

Clothing for use in clean-air environments

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SUMMARY

Disposable plastic two-piece suits were compared with conventional cotton suits, gowns, and plastic aprons by nurses in a burns unit. The plastic suits allowed fewer micro-organisms to be dispersed into the environment than the other garments but were less comfortable.

INTRODUCTION

There has recently been considerable interest in the use of disposable plastic or paper garments for use in ultra-clean areas such as operating theatres and intensive-care units where the prevention of infection is important. In such areas the hazard of airborne infection comes from the staff who are constantly dispersing micro-organisms into the air (Blowers & McCluskey, 1965).

Bethune, Blowers, Parker & Pask (1965) investigated the dispersal of *Staphylococcus aureus* from the body surface. They showed that this occurs mainly from the perineal region and that plastic undergarments can reduce this dispersal. An investigation has been made at the Regional Burns Unit at Mount Vernon Hospital, Northwood, Middlesex to evaluate the dispersal of micro-organisms from nursing staff who have worn several garment assemblies including a polyethylene two-piece suit that can be laundered several times before disposal.

This burns unit is equipped with complex air-conditioning systems delivering large volumes of sterile air which can be temperature and humidity controlled (Clark, Mullan, Sanders & Scales, 1975). Barrier-nursing techniques are practised to reduce cross infection from staff to patients by the contact route.

Many burned patients require air temperatures as high as 30° C. at relative humidities of 50–60%. The clothing requirements for nursing staff in these conditions are fairly rigorous. The garments have to be light in weight, they must allow the wearer to remain cool at fairly high work rates, and they must absorb sweat. They should also be aesthetically pleasing and fashionable and be quickly and easily changed.

MATERIALS AND METHODS

Clothing

In Plate 1 (A) shows the open-weave cotton two-piece suit currently in use. For dressings and other patient care either a cotton gown (B) or a disposable plastic apron (C) is worn over the suit. Also shown (D) is a two-piece disposable

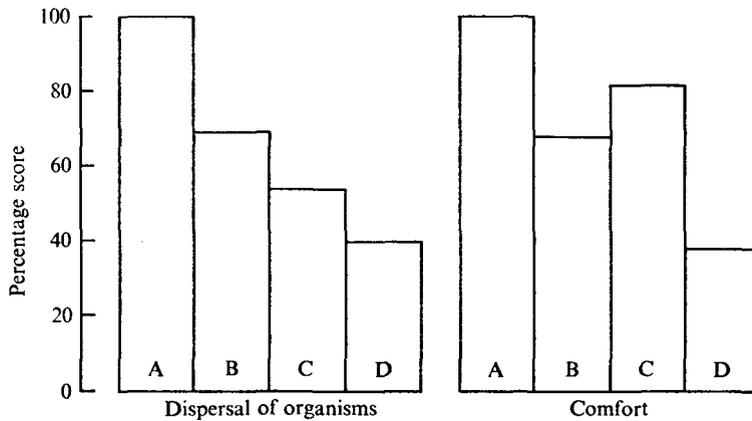


Fig. 1. Four assemblies graded according to bacterial dispersal and comfort. (A) Open weave two-piece cotton suit (tunic and trousers). (B) As in A, with cotton gown over. (C) As in A, with disposable plastic apron over. (D) Two-piece plastic suit.

suit made from spun-bonded polyethylene material (Tyvek) with elastic at the wrists and waist. This suit could be worn in place of the cotton suit.

The tests

Dispersal of micro-organisms from the body was assessed by the method described by Bethune *et al.* (1965). The four different garment assemblies were worn by each of four subjects who each exercised for 2 min. in a special enclosure. During this time 700 l. of air were drawn from the chamber into a bacterial slit-sampler in which the micro-organisms were deposited on nutrient agar. The number of colonies cultured provided the measure of dispersal of microbially contaminated particles from the subject.

