FROM PHYTOTENSORS TO A NATURAL, PROTECTIVE AND LIFTING SECOND SKIN FILM

FEEDBACK FROM 30 YEARS OF SILAB'S EXPERTISE

Pauline Rouaud-Tinguely, David Boudier, Sandrine Peyrat-Kaczorowski, Michel Dana, Brigitte Closs,
SILAB R&D, Saint-Viance, France

Following the launch of FILMEXEL®, SILAB recounts the history of its technological expertise in the field of phytotensors used in the cosmetics industry.

A major goal of today's consumers is to eliminate the visible signs of age, in particular in terms of immediate and long-lasting results. Lifting tensor ingredients fulfill these criteria and so are indispensable components of cosmetic anti-aging formulations. The molecules composing their 3-dimensional meshwork form a large number of bonds with the skin, becoming adsorbed to its surface to provide smoothing and lifting effects, that are immediately visible and felt **(1)**.

The high molecular weight of bovine serum albumin (about 66 kDa) is why it has long been used as a tensor **(2)**. At the time of the mad cow disease crisis, SILAB's pioneering vision and foresight anticipated the interdiction of animal products in cosmetic formulations: the era of the natural tensor of plant origin, or phytotensor, was born.

SILAB'S PHYTOTENSORS

According to the initial criteria of SILAB, the viscoelastic characteristics of phytotensors were required for them to form a transparent and non-sticky film that perfectly fits the skin and whose immediate and long-lasting lifting effect was scientifically demonstrated.

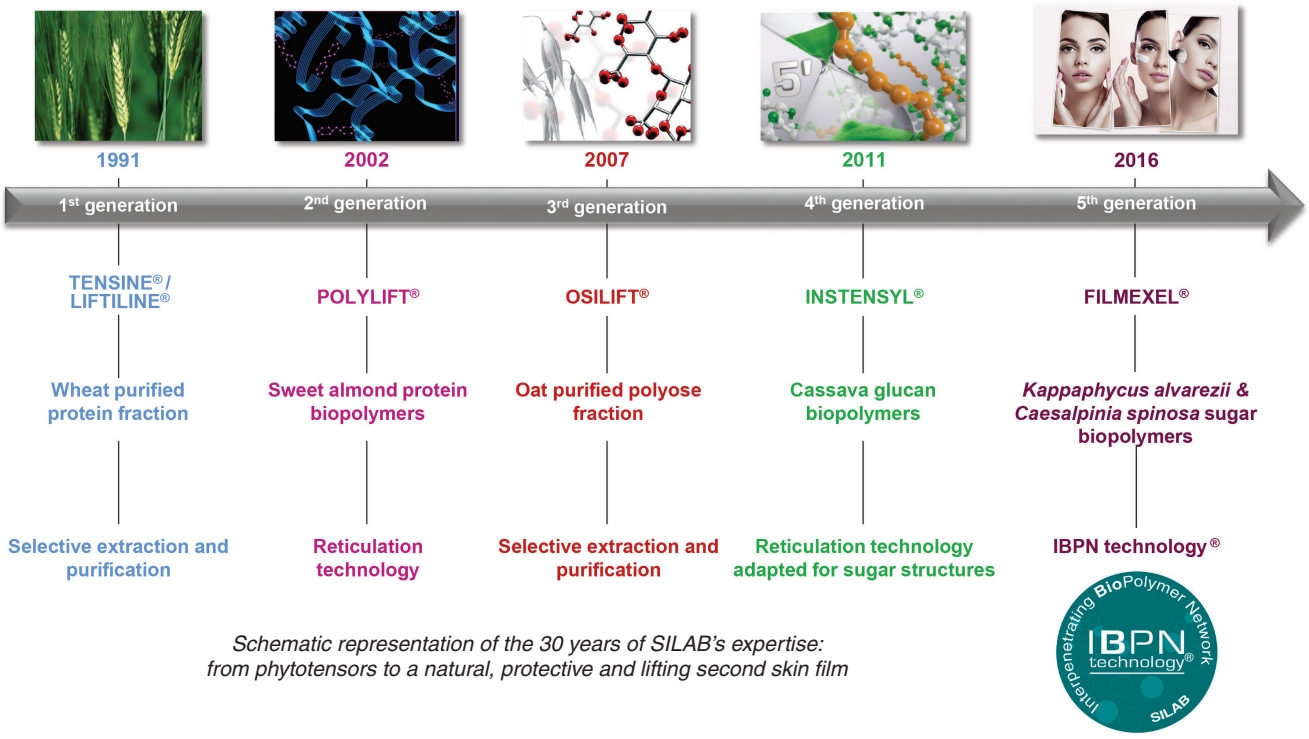
At each stage of development there was the additional goal of augmenting the cosmetic benefits of phytotensors at the same time as improving their formulation capacities and sensoriality. This is why SILAB's innovation is based on its unique ability to combine each new generation of phytotensors with a new technology.

