

PSORIATIC AND "UNAFFECTED" SKIN

A Scanning Electron Microscope Study of Adjacent Sites

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Abstract. Scanning electron microscopic examination of psoriatic and clinically unaffected skin immediately adjacent has revealed different patterns of cellular structure and configuration. These variations support a concept that the intercellular adhesion of psoriatic skin differs from the normal. The altered configuration also suggests an increase in the intercellular space between stratum corneum cells which may alter the barrier function of this layer of cells in psoriasis.

The dimensions of the normal horn cell (corneocyte) of human stratum corneum suggest that the microtopography of this cell layer should be examined most advantageously in the horizontal plane. Wolf (9) made this procedure easily possible when he introduced a technique using cellophane tape to strip away very thin layers of skin. These preparations could then be examined directly by light microscopy.

New tools demand new methods and the availability of the scanning electron microscope (SEM) required an improved technique to obtain full advantage of the microscope's properties. Marks & Dawber (4) have recently described a method for skin surface biopsy using methacrylate adhesives. This method is ideally suited to the study of the microtopography of skin by scanning electron microscopy because the horn cells and their spatial relationships with contiguous cells are accurately preserved.

Stratum corneum cells obtained from different regions of the body show variations in size and configuration which appear to characterise particular anatomical sites (6). These variations, however, are not precisely delineated and abrupt changes are not normally seen in biopsies from adjacent anatomical sites. It therefore remains

valid to compare the stratum corneum from a psoriatic lesion with the stratum corneum from an immediately adjacent but clinically unaffected site.

This paper describes differences seen on examination by SEM between psoriatic and clinically unaffected skin immediately adjacent to the lesion.

MATERIALS AND METHODS

Patients

Skin biopsies suitable for examination by SEM were taken from 12 male patients (age range 30-58 years). Certain criteria were fulfilled, (a) discrete psoriatic lesions were present on the trunk, interspersed with normal skin (Fig. 1), (b) the psoriasis was untreated at the time the investigation began.

All patients had had previous eruptions of psoriasis but, this apart, all enjoyed good health.

Biopsies

Biopsies were taken from the edges of well defined psoriatic lesions so as to include both manifest psoriasis and clinically unaffected skin (Fig. 2). After cleaning the selected site with surgical spirit an SEM metal stud (12 mm diameter) covered with a thin layer of cyanacrylate clear contact cement ("Permabond") was pressed firmly on the site for about two minutes. On withdrawal, a thin layer of stratum corneum adhered to the stud. After drying in air for 24 hours the specimens were coated with a uniform layer of gold/40% palladium 20 nm thickness in an A.E.I. Vacuum Coating Unit MC 9 and examined in the SEM (Stereoscan, Mark IV, Cambridge Instrument Co., England).

OBSERVATION AND DISCUSSION

When the term "unaffected skin" is used to describe the appearance and status of some skin of a patient with psoriasis, it does not mean that

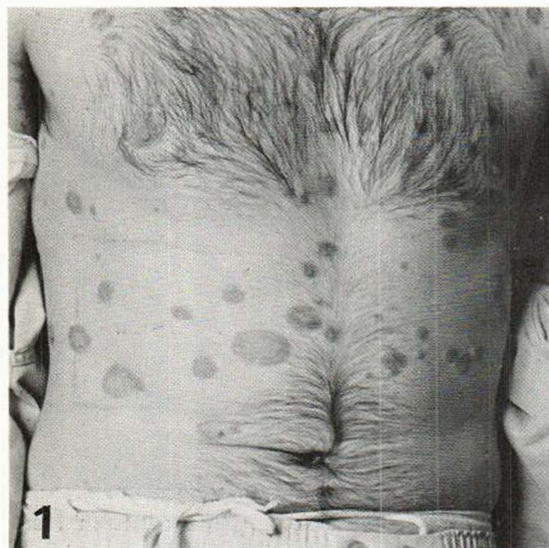


Fig. 1. Photograph showing trunk affected by psoriasis. Characteristic, well defined lesions are interspersed with clinically unaffected skin.

the skin is "normal" because there are at present no means available for detecting a psoriatic diathesis. In this context the term "unaffected skin" can only indicate that the skin is free from psoriatic stigmata.

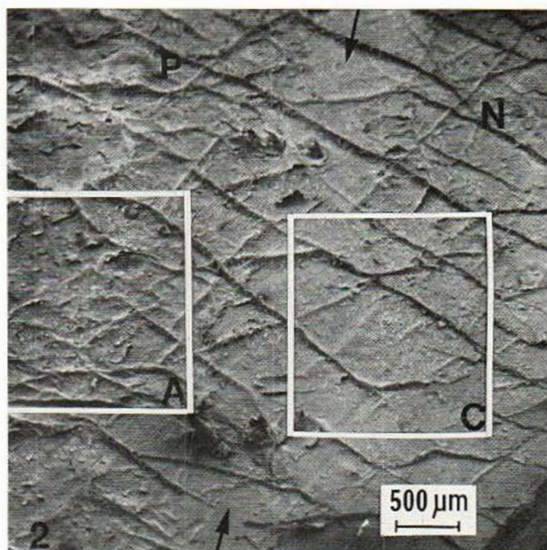


Fig. 2. Scanning electron micrograph of skin surface biopsy. The "edge" dividing psoriasis from unaffected skin is roughly central (arrowed). Psoriatic skin (P) is shown on the left and unaffected skin (N) on the right ($\times 16.3$).

