Merkel Cells Express Desmosomal Proteins and Cytokeratins

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Indirect immunofluorescence experiments performed on various mammalian tissues rich in Merkel cells show that these cells contain keratin intermediate filaments and desmosomal proteins, which demonstrates their epithelial nature. Although they share desmosomes with neighbouring keratinocytes, Merkel cells differ from them, since they contain keratin polypeptides usually found in simple epithelia. In that respect, Merkel cells resemble fetal keratinocytes.

Key words: Skin; Intermediate filaments; Keratinocytes.

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The embryonic origin of Merkel cells (MC) is still controversial, but two main hypotheses have been proposed. According to the first one, MC would be derivatives of the neural crest, while, according to the second, they would derive from the epidermis (1). Intermediate filaments are excellent markers to identify cell types, since their polypeptide composition is specific of each type of tissue (2). For example, epithelial cells contain keratin polypeptides, while neurons contain neurofilament proteins.

We recently reported (3, 4) that MC were specifically labelled by a monoclonal antibody, Troma-1 (5) recognizing a basic cytokeratin found in simple epithelia and fetal skin, i.e. component 8 of the Moll catalogue (6), but did not contain neurofilaments, and concluded that MC are probably of epithelial rather than of neural origin. These observations were recently confirmed by others (7, 8). In the present paper, we show that MC also contain acidic keratins found in simple epithelia and fetal skin, but not the keratin polypeptides specific of adult keratinocytes. We thus conclude that MC are epithelial cells similar to fetal keratinocytes.

Table I.

(-): Negative; (+) to (+++): increasing intensity of labelling. MC = Merkel cells; BK: basal keratinocytes; SBK: suprabasal keratinocytes. * = Dr M. Steinberg, Princeton, New Jersey, USA. Personal communication. ** = Dr H. Eto, Detroit, Michigan, USA. Personal communication

<table>
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<th>Antibodies and corresponding references</th>
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<td>M.C.</td>
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<tr>
<td>TK (15)                                      Epidermal keratins</td>
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<tr>
<td>67 K (16) (PAb)                              Component 1</td>
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<td>EndoB (11) (PAb)                             Component 18</td>
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<td>KG 8/13 (13) (MAb)                          Components 1, 5, 6, 7</td>
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<td>KL 1 (14) (MAb)                              Components 1, 10</td>
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<td>Troma-1 (15) (MAb)                          Component 8</td>
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<td>Troma-3 (5) (MAb)                           43 kD, acidic</td>
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<td>LE 61 (12) (MAb)                            41-43 kD, acidic</td>
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<tr>
<td>B 11-1** (PAb)                              Desmoplakin and desmogleins</td>
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<tr>
<td>HK 1** (MAb)                                 Desmoplakin</td>
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MATERIALS AND METHODS

The following tissues were processed for indirect immunofluorescence: rabbit lip, pig snout, human gingiva, and human finger tip skin; rabbit epidermal sheets were prepared with EDTA (9). Staining was performed using standard procedures on 4 µm cryostat sections or on epidermal sheets. MC were identified by labelling with monoclonal human immunoglobulins Pr 1 h (10). Table I lists the specificities of polyclonal (PAb) and monoclonal (MAb) antibodies reacting with desmosomal and keratin proteins. Whenever possible, the Moll classification of human keratins was used. Negative and positive controls for each antibody were included in all experiments.

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Fig. 1. TROMA III-positive Merkel cells in rabbit lip.

Fig. 2. Desmosomes of Merkel cells. Double labelling with Pr 1 h and anti-desmosome MAb (HK 1). (A) Merkel cells detected by Pr 1 h antibody. (B) Desmosomes are labelled by HK 1 MAb at the surface of all epidermal cells including Merkel cells.
RESULTS AND DISCUSSION

Fig. 1 shows that rabbit lip MC contain a cytokeratin network and establish desmosomal contacts (Fig. 2A, B) with neighbouring keratinocytes. These features allow us to classify MC as epithelial cells. Table I lists the results obtained on rabbit lip with the various antibodies used in that study. Similar results were obtained on pig snout and human gingiva and skin. On EDTA-separated rabbit epidermal sheets, MC could be easily stained and counted. In all tissues examined, MC were found to contain keratin polypeptides usually found in simple epithelia or fetal skin, namely the basic keratin no. 8 recognized by Troma-1 MAb (5), the acidic keratin no. 18 recognized by anti-EndoB PAb (11) and the acidic keratin recognized by Troma-3 (5) and LE61 MAb (12). On the other hand, antibodies reacting with polypeptides found in adult keratinocytes such as MAbs KG 8.13, reacting with components 1, 5, 6 and 7 (13) and KL1, reacting with components 1 and 10 (14), did not label MC.

These results suggest that MC are of epidermal origin and are similar to fetal keratinocytes.

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Functional and Morphological Analysis of the Horny Layer of Pityriasis alba

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The affected skin of pityriasis alba showed functional defects in both hygroscopicity and water-holding capacity detectable by water sorption-desorption test. Furthermore using skin surface biopsy technique in 5 patients, we noted that the mean area of corneocyte obtained from the affected skin of pityriasis alba was smaller and that the surface of that area showed a more prominent villous pattern than the adjacent normal skin in scanning electron microscopical observation. In this study we demonstrated the abnormalities of the horny layer in pityriasis alba, which suggest that the condition is similar to a dermatitic change and that its hypopigmentation may be due to postinflammatory mechanisms. Key words: Water sorption-desorption test; Skin surface biopsy. (Received September 19, 1984.)

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Pityriasis alba has been considered a non-specific dermatitis of unknown origin, possibly related to dryness of the skin (1). Its hypopigmentation has been attributed to postinflammatory changes, i.e. ultraviolet screening effects of the hyperkeratotic and parakeratotic epidermis and possibly to a reduced capacity of hypermetabolic epidermal cells to take in melanin granules (2, 3).

Recently there was a histochemical and ultrastructural study demonstrating that in extensive pityriasis alba in adults, hyperkeratosis and parakeratosis were not consistently present and that hyperpigmentation may thus be primarily due to the reduced numbers of active melanocytes and a decrease in number and size of melanosomes in affected skin (4). However, no detailed histochemical and ultrastructural study of classical pityriasis alba has been performed because of the facial localization of lesions predominantly in children. Therefore, we have tried to elucidate whether or not the hypopigmentation of classical pityriasis alba on the face in young patients is attributable to postinflammatory changes by functional and morphological analysis of its horny layer in 20 outpatients.

MATERIALS AND METHODS

20 outpatients with pityriasis alba who visited Enshu General Hospital served as subjects for this study. All were children (ages 4 to 14 years) consisting of 12 boys and 8 girls. A history of atopy was found in 12 patients. The lesions were asymptomatic and were distributed only over face. They consisted of dry hypopigmented macules. The surface of the lesions was not rough and there was no