The lifting capacity of plant proteins

TENSINE® was SILAB's first generation of plant tensors launched on the global cosmetics market. This active ingredient was obtained using a highly selective extraction and purification technology that enhanced the intrinsic viscoelastic properties of wheat proteins. Their tertiary structure was maintained, thereby ensuring the formation of a film that was both resistant and elastic.

The use of TENSINE® in fact reduces the number and depth of wrinkles, improves radiance of the face, increases make-up long-lasting effect and provides exceptional softness to the feel of cosmetic products.

Wheat proteins were also used to develop LIFTILINE®, an active ingredient with an immediate tensor effect in the form of a reduction of roughness of the microrelief and an improved skin tone.



Schematic representation of the 30 years of SILAB's expertise: from phytotensors to a natural, protective and lifting second skin film

Visual of LIFTILINE®

Biopolymerization potentiates the tensor effect of plant proteins

Encouraged by its previous success rate, SILAB profited from new chemical polymerization techniques to transpose them to natural active ingredients in order to augment the efficacy of its phytotensors.

In the early 2000s, SILAB developed POLYLIFT® and patented a new technology: biopolymerization of plant proteins. The value of this technology is that it boosts the tensor and lifting effect of monomers at the same time as retaining their high solubility in aqueous media and thus their ease of formulation **(3)**. The biopolymerization of proteins in fact increases their hydrophobic character, thereby extending interactions between the biopolymers obtained and cutaneous lipids to intensify the tensor effect. This state of the art technology is based on two essential factors:

- total control of the extent of enzymatic hydrolysis that has a direct effect on the size and structure of the monomers obtained;
- the intensity of subsequent cross-linking.

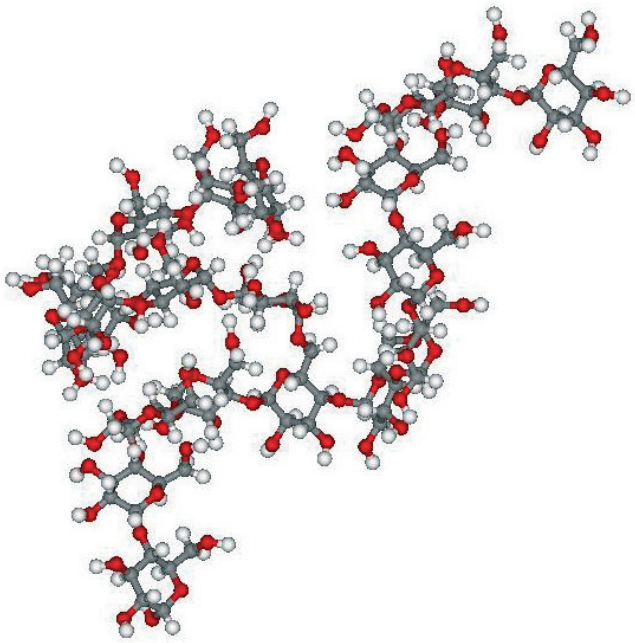
Sweet almond, natural raw material of POLYLIFT®

POLYLIFT® is a high molecular weight (> 500 kDa) biopolymer obtained by cross-linking selected monomers resulting from the controlled enzymatic hydrolysis of sweet almond proteins. POLYLIFT® forms a microrelief-smoothing film on the surface of the skin to provide an immediate anti-wrinkle effect. The skin appears more tonic, more radiant and younger **(4)**.

Natural polysaccharides used for phytotensors

SILAB decides to use the well-known film-forming properties of new molecular structures little used beforehand to prepare phytotensor active ingredients: sugars, also called polysaccharides. OSILIFT® is a purified fraction of natural oat polysaccharides obtained by the use of several selective, mild and non-denaturing fractionation and purification steps. The large number of hydroxyl functions on sugars on these polysaccharide chains creates hydrogen bonds with lipids of the *stratum corneum*. OSILIFT® thereby adsorbs to the skin surface to form a lifting film whose cosmetic benefits have been assessed using three different approaches **(5)**:

- sensorial: immediate tensor result;
- instrumental: long-term anti-wrinkle action;
- aesthetic: increased make-up long-lasting effect.



