

A SUGGESTED MODE OF PIGMENT TRANSFER INTO THE DERMIS

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Abstract. By the electron microscopical examination of skin specimens from a case of Bloch-Sulzberger syndrome and from two cases of Xeroderma pigmentosum, dendritic processes of melanocytes were observed below the basement membrane. One such dendrite was observed in the process of being phagocytosed by a dermal macrophage. It is suggested that this is the normal means of passage of melanin into the dermis.

The mechanism of transfer of melanosomes from melanocytes to keratinocytes within the epidermis has been much studied and there now remains little doubt that this is effected by cytophagocytosis, that is, the ingestion of the melanosome-containing terminal portion of the dendritic process of a melanocyte by a keratinocyte (1, 6).

On the other hand, the method by which melanin enters the cells of the dermis has received scant attention. Various mechanisms have been suggested; these include the engulfing of effete melanocytes by dermal macrophages (2) and also the postulated existence of dermal melanocytes (4). Unfortunately, there is little concrete evidence in the normal skin for these propositions.

Wong et al. (5) showed that in the pigmented papule phase of incontinentia pigmenti (Bloch-Sulzberger) the dendritic process of the essentially epidermal melanocyte was capable of crossing the basement membrane and penetrating into the dermis. It was therefore decided to examine in the electron microscope specimens of skin from patients suffering from diseases in which there is known to be active deposition of pigment in the dermal macrophages. The conditions chosen were again the pigmented papule phase of incontinentia pigmenti (Bloch-Sulzberger) (I.P.) and the deeply pigmented macule of Xeroderma pigmentosum (X.P.) (3).

MATERIAL AND METHODS

Case 1. A papule with surrounding erythematous skin was obtained from the chest of a girl of 9 months still in the active pigmented papule phase of I.P.

Case 2. A deeply pigmented macule was taken from the area of the anterior axillary fold of a boy aged 11 years suffering from classical X.P.

Case 3. A deeply pigmented macule was taken from the lateral chest wall of another boy, aged 8 years, suffering from classical X.P. (the younger brother of case 2). The specimens were fixed in 3% glutaraldehyde in phosphate buffer for 2 hours, washed in phosphate buffer for 5 min and transferred to phosphate buffer with 5% sucrose for storage at 4°C. Later, the specimens were post-fixed in 1.5% osmium tetroxide, washed in distilled water and stained in 5% uranyl acetate. They were then dehydrated in increasing concentrations of alcohol and embedded in Epon 812. Sections were cut with glass knives on a Reichert Ultramicrotome, stained on the grids with Reynolds lead citrate and examined in a Philips 300 M electron microscope.

RESULTS

In all specimens, dendritic processes of melanocytes were observed below the basement membrane (Fig. 1). In one instance in case 2 (X.P.), it was possible to see the dendritic process actually piercing the basement membrane (Fig. 2). In the case of I.P., electron micrographs have been obtained showing the terminal portion of a dendritic process being phagocytosed by a dermal macrophage (Figs. 3, 4).

DISCUSSION

The above observations, linked with the evidence of Wong, show that in these two dissimilar diseases the dendritic processes of melanocytes are capable of passing through the basal lamina into the dermis. The electron-micrographs obtained in



Fig. 1. Incontinentia pigmenti. The tip of a dendritic process (D), containing melanosomes (M), in the dermis. The proximal portion of the dendritic process has passed

out of the plane of the section. Basement membrane (B). $\times 16\,400$.

the present case of I.P. suggest that dermal macrophages are capable of ingesting the terminal portion of the dendritic process in the same manner as keratinocytes.

Other methods of pigment transfer into the dermis may exist. In I. P., Wong showed melanosomes lying free in the dermis. It would not be unreasonable to suppose that these were destined to be phagocytosed by dermal macrophages. The fact that in these two dissimilar con-

ditions the same mechanism appears to be at work suggests that this may well be the normal method of transfer. As the passage of pigment into the dermis is an infrequent event in normal adult skin it will only be infrequently observed by electron-microscopy. On the other hand, in both the conditions used in the present model there is very active deposition of pigment in the dermis and subsequently our chances of observing the mechanism are greatly enhanced.

