Dr Laurent Sousselier, Caroline Camuzat - Soliance, France

White biotechnology: new source of ingredients

White biotechnology has been used for millennia for the preparation of bread and alcoholic drinks. Sumerians had mastered alcoholic fermentation, for the manufacture of beer, 4,000 years AD.

Nowadays, white biotechnology is used for several applications. In the pharmaceutical sector it is used for the production of antibiotics such as famous Penicillin, and it is used for energy in bioethanol production.

Fermentation is also used as a source of innovation for the production of cosmetic biomolecules, such as dihydroxyacetone (DHA), hyaluronic acid (HA) and coenzyme Q10. This biotechnological process presents many innovation opportunities thanks to the huge biodiversity of the micro-organism kingdom.

Soliance is a French company which has developed cosmetic active ingredients since 1994. It explores the nature's richness to offer innovative ingredients for the cosmetic industry, based on three "pillars": Soliance White (white biotechnology/ fermentation), Soliance Green (plant extraction) and Soliance Blue (blue biotechnology using microalgae).

The company masters development and optimisation of fermentation processes using renewable raw materials, from the laboratory to the industrial scale.

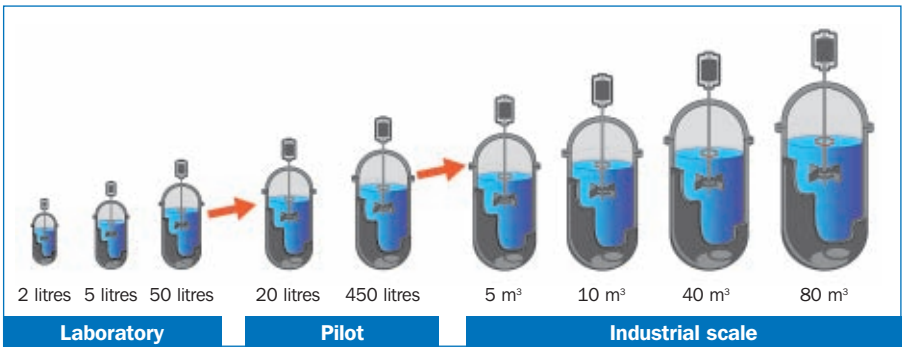

Figure 1: *Fermentation scale up.*

Soliance benefits from the research and development know-how and the industrial equipment of its parent company, ARD.

With its pool of knowledge, Soliance is one of the leading manufacturers for DHA and hyaluronic acid and produces many value-adding cosmetic biomolecules.

Preventing dehydration

A specific microorganism living in the sunflower root area through a symbiosis system has been described by the Pasteur Institute. This *Rhizobium* bacteria is a gram-negative bacteria playing a vital role for the plant in periods of drought. It enables plants to stay alive under the roughest conditions by preventing their roots from becoming dehydrated.

In periods of sufficient rainfall, water abounds in the soil and available in adequate quantity to fulfil the requirement of the plant. In summer or during drought periods, water is no more available to the roots. In this extreme condition, the bacterium synthesises a polymer, forming a moisturising film around the roots,

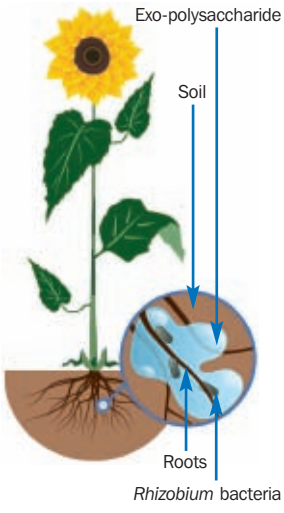

Figure 2: *Sunflower and* Rhizobium *bacteria: a symbiosis system.*

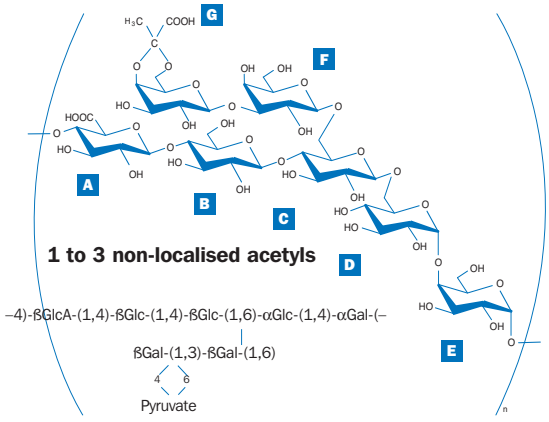

Figure 3: *Structure of the native polymer repetitive unit.*

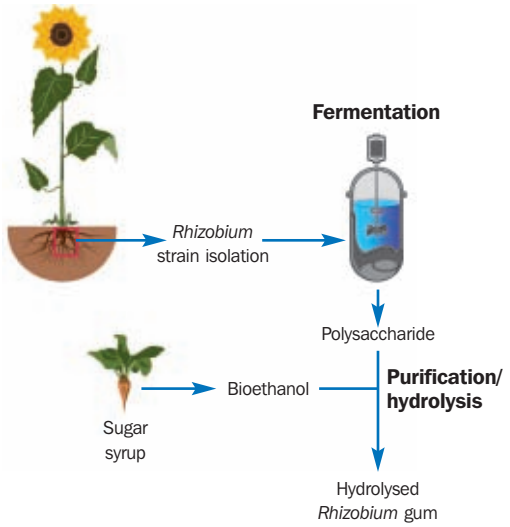

Figure 4: *Biopolymer production process.*

which draws up the water present in a small amount in the soil and concentrates it to keep a sufficient storage for the plant. The polymer also plays an important role in structuring the soil which, deprived of water, has a tendency to lose its consistency.

The remarkable high water binding capacity of this polymer leads Soliance to isolate the secreting bacteria in order to produce the polysaccharide at an industrial level. The production is performed through a biotechnological process, a specific area of knowledge of Soliance. The microorganism used for the process is guaranteed to be a non-GMO strain.

This polymer contains 7 sugars: 1 glucuronic acid (A), 3 carbohydrate residues (B, C and D), 3 galactose residues (E, F and G), pyruvate grouping, 1 to 3 – non-localised acetyl groupings. Since it is between 228 and 3750, the molecular weight of the native molecule is between 300,000 and 5.10^6 g/mol.

The polymer is then hydrolysed through a patented industrial process. At the end

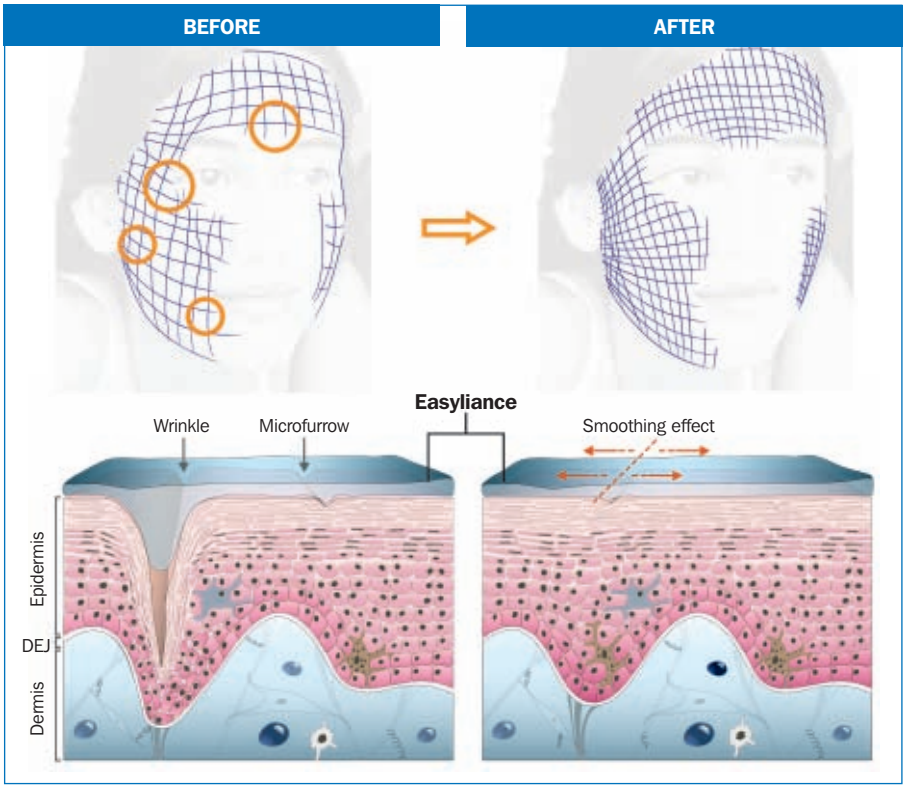

Figure 5: *Mechanism of action.*

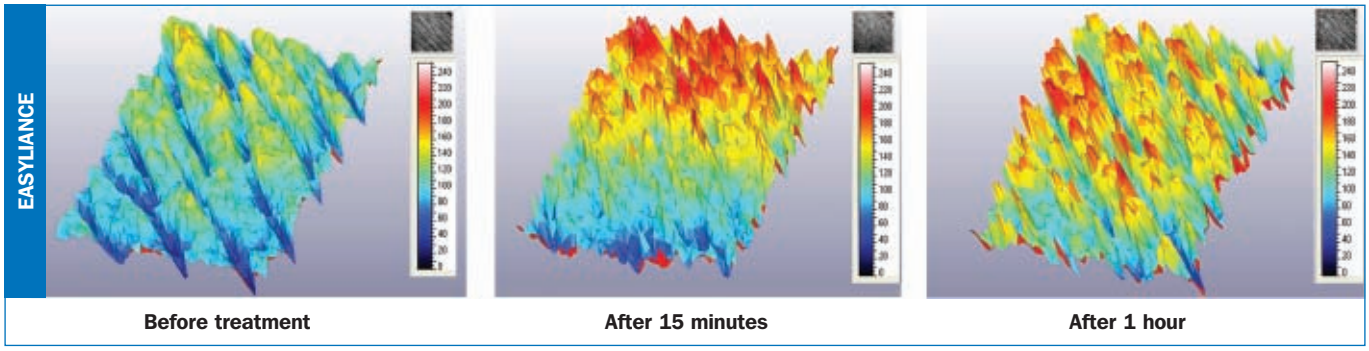

Figure 6: *Effect of Easyliance.*

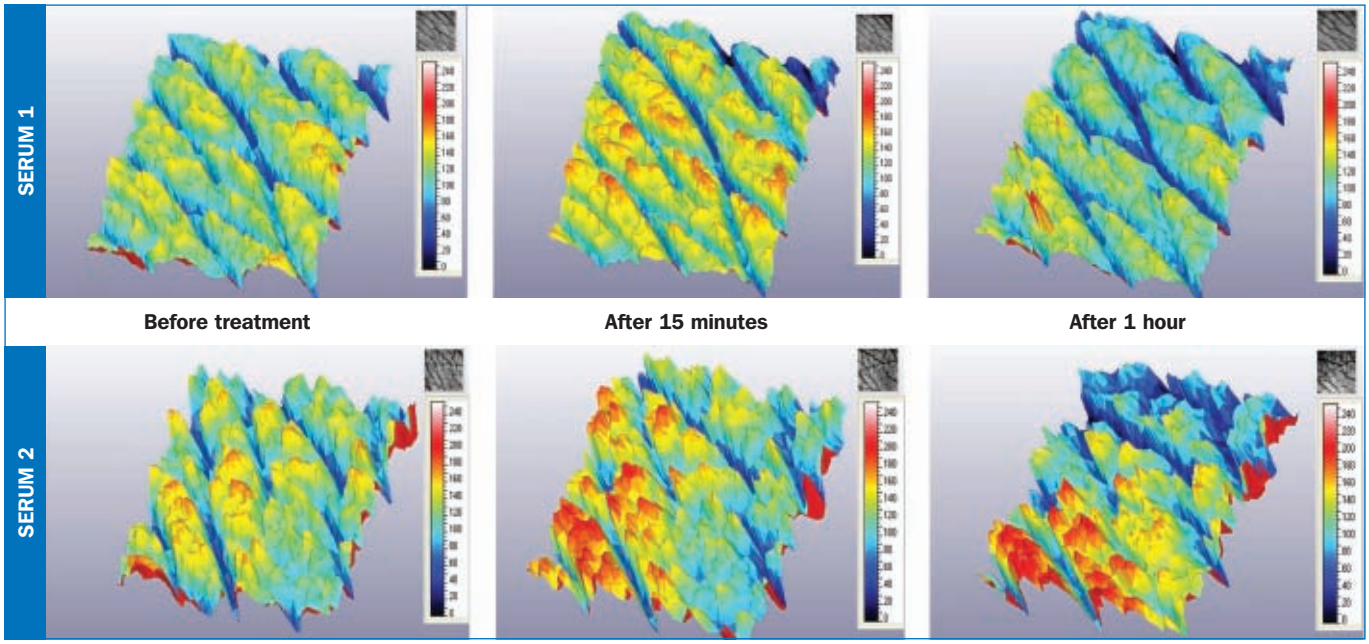

Figure 7: *Comparison of Easyliance effect with two reference serums.*

of the process, its molecular weight is between 20,000 and 60,000 g/mol, corresponding to 15 to 46 repetitive units.

After years of research, Soliance discovered the incomparable synergy of this natural polysaccharide and the Acacia gum. The combination of these two ingredients demonstrated great performance as a flash tensor by tightening the skin within 15 minutes.

New cosmetic active

Easyliance is new cosmetic active which acts as a tensor with immediate effect. It is an optimised blend of hydrolysed polysaccharide and acacia gum, with synergistic action.

Mechanism of action

Easyliance smoothes the skin by mechanical effect, due to both of the polymeric structures. It is adsorbed and spreads out on the skin surface to form a network. When it dries, the Easyliance polymer film retracts and stretches the skin.

The tightening effect leads to a visible and immediate decrease of wrinkle depth. Therefore, the skin appears smoother and younger, and fine lines disappear. The combined action of the polymer and the acacia gum presents an immediate effect on the skin, and, in particular, on facial skin.

The effect is clearly visible, especially on crow's feet and cheeks.

In vivo tests

Protocol: the person chosen for the test applied the cream on the upper side of the hand. The cream contained 3% Easyliance. Evaluation and analysis were performed using a Visioscan VC 98.

Results: a histogram (Fig. 6) shows the distribution of the pixel level of the image. The darkest colours represent the wrinkles of the skin, and the lightest ones correspond to the skin micro-relief basal level.

The more we increase the number of pixels, the more we repulp the wrinkles, the more we smooth the skin. The bluer the shade the more uneven the skin is. A red/yellow shade indicates a smoothing of the skin.

At 3%, Easyliance lifts up the skin wrinkles as it may be observed in the images. The effect is visible as soon as 15 minutes after application and is optimum after 1 hour.

The Easyliance effect was compared with two reference serums on the market (Fig. 7). A serum with 3% Easyliance outperforms other commercially available serums.

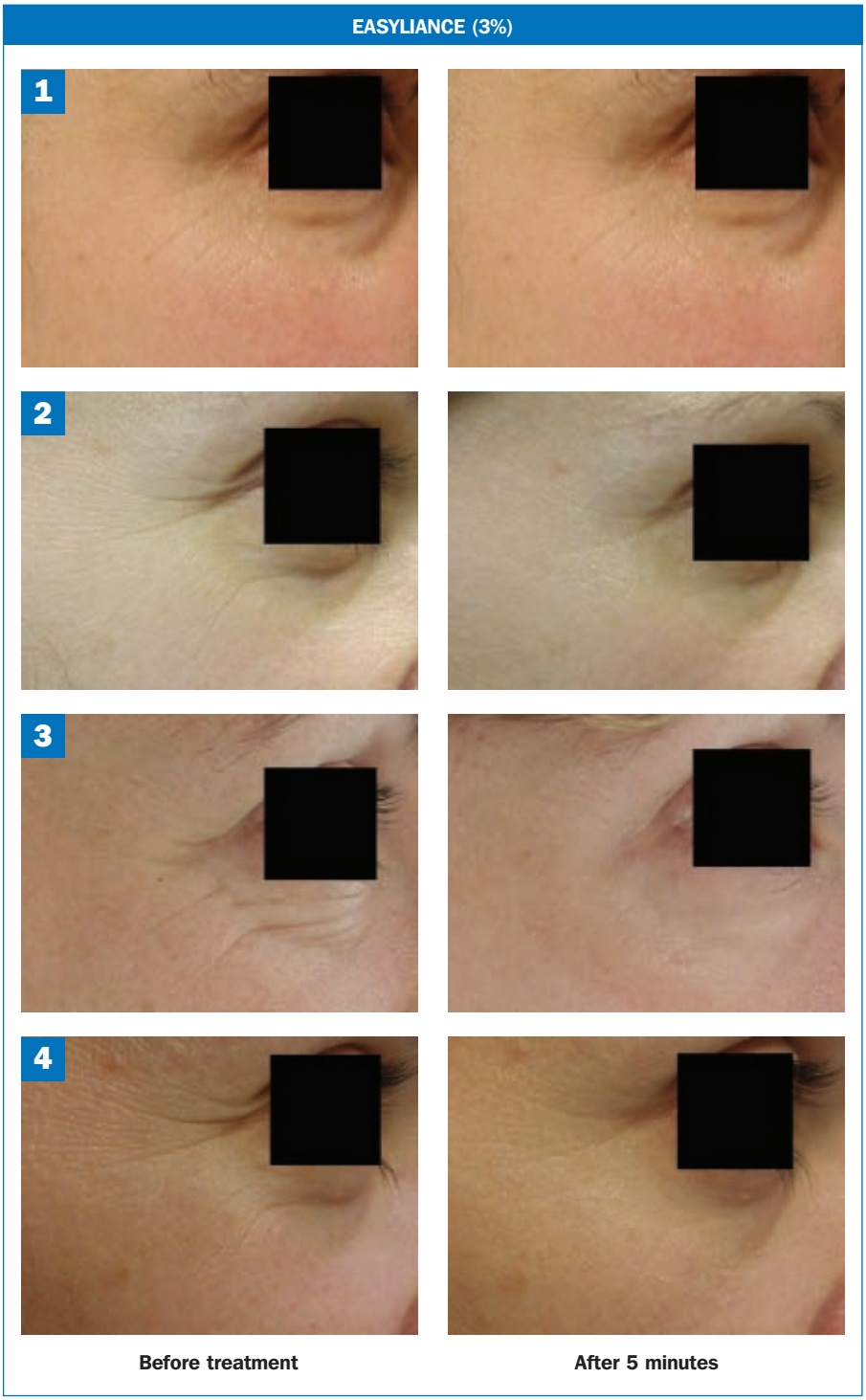

Figure 8: *Photographs of the effect of Easyliance in serum on the crow's feet area of 4 panellists.*

Crow's feet test

In order to illustrate the effect of Easyliance at 3% in a serum, photographs of crow's feet of a panel (12 volunteers) were taken with a digital camera (Canon EOS 400D, Macro zoom EF-S 60/2.8) (Fig. 8). The left side represents the local area before application and the right side corresponds to the same area to 5 minutes after application and drying of the product. The digital camera enabled the taking of macrophotographes that highlight the crow's feet area of the panellists' faces.

Conclusion

White biotechnology allows Soliance to develop polymers with unique cosmetic properties. Easyliance is an example of how a smart combination of a polysaccharide with a natural gum can lead to an astonishing tensor.

As it starts from renewable materials and does not rely on fossil resources, White biotechnology holds many promises for sustainable development and will continue to bring many innovations to the personal care industry. PC