

Institute of Occupational Health, Helsinki, Finland.

THE CHAMBER TEST,
A PRACTICAL METHOD FOR ALL-ROUND
PATCH TESTING

By

VEIKKO PIRILÄ & LARS FÖRSTRÖM

Since Jadassohn in 1895 introduced the patch test for demonstrating eczematous sensitivity, this method has been widely used. Rokstad, in connection with his investigations on skin reactions caused by oil of turpentine, observed that the customary patch test "failed on non-hypersensitive individuals where the point was to determine the toxic effect of the substances". A new method was therefore devised (12, 13). This method, from its principle, was called the adhesion chamber method or briefly the chamber method. A circular patch stamped out of boiled linen absorbed the test substance, and for the impermeable layer a celluloid chamber was used (Fig. 1). *Pirilä* (6) agreed with Rokstad as regards the unsuitability of the customary patch test for testing with volatile substances and used the chamber method, slightly modified, for testing with solvents. The method gave reproducible results in patients sensitized to oil of turpentine and even proved suitable for determining the threshold concentrations of toxic reactions to solvents (7). In testing with other substances such as neomycin and bacitracin (11) it has also given more reliable results than the ordinary patch test method.

Probably because at first glance the chamber method looks somewhat complicated, it has not gained much ground. Therefore Fernström, who was fully aware of the disadvantages of the customary patch test method, developed a new technique,

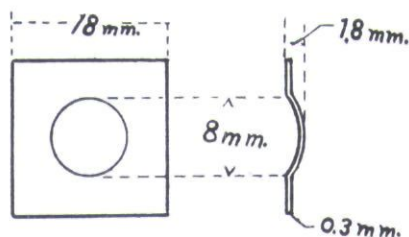


Fig. 1.

Adhesive chamber according to Rokstad.

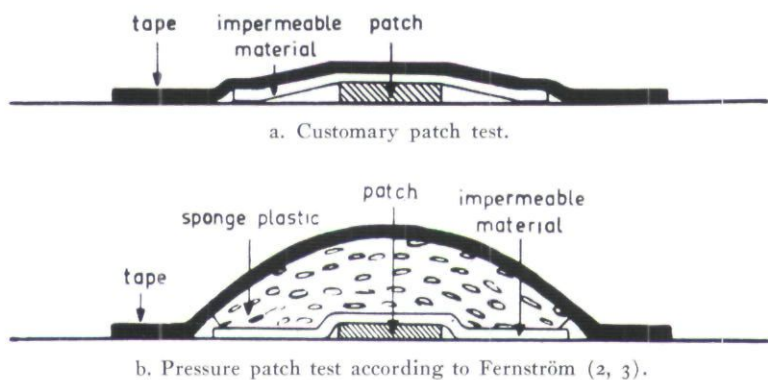


Fig. 2.

the pressure patch test (2). "An 8 by 8 mm, later 9 by 9 mm (3), square of blotting-paper is covered with a 21 by 21 mm square of rubber-cloth or cellophane, upon which a block of sponge plastic with the dimensions 19 by 19 by 4 mm is placed (Fig. 2 b). The tape is then applied well stretched, each plastic block being compressed through the tape when this is fastened". Although twelve years have already elapsed since the introduction of this method, it has not yet come into general use.

According to Fernström, as regards the routine patch test method, the following essential conditions are to be fulfilled:

1. During the entire period of exposure the patch should be firmly retained in place on the skin, *i.e.* on the same contact surface.

2. The patch should remain in close contact with the skin.
3. The covering material should as far as possible be impermeable, producing a close chamber.

We agree with Fernström that these requirements are essential. Furthermore, we believe that they are, in general, fulfilled by both the chamber and the pressure patch test methods.

However, we do not find these requirements sufficient. In standardization of patch testing, according to *Pirilä & Kajanne* (10), it is also essential to keep the test dose per unit area uniform. When applying the original chamber test (Rokstad) on the skin, care has to be taken to use the proper technique in order to ensure that all air is driven out. According to Rokstad, however, at the same time some fluid also runs out of the chamber, partly due to pressure, partly due to capillary action. In our experience, the same may occur, at least in unfavourable conditions (friction of the clothing, sweating). When Fernström's pressure patch test is used. Spreading of the test solution outside the area covered by the patch decreases the amount of test solution in the patch. Consequently, the amount of the test substance per unit area varies.

In the following a modification of the chamber test is described, through which this disadvantage can be reduced or even eliminated and the test dose per unit area kept uniform.

