

nature
[**inside**view]

ESTÉE
LAUDER
COMPANIES

Profile Feature as seen in *Nature* 4th July 2019

A SYSTEMS BIOLOGY APPROACH TO SKINCARE

A conversation with **DR. NADINE PERNODET**, vice president of global research and development in the skin biology and bioactives group at The Estée Lauder Companies



The skin is a complex organ — and creating skincare products that work effectively requires complex science. At The Estée Lauder Companies, Dr. Nadine Pernodet leads a team that uses state-of-the-art ‘omics’ technologies to beat back visible signs of aging. Pernodet explains how a systems biology approach to beauty research could help advance a new era of precision skincare.

How do so-called ‘omics’ technologies inform your approach to skin research and product development?

The world of ‘omics’ has really helped us connect different molecular pathways and define biological networks to improve our basic understanding of how skin works. We’ve learned that we have to consider the skin as an entire system, not just as a series of individual layers or cell types. By studying the interconnectedness of these different pathways, we have found ways to affect behavior and improve skin’s appearance.

Recently, you’ve been mapping the metabolites in a given tissue or cells. Why?

The beauty of that work, called metabolomics, is that it offers a more direct link to phenotype than any of the other ‘omics’ because it takes into account how the environment influences the behavior of your skin. When it comes to skincare, that is extremely important. Our exposure to sunlight or pollution can affect skin as much or more than our genes. Another unique characteristic of metabolomics is that it is highly dynamic. Through our years of research in skin circadian rhythm, we have learned that time is also extremely critical for skin, with the natural rhythm of skin

focusing on protection in the daytime, and switching at night to focus on repair.

Has this systems biology approach to skin research resulted in any products?

Our Perfectionist Pro Rapid Firm + Lift Treatment is a skin-rejuvenating product that evolved from this work. We asked, ‘Which biological pathways do you have to impact in order to enhance skin firming and lifting in mature skin?’

We had known previously that collagen production in skin decreases with age and that decreased collagen can be responsible for a loss of firmness. But products that increased collagen production were not enough to dramatically improve skin lifting. To understand why, we first defined skin as a whole and this helped us to understand and connect the many pathways that could be impacted to increase the natural volume, structure and architecture of the skin, resulting in high performance firming and visible lifting.

In your work on the skin metabolome, you studied the natural daily rhythms and the connection to skin repair. What did you learn?

In ageing studies, we compared skin samples from young people,

WE HAVE TO CONSIDER THE SKIN AS AN ENTIRE SYSTEM, NOT JUST AS A SERIES OF INDIVIDUAL LAYERS OR CELL TYPES.

aged 20–25 years old, to those obtained from people older than 60. We sampled their skin surