3D technology: visualization tool of cosmetic activities

Vazquez-Duchêne Marie-Danielle, Gillon Véronique, Freis Olga, Périé Gilles, Gauché Dominique, Zambaux Marie-France and Pauly Gilles

Laboratoires Sérobiologiques, France.

Marie-Danielle Vazquez-Duchêne is a researcher who works in the field of three-dimensional representations in Advanced Imagery & Multimedia Department.

She has a PhD in Biological Engineering and Health.

Various domains like archeology, the motor industry and medicine, search to convert 2D data into 3D data, in order to obtain an increased amount of information, some of which are un-perceptible in two dimensions (2D).

In the cosmetic field, the observation of skin surface is possible today with the microtopography technology (Payonk et al, 1998, Hawkins et al, 2002, 2003). This technology of precision brings a lot of structural and functional information but is unfortunately limited to the surface state of the sample.

It is to exceed these limits and to access the spatial dimension of structures that Laboratoires Sérobiologiques have developed their own 3D imaging tools.

From now on, in the whole of our activities, skin and hair structures are re-created in space in a dynamic way, allowing for visualisation of the effect of a cosmetic treatment, comparing the morphological states before and after treatment.

This visualization of real effects of a cosmetic treatment, as they are perceived by the end user, constitutes a real advance in the demonstration of active ingredients efficacy.

Methods

In the 3D concept, numerous methods allow for the study of the cutaneous morphological properties and thus to penetrate to the heart of cosmetic world. The two main methods we have used are confocal microscopy and the technique of interferometry in vivo (Rohr et al, 2000). Indeed, a 3D object can be created from a series of images obtained with serial topographical sections from reflectance microscopy but also by the fringe projection method of interferometry technique.

We have adapted some applications of these two acquisition systems allowing for stabilization of the effect of our active ingredients by selected views, accurately visualizing the structural modification.

Evaluation of microscopical changes

Whole hair rotation

We present here the hair anti-pollution properties of the active ingredient Puricare® LS 9658. The serial image acquisitions of hair fibers were obtained by reflectance microscopy. All the 2D data were converted to obtain a 3D object able to rotate. As illustrated in figure 1, the particles are visible by a transparency effect on hair after a rotation of 120°. This dynamic representation facilitates the visualization of particles distribution and confirms the reduced adhesion of particles on the hair pretreated with shampoo containing 2% Puricare® LS 9658.

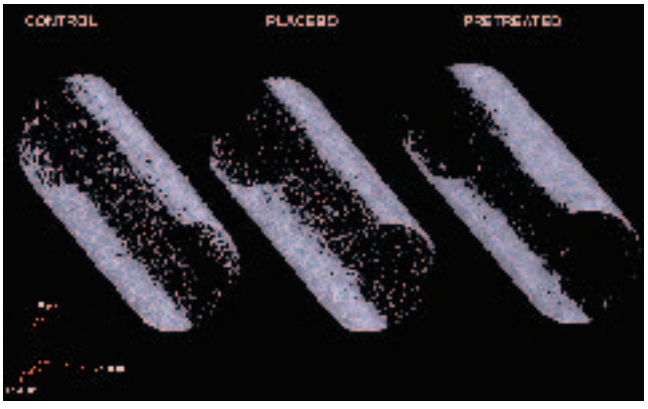

Figure 1: 3D visualization of the hair anti-pollution effect of Puricare® LS 9658 at 2% in a shampoo

Evaluation of interferometric changes

Study of hair surface

Hair surface can be studied by interferometry microscopy. This technique is being used for the first time in the hair field. It allows a fast acquisition of hair surface, a nanometric measurement of its roughness and more precisely the length and aperture of scales. From a 3D representation of a 2D hair, was generated 3D hair data (in grey on figure 2) and 3D shadow data (in red on figure 2). The scales closing appears with a red surface less pronounced after treatment than before and the smoothing effect is well visible on hair surface. The repairing effect of Puricare® LS 9658 at 2% in a shampoo was demonstrated in vivo by this technique. The active ingredient effect can also be visualized by morphing (interpolation between 2 stages of a cosmetic treatment, before and after).

This method of visualization eases the understanding of changes linked to the treatment.