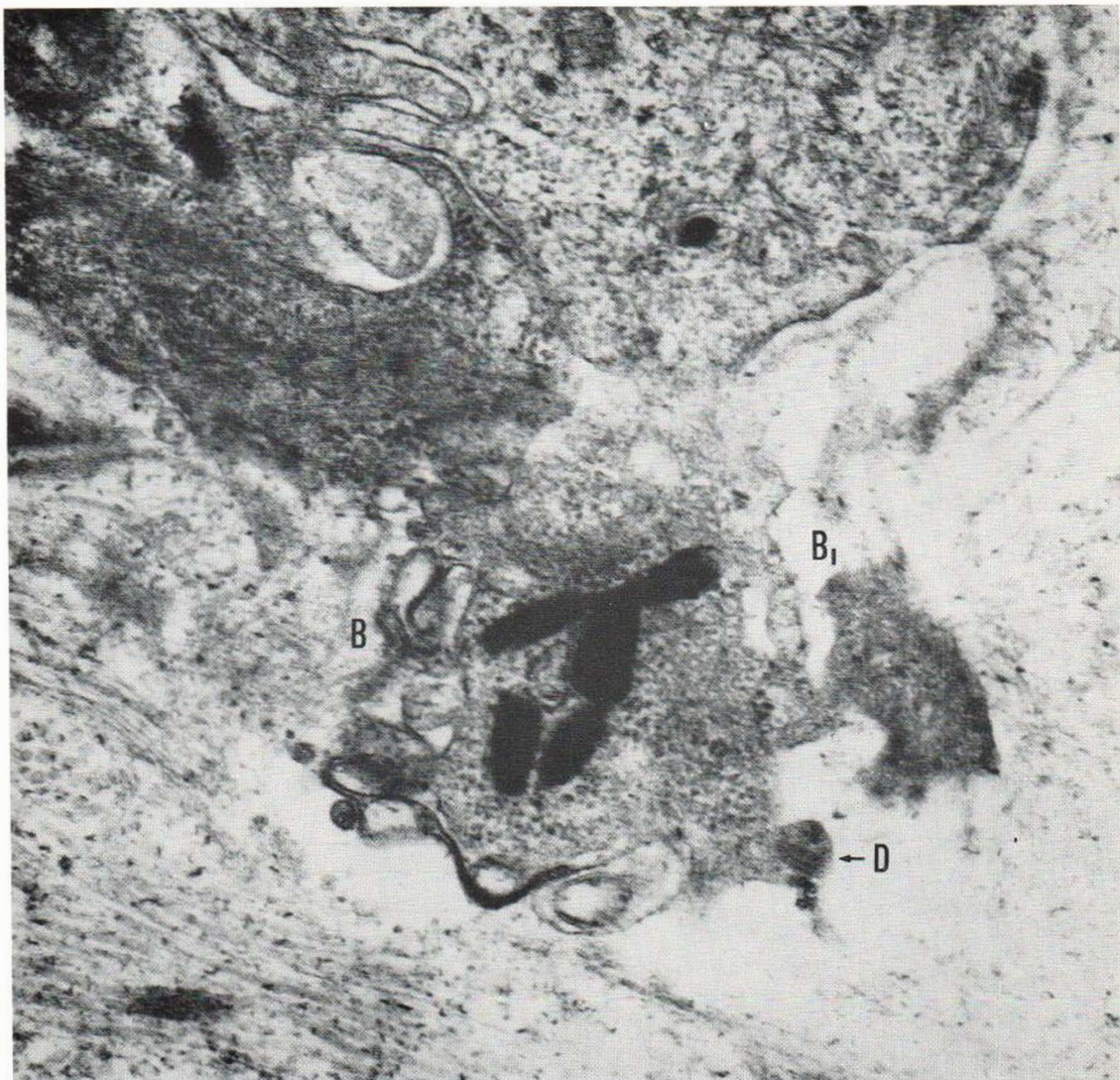


Fig. 2. Xeroderma pigmentosum (case 2): The dendritic process of a melanocyte (D) containing melanosomes pass-

ing into the dermis through a breach in the basement membrane (B-B₁). $\times 34\,000$.

