methods. It has been reported that ketoconazole inhibits the lymphocyte response in vitro to PHA in concentrations corresponding to those obtained in vivo (11). This effect was not found in this study.

Our findings support a primary disturbance of cell-mediated immune functions in CMC.

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A Method for Testing the Effect of Pressure-relieving Materials in the Prevention of Pressure Ulcers

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Karlsmark T, Kristensen JK. A method for testing the effect of pressure-relieving materials in the prevention of pressure ulcers. Acta Derm Venereol (Stockh) 1987; 67: 260–263.

A method is described by which the effect of pressure and relief of pressure on blood flow in cutaneous and subcutaneous tissue can be evaluated. Five normal persons were placed supine on a transparent polyacrylate board and blood flow in the skin overlying the sacral area was measured. Cutaneous blood flow was measured by the laser-Doppler technique and subcutaneous blood flow was measured by the ^{133}Xenon washout technique using atraumatic application. Blood flow was measured by both techniques before and after relief of pressure, using the antipressure material Comfeel® Pressure Relieving Dressing (in the following referred to as Comfeel PRD) consisting of a foamy plastic material with an adjustable central opening.

With this material, it was possible to obtain relief of pressure which was shown as a significant increase in blood flow measured by both methods. It is suggested that the methods described should be used to test other materials as well. (Received July 8, 1986.)

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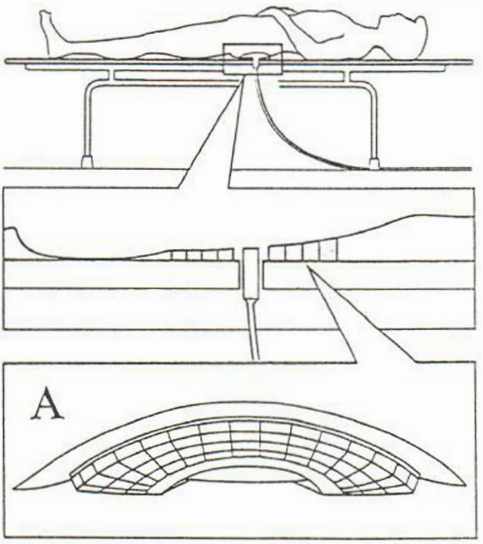

Fig. 1. The experimental set-up is shown with a person lying on the polyacrylate plate, the laser-Doppler probe in the small bore hole through the plate looking at the central pressure relieved area. Pressure relief was obtained by removing the centre of the product shown at *A*.

The pressure sore problem has become intensified in medicine, because of an increased number of geriatric and immobilized patients. Many contributing factors have been associated with the onset of pressure sores including infections, age, diet and hygienic status (1). Nevertheless, it is widely accepted that the prime factor is tissue anoxia, due to constant pressure on a single skin area covering a bony prominence (2, 3, 4). The most important factor in the management of pressure sores is prophylaxis directed at distributing the body pressure over the largest possible area, and at avoiding skin pressure against a bony prominence (4). Several types of anti-pressure relieving products are available. In an attempt to measure the effect of relief for different products, we have developed the following method. The pressure relief will be indicated by the microcirculation in the tissue. This can be determined in the cutaneous tissue by use of laser-Doppler flowmetry (5) and in the subcutaneous tissue by use of local ^{133}Xenon washout technique (6).

MATERIALS AND METHODS

In five healthy persons (aged 23 to 44, weight 65–90 kg), the blood flow was measured in the skin overlying the sacral area in the supine position with stretched legs. The persons were placed on a transparent polyacrylate board and skin blood flow was measured before and after relief, with a circular closed cell foam plate (Comfeel PRD). The pressure-relieving product was placed on the skin in the sacral region, and relief was obtained by removing the centre of the plate, leaving the skin area in the centre without any load.

Measurement of blood flow

Cutaneous blood flow was measured with a laser-Doppler flowmeter (Perimed Sweden) (5) employing fiberoptics placed in small bore holes in the polyacrylate board just beneath the central part of the sacral region (Fig. 1). Light from a 2 MW Helium-Neon laser (wavelength 632.8 mm) is directed to the skin area to be monitored via an optical fibre. The depth of penetration is about 1 mm and the change in wavelength due to the Doppler phenomenon of flowing blood is monitored via a similar fibre.