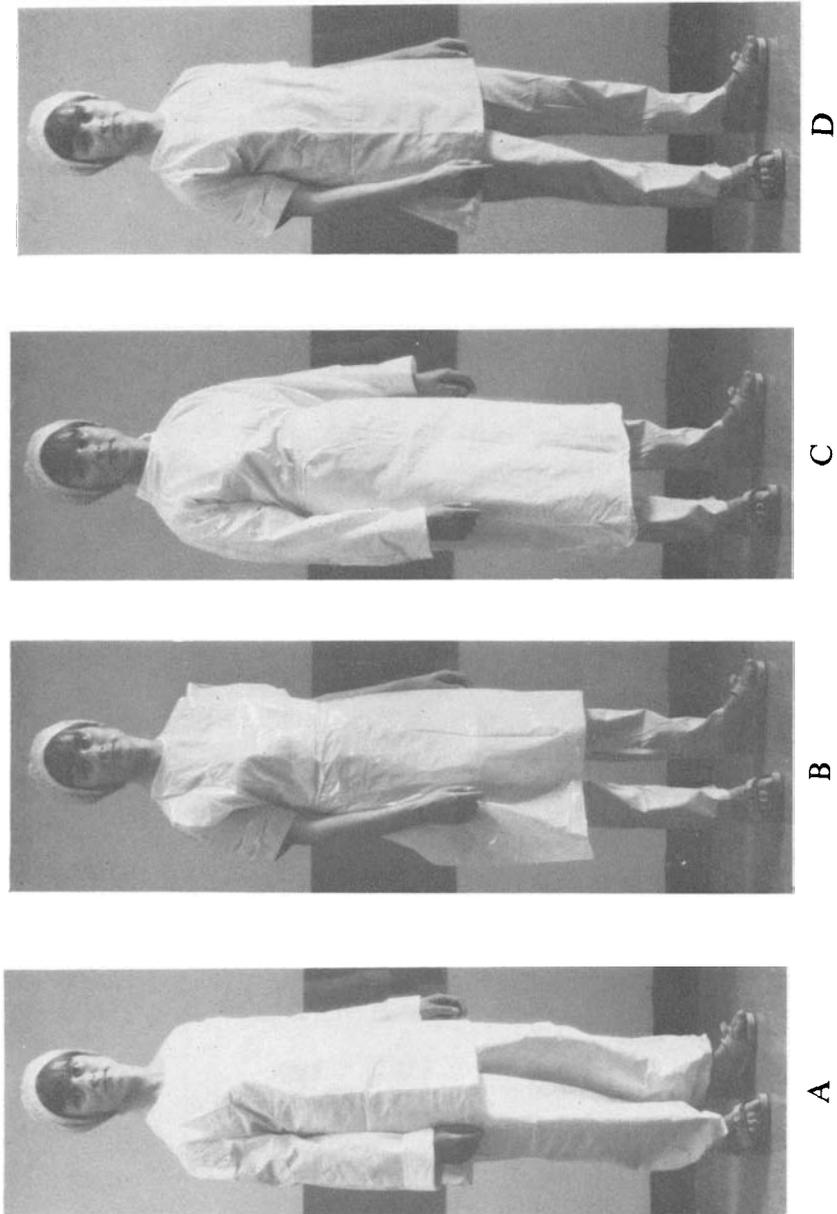
The plastic two-piece suit was worn by the ward sister; at the end of each shift it was sent to the hospital laundry and worn again on its return. This continued until the garment appeared unserviceable. A subjective assessment was made of the garment and compared with the usual cotton suit worn.

RESULTS

Micro-organism dispersal

Figure 1 shows the dispersal of micro-organisms from the four garment assemblies as a percentage of the dispersal from the standard cotton suit. The results for each garment assembly are the arithmetic mean of the numbers of cultured micro-organisms from the four subjects.

The plastic two-piece suit gave the lowest dispersal at 40% of the cotton-suit value. The cotton suit with plastic apron and the cotton suit with cotton gown assemblies produced 54% and 69% respectively of the cotton suit value for micro-organism dispersal. The comments of the ward sister about the disposable suit are as follows.



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Acceptability

The plastic suit was poorly styled. The appearance was disliked by both patients and staff. It was comfortable as long as little movement was needed, but felt extremely hot with any appreciable activity. There was no sweat absorption and this added greatly to the discomfort. When a gown or apron was worn over the suit during a burn dressing, the assembly was almost unbearably hot. When the wearer sat down the suit tended to stick to the plastic chairs.

All the staff were asked to assess the comfort and acceptability of the four assemblies by giving them a score, assuming that the cotton suit was 100% acceptable. The results of this survey are shown in the figure from which it is seen that the cotton suit with plastic apron was the preferred assembly after the cotton suit alone with an acceptability score of 82%. The plastic suit was found to be the least comfortable with a score of only 38%.

The plastic suit was worn and laundered 5 times before it was considered to be too fragile and crumpled for further use and had to be discarded.

CONCLUSIONS

The plastic two-piece suit allowed less dispersal of micro-organisms to the environment than the other garment assemblies probably because the fabric is less permeable to skin scales and because of the occlusion of the perineum by the elastic at the waist. However, the disadvantages from the aesthetic and comfort standpoints outweighed this. The garments were generally considered unacceptable for long-period use in a stressful environment such as the burns ward intensive care areas. There would be a case for the use of these suits when extreme cleanliness is required for short periods although considerable design effort is needed to overcome the many obvious deficiencies in these garments.

We thank Mr J. M. H. Owen of WM Supplies Ltd, Oldham, Lancs, for providing the plastic suits, and the nurses of the Burns Unit at Mount Vernon Hospital for taking part in the trial.

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EXPLANATION OF PLATE

The four different assemblies in use. (A) Cotton suit. (B) Cotton suit and cotton gown. (C) Cotton suit and plastic apron. (D) Plastic suit.