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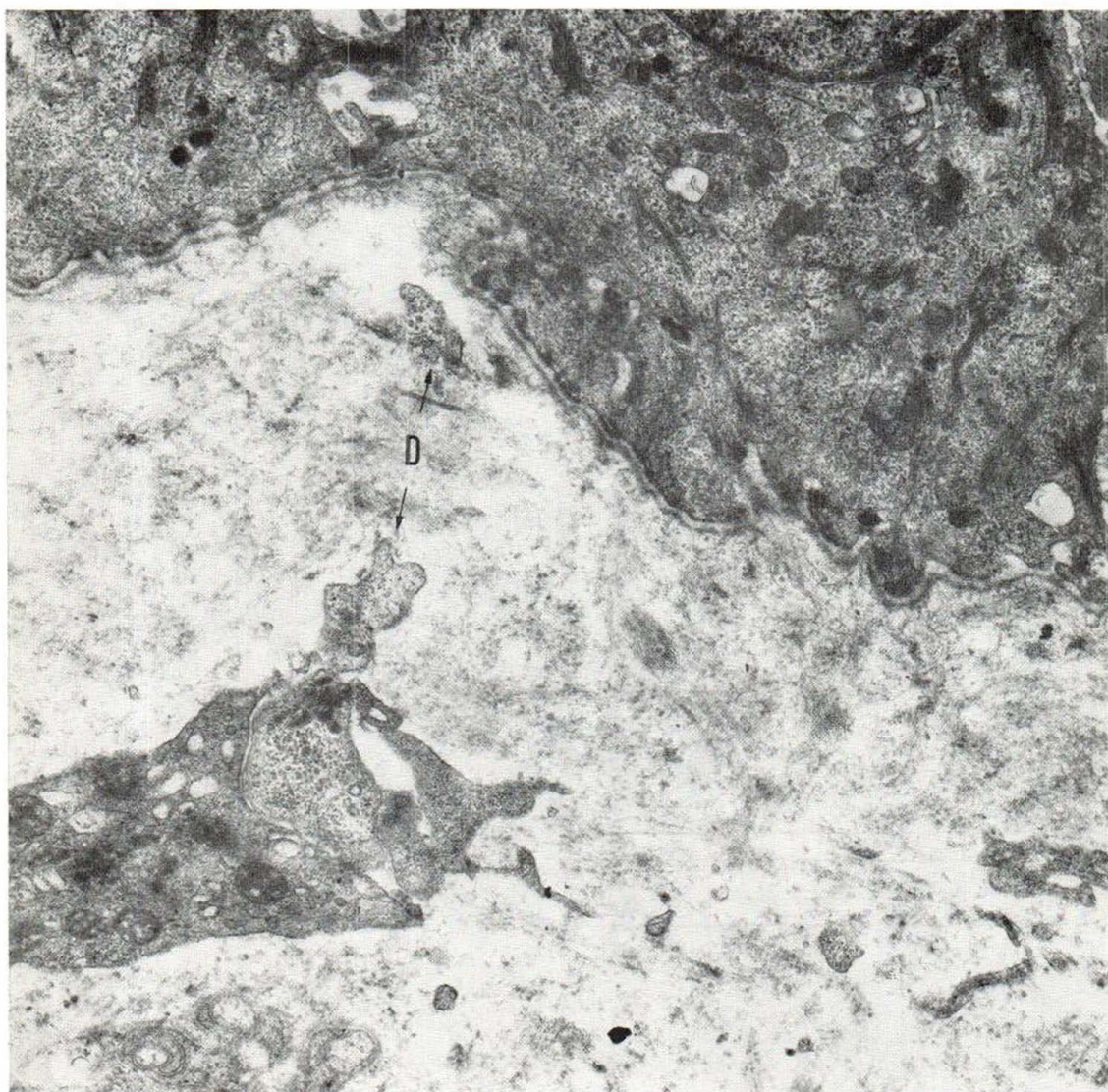


Fig. 3. Incontinentia pigmenti. The dendritic process of a melanocyte (D), containing melanosomes, undergoing cytophagocytosis by a dermal macrophage. The dendritic process passes in and out of the plane of the section $\times 12\,800$.

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Fig. 4. Incontinentia pigmenti. High magnification of part of Fig. 3 showing detail of the relationship between the

dermal macrophage (P) and the tip of the dendritic process (D). Melanosomes (M). $\times 28\,800$.