As material for the latest model of our chamber, cellulose acetate was used, instead of the celluloid in Rokstad's chamber. The form and dimensions of the chamber are seen in Fig. 3. In order to obtain a uniform distribution of the test substance the roof of the chamber was made flat. The inner border of the brim is slightly elevated towards the skin to prevent the spread of the test solution under the brim. After removal of the chamber the success of the test is indicated by a ring-formed depression around the site of the patch (Fig. 4). As patch for test solutions a disc 8 mm in diameter, 0.5 sq cm, of Whatman filter paper No 3 MM, fixed to the chamber with small amount of cellulose acetate glue, has been used. This patch absorbs 15 μ l test solution. We have observed,

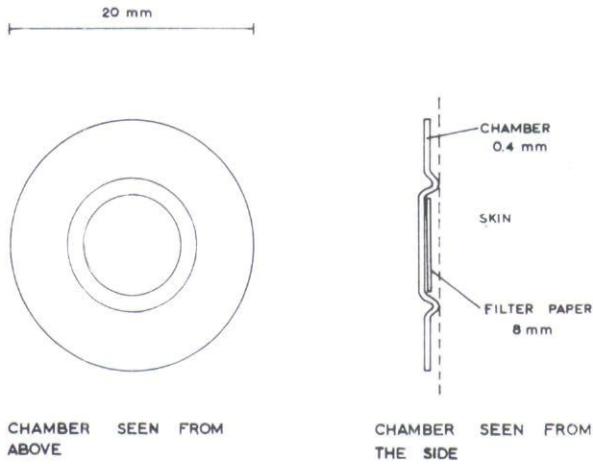


Fig. 3.
Modified chamber test.

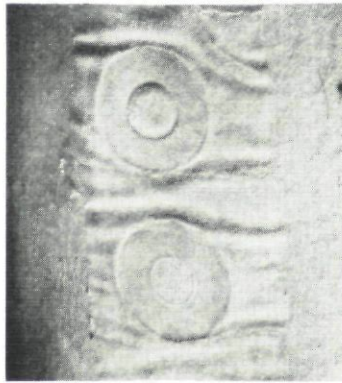


Fig. 4.
Skin of non-sensitive patient immediately after removal of the chambers.
Above with solution, below with ointment.

however, that this paper and the other materials customarily used reduce a high proportion of Cr^{VI} to Cr^{III} within a few hours (8, 9). Therefore a patch disc of glass fibre paper (Whatman paper GF/A) is under trial. In tests with ointments no patch disc is necessary. Ointments are applied by

stroking them across the cup of the chamber from Blohm's standard tubes (1). A subsequent simple spreading of the test ointment over the cup area, before placing the chamber, possibly followed by slight pressure on the roof of the chamber at its place on the skin, seems to be sufficient for even distribution of the test substance. With the amounts of the test substance (cobalt chloride) used, the ointments have given both allergic and toxic reactions at slightly lower concentrations than the solutions. It may be mentioned that the same trend in the relative strengths of the reactions and the threshold concentrations to ointments and solutions has been observed by the other members of the Scandinavian patch test committee (4) with the ordinary patch test method (5).

In investigations now in progress chemical methods and radioisotopes are being used to compare absorption of various test substances into the skin from the ordinary patch test and the chamber test. Preliminary results indicate that the amount of Co^{60} absorbed from the chamber test clearly exceeds that absorbed from the customary patch test. In addition, the amounts absorbed from the chamber test were much more uniform. Consistently with these results, in quantitative testing with, for instance, fractions of oil of turpentine the chamber method has given both allergic and toxic reactions at lower concentrations and with better reproducibility than the customary patch test method.

The chamber test is inexpensive, handy and time-saving. It holds the tightly covered test substance in close contact with the skin and does not allow it to spread outside the test area. Thus, provided that the total amount of the test substance applied is equal, the amount of test substance per unit area is also uniform. As a practical and at the same time exact method the chamber test is suitable both for routine patch testing and for more exacting scientific investigations. In fact, this test, among others, has been discussed at the meeting of the Scandinavian patch test committee (4) in Helsinki, May 1966, as one possibility for a future standard method of patch testing (5). During a two months' trial of routine patch

testing, involving 999 tests on 33 persons, no untoward effects have been observed.

SUMMARY

A further modification of the adhesive chamber method (Rokstad) is described (Fig. 3). For the patch disc (0.5 sq cm) cellulose filter paper (Whatman No. 3 MM) has been used. Because of its reducing properties (*e.g.* Cr^{VI} to Cr^{III}), however, glass fibre paper (Whatman paper GF/A) is under trial.

Quantitative skin tests and preliminary results of absorption studies with Co⁶⁰ indicate that the amounts of various test substances absorbed from the chamber test clearly exceed those absorbed from the customary patch test and are much more uniform and the test results correspondingly more reproducible. Being handy and inexpensive, the chamber test method may prove to be the method of choice for all-round epicutaneous testing.

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