The sheet of cells removed by the cyanacrylate adhesive resin is not restricted to a monolayer but ranges from one to several layers in thickness. Inter-cellular spatial relationships are preserved

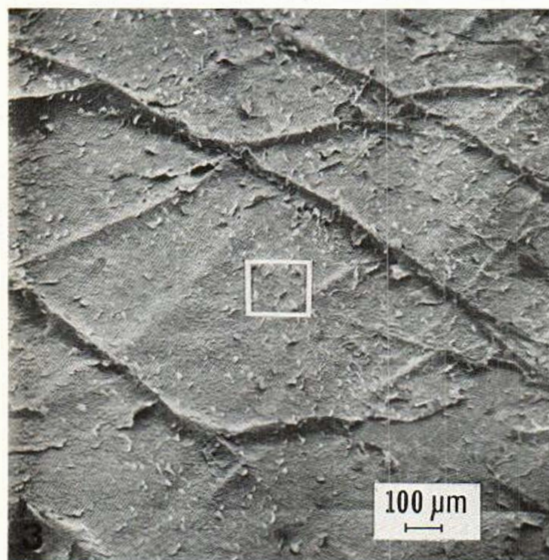


Fig. 3. Scanning electron micrograph of skin surface of unaffected skin. Field examined indicated in Fig. 2 by window (C) ($\times 40$).

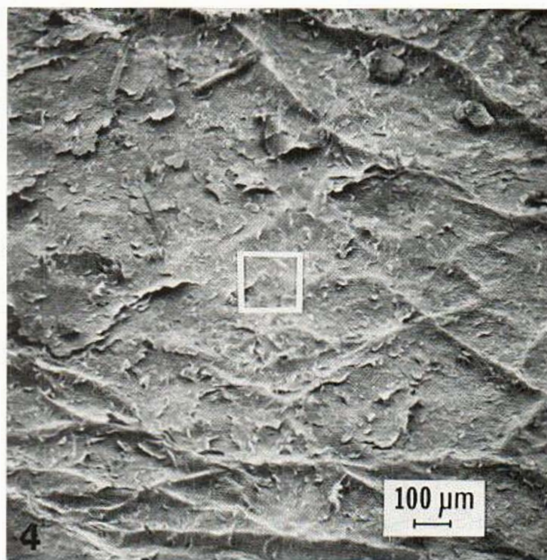


Fig. 4. Scanning electron micrograph of skin surface affected by psoriasis. Field examined indicated in Fig. 2 by window (A) ($\times 40$).

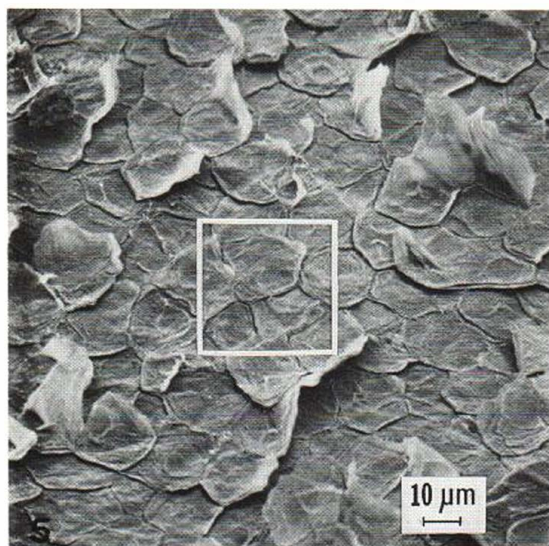


Fig. 5. Scanning electron micrograph of surface of unaffected skin. Window in Fig. 3 indicates field examined. Stratum corneum cells are uniform in appearance and size and show well defined margins ($\times 410$).