Modeling the structure of OSILIFT® - visualization of the unit component

When biopolymerization is applied to natural polysaccharides

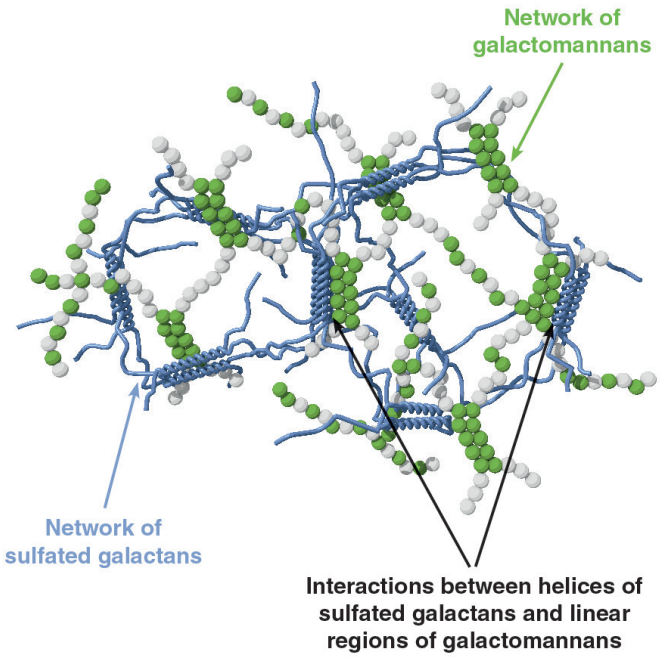
SILAB transposed its experience with the biopolymerization of proteins to sugar monomers. Enzymatic hydrolysis and the size and structure of the resulting monomers, as well as the extent of subsequent cross-linking of polymers were fully adapted to the structure of polysaccharides.

The synthesis of sugar biopolymers was behind the development of INSTENSYL®, underlining the launch of the 4th generation of SILAB's natural phytotensors. Obtained from cassava (manioc), INSTENSYL® is a cross-linked network of polysaccharides with elevated viscoelastic properties. It rapidly forms a resistant, cohesive and highly flexible film on the surface of the skin. The smoothing anti-wrinkle action is immediate and long-lasting (from 30 minutes to 4 hours after application) **(6)**.

Cassava, natural raw material of INSTENSYL®

IBPN technology®, a breakthrough innovation

In order to impart a new dimension to their natural polymers, SILAB researchers benefited from recent progress in the development of interpenetrating polymer networks (IPN), a method that combines the beneficial properties of several polymers. In this way, they developed an avant-garde technology IBPN technology® *(Interpenetrating BioPolymer Network Technology)*. This breakthrough innovation involved obtaining a network of galactomannans from *Caesalpinia spinosa* (Peruvian spiny holdback) and a network of sulfated galactans from *Kappaphycus alvarezii* (elkhorn sea moss, a red alga). These two simple networks of biopolymers are then mixed in standardized and optimized proportions before carrying out ionic cross-linking in the absence of chemical additives.



Schematic representation of the interpenetrating structure of FILMEXEL®

This novel process (IBPN technology®) results in a network of interpenetrating biopolymers with outstanding properties: it forms a “second skin” film that is resistant, flexible and non-occlusive.

IBPN technology® is patented and is the heart of the development of FILMEXEL®. This biopolymer has three major cosmetic benefits, demonstrated *in vivo* in seven different formulations and in panels of 1,100 Caucasian and Asian volunteers:

- a protective effect by forming a natural barrier against external aggressions (allergens, irritants and pollutants);
- an immediate lifting and tensor capacity;
- sensorial efficacy for a more radiant complexion and enhanced attractiveness.

FILMEXEL® also is imbued with a second innovation because it is SILAB’s first active ingredient available as a powder, without preservatives, soluble in water and entirely composed of natural active molecules **(7)**.

CONCLUSION

SILAB’s 30 years of expertise and 32 patents make it a genuine leader on the market of cosmetic phytotensors.

Resulting from avant-garde technological innovations, each new generation has increased the lifting and protective capacity of natural molecules. SILAB thereby responds to the needs and expectations of consumers of lifting, anti-wrinkle and second skin cosmetic care products with proven immediate efficacy.

At the present time, IBPN technology® marks the start of a new era in the field of biopolymers. SILAB research teams are already working on future applications of this technology that will target markets in a permanent search for efficacy, innovation and naturality.

Progress in the development of these phytotensors clearly shows SILAB’s desire for innovation that continually deploys more and more human and technical resources in order to consolidate and augment its experience.

REFERENCES

1. Boudier D, Le Dudal E, Crémillieux F, Vignaux E, Le Guillou M, Closs B. Tenseurs naturels : innovation, expertise et savoir-faire. GIC - Guide des ingrédients cosmétiques. 2011;311–4.

2. Martini M-C. Introduction à la dermopharmacie et à la cosmétologie. Lavoisier; 2011. 531 p.

3. Ancey C. Séminaire de rhéologie. Quae; 1998. 260 p.

4. Jouandeaud M, Dana M, Closs B. A new generation of tensor actives. Happi. 2003;

5. Lenaers C, Cremilleux F, Dana M, Vignaux E, Closs B. Natural polyoses provide immediate tightening effects. Happi. 2008 Avril;79–82.

6. Guzman-Struillou A-I, Boudier D, Le Dudal E, Dana M, Bon G, Le Guillou M, et al. Phytotensor providing instantaneous anti-wrinkle properties. SOFW J. 2015 Mar;141(3):2–7.

7. Verzeaux L, Boudier D, Peyrat-Kaczorowski S, Alloncle M, Dana M, Closs B. IBPN technology®: a breakthrough innovation for a natural “second skin.” Expr Cosmétique - Guide Ingrédients Cosmétiques. 2016 Décembre;283–8.