The output was registered on a pen recorder. Zero adjustment was achieved by placing the laser-Doppler probe against a skin area on the forearms of the patients and inflating a blood pressure cuff above the systolic blood pressure. The pen recorder was adjusted to zero in this situation. Each measurement of blood flow level was performed for about 10 min. Results were expressed in arbitrary units.

Measurement of *subcutaneous* blood flow was performed, using the ^{133}Xenon washout technique. ^{133}Xenon was applied epicutaneously (atraumatic) to the skin, according to the technique described by Sejrsen (6). Approximately 30 min after labelling all the ^{133}Xenon is concentrated in the subcutaneous fatty tissue. Washout from this tissue follows a slow monoexponential course, and experiments can be performed for several hours if so desired. The γ-radiation of ^{133}Xenon was detected by NaI (Tl) scintillation detectors collimated to see more than the labelled area. The detector was placed perpendicularly to the sites of labelling at a distance of about 15 cm from the polyacrylate surface. Care was taken that the counting geometry remained constant during a single investigation, as the person was immobilized. The recorded activity was fed to a γ-spectrometer with a window of acceptance adjusted around the 81 keV photopeak of ^{133}Xenon. Washout rate constants (k) were computed by the least squares method after logarithmic transformation and correction for background activity. Each measurement of washout lasted 10 min or more.

Statistical analysis

Wilcoxon's rank test for paired observations was used for comparison of blood flow values before and after relief of pressure.

RESULTS

The results are shown in Tables I and II. The blood flow was significantly greater in the cutaneous and subcutaneous tissue of the sacral region when using the pressure-relieving product (Comfeel PRD) (laser-Doppler $p<0.01$, ^{133}Xenon washout $p<0.05$).

DISCUSSION

When using the transparent polyacrylate plate, we were able to measure the blood flow in exactly the same area with the laser-Doppler as well as with the Xenon washout technique. It is possible to select an area in the sacral region with a maximum pressure, since the location of the anaemic skin can be established when the persons are lying on the plate, without application of the pressure-relieving product. In the use of such a non-flexible

Table I. *The cutaneous blood flow before and after relief with Comfeel PRD*
The results are expressed in arbitrary-units. For statistical evaluation see text

Laser-Doppler method	
Before relief	After relief
0–16.0 (range)	0.3–31.0
3.17 (mean)	11.6

Table II. *The subcutaneous blood flow before and after relief with Comfeel PRD*
For statistical evaluation see text

^{133}Xenon washout rate constants $\times 10^2$	
Before relief	After relief
0.51–0.74 (range)	0.53–1.64
0.58 (mean)	0.68

plate, the weight of the examined person is important. Nevertheless, the product tested had an effect even with persons weighing 90 kg.

Since both the subcutaneous and the muscle tissues are more in risk of creating necrosis due to pressure than the overlying skin (7), it is necessary to measure both the subcutaneous blood flow (Xenon washout) and the dermal blood flow (the laser-Doppler). The results are found to reflect the same pattern, indicating that the measurement of the blood flow by the laser-Doppler technique is sufficient when testing pressure-relieving materials according to the described procedure. In conclusion, the model appears to be useful in the determination of the blood circulation in tissue under applied pressure, and we should recommend it to be used in the evaluation of other types of pressure-relieving products.

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Scleroderma after Occupational Exposure to Trichlorethylene and Trichlorethane

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Flindt-Hansen H, Isager H. Scleroderma after occupational exposure to trichlorethylene and trichlorethane. Acta Derm Venereol (Stockh) 1987; 67: 263–264.

Three cases of scleroderma, developed after occupational exposure to trichlorethylene and trichlorethane are described. The question is raised whether exposure to these chlorohydrocarbon solvents may be an etiological factor. (Received October 9, 1986.)

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Scleroderma-like disease has been described after exposure to vinylchloride monomer and to vapor of epoxy resin (1). A few observations suggest that scleroderma may develop after exposure to trichlorethylene and perchlorethylene as well (2, 3). We describe three cases of scleroderma developed after occupational exposure to trichlorethylene and trichlorethane.

CASE REPORTS

Case 1

A 52-year-old man was admitted because of disabling sclerodactyli with nail fold capillary changes, scleroderma of hands and forearms, and Raynaud's phenomenon, developed during the previous 18