A.* **99**: 972-975, (Sept. 17) 1932.
- (2) SCHWARTZ, LOUIS: Dermatitis in the Rubber Industry. *Public Health Bulletin No. 215*, pp. 1 to 10, (October) 1934.
- (3) OBERMAYER, M. E.: Eczema due to Hypersensitiveness to Rubber. *Archives of Derm. & Syph.*, **27**: 25-35, (January) 1933.
- (4) RATTNER, HERBERT: Dermatitis of the Penis from Rubber, *J. A. M. A.*, **105**: 1189, (October 12) 1935.
- (5) Possible Vulvul Dermatitis from Condom. *J. A. M. A.*, *Queries and Minor Notes*, **110**: 389, (January 29) 1938.