

Facial mapping of stratum corneum capacitance of different ethnic groups

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Objective

Large differences in hydration of the stratum corneum (SC) have been observed on different body sites, especially on different regions of the face. The purpose of this study was to perform a detailed capacitance mapping of the face of subjects of different ethnicities.

Methodology

SC capacitance was measured with a Corneometer CM825 on 30 pre-defined sites of the face (Table 1) of subjects of four different skin ethnicities: Chinese, Caucasians, Indians and Black Africans. As the measurements are highly time consuming we had to enrol a limited number of subjects (four subjects per ethnicity). However, in order to limit the biological heterogeneity we chose young female subjects (21.8±1.1 years) without visual signs of photoaging and all living in the same region (Pretoria, South Africa).

To reduce an inter-individual variation of the measurements a template was used to ensure the same facial site was measured on each occasion (Figure 1). Capacitance maps were generated by combining digital images from Visia-CR and the Corneometer data. An algorithm was developed which automatically detects skin pixels and interpolates a Corneometer value for each of them after superimposing the native Corneometer data on the images. This results in a full continuous color map of SC capacitance on the face of the subjects (Figure 2).



Figure 1: Anterior, oblique and lateral images of 30 predefined measuring points, shown on one selected subject.

Site #	Description of site	Site #	Description of site
01	Forehead, central, upper	16	Nose, apex
02	Forehead, central, middle	17	Nasolabial sulcus, top
03	Forehead, central, lower	18	Cheek, middle, oblique
04	Forehead, middle left, upper	19	Cheek, middle, oblique/lateral
05	Forehead, middle left, middle	20	Cheek, middle, lateral
06	Forehead, middle left, lower	21	Philtrum
07	Forehead, left, middle	22	Nasolabial sulcus, midpoint
08	Forehead, left, lower	23	Cheek, lower, oblique
09	Eyelid	24	Cheek, lower, oblique/lateral
10	Forehead, outer, level with eyebrow	25	Cheek, lower, lateral
11	Nose, bridge	26	Chin, central
12	Under eye, inner corner	27	Jaw, anterior/oblique
13	Under eye, middle	28	Jaw, oblique
14	Outer eye canthus	29	Jaw, oblique/lateral
15	Cheek, lateral	30	Jaw, lateral

Table 1: Description of 30 facial measuring points.

Results

When considering the overall ethnicity and overall facial skin hydration values, capacitance was: Chinese (41.5±3.1) < Caucasians (46.8±1.2) < Indians (51.0±2.7) < Blacks (55.0±1.3). Overall hydration of Black skin was significantly different to Caucasian and Chinese skin (p<0.01). Highest levels were observed for the eye lids, under eye regions and chin, and lowest levels for the top of the nasolabial sulcus and lower cheek. On different areas of the face subtle differences were found, with steep particular gradients within short distances.

Conclusion

Despite the small number of subjects in the study it is obvious, that

- there exist remarkable capacitance gradients even within short distances on the face.
- skin hydration studies need careful designs.
- moisturizing concepts need to consider the different characteristics of various facial anatomical locations as well as the various characteristics of different skin ethnicities.

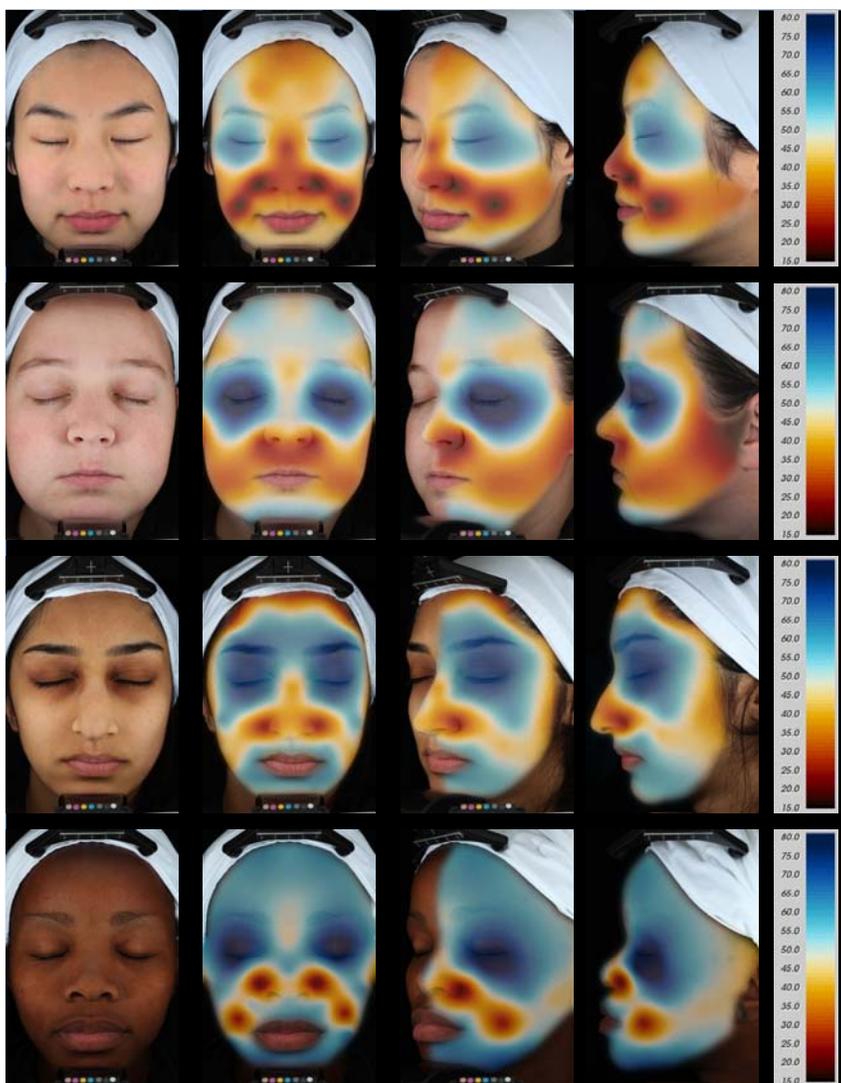


Figure 2: Continuous capacitance color maps of one selected subject per skin ethnicity, mean values of each group, from top: Chinese, Caucasians, Indians, Blacks. Color code for Corneometer values shown on the scales on the right (dark blue = high value, dark red = low value).

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