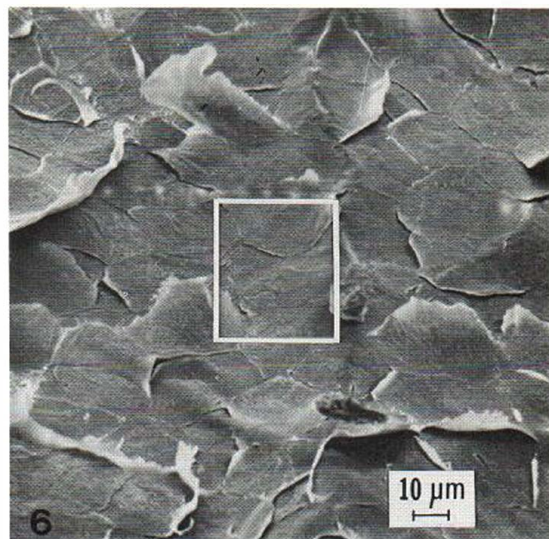


Fig. 6. Scanning electron micrograph of surface of psoriatic skin. Window in Fig. 4 indicates field examined. Cell margins tend to fold and are ill-defined ($\times 410$).

and these relationships are more obvious in the unaffected skin, being defined by smooth, straight intercellular junctions of the polygonal and hexagonal stratum corneum cells (Fig. 5).

Certain features distinguish the scanning electron microscopic appearance of psoriasis from unaffected skin. There is a loss of normal ridge pattern (Figs. 3 and 4) and alterations in the size and homogeneity of the stratum corneum cells

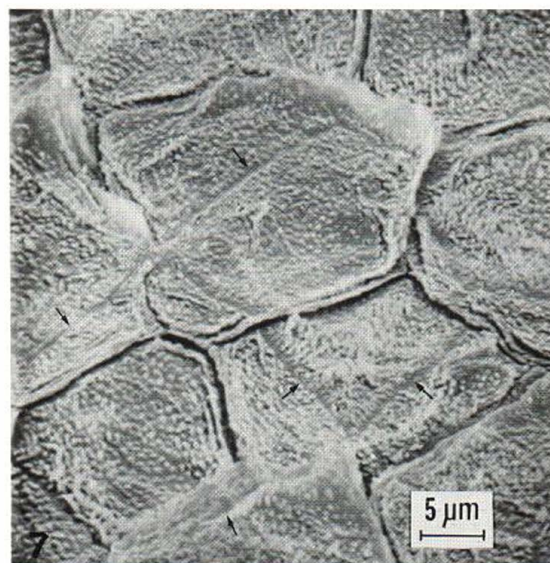


Fig. 7. Scanning electron micrograph of surface of unaffected skin. Imprints of deeper cell boundaries are shown (arrowed) and overlap. Window in Fig. 5 indicates field examined ($\times 1630$).

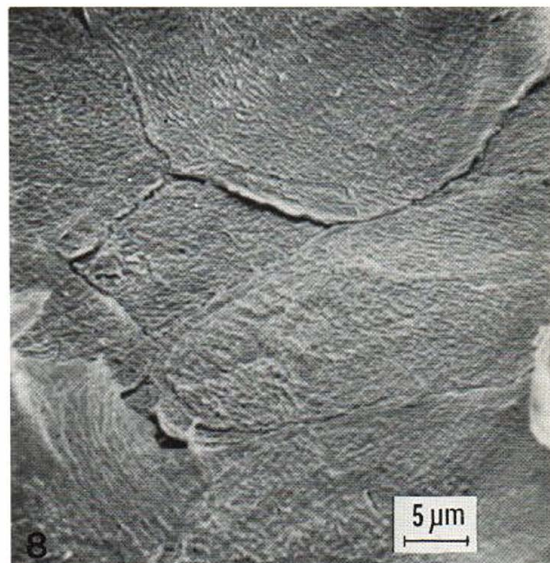


Fig. 8. Scanning electron micrograph of surface of psoriatic skin. Cells vary in size. Window in Fig. 6 indicates field examined ($\times 1630$).

(Figs. 5, 6, 7 and 8). Psoriatic cells exhibit a pronounced thinning of the cell margins, presenting an appearance of overstretched envelopes with free edges. The margins of these cells show a proclivity to folding, thereby suggesting some alteration in intercellular adhesion.

In a critical re-examination of epidermal turnover times, Halprin (2) concluded that the time needed for replacement of the Malpighian compartment of normal and psoriatic skin is much longer than the commonly accepted values. This indicates that the excessive production of scale characteristic of psoriasis may in part be due to a failure of the epidermal shedding mechanism and an alteration of intercellular adhesion.

The extensive overlapping of the thinned, free margins of psoriatic cells would tend to enlarge the intercellular spaces in the keratin layer and alter the barrier function of the stratum corneum. An enhanced rate of penetration of zinc chloride and testosterone through psoriatic stratum corneum compared with normal epidermis has been demonstrated (3, 7).

Stratum corneum cells show prominent villous elevations (Figs. 7 and 8) on their surface. Goldschmidt & Kligman (1) considered these elevations to be attachment sites of desmosomes which are specialised areas on opposing cells essential for the maintenance of cell contact and adhesion (8). The arrangement of the villous elevations appears more regular on the unaffected cell surface and their size (about 0.3 μm in diameter) frequency and location are consistent with the site of desmosomes (5).

The significance of these changes and their possible reversal during the treatment of psoriasis is now under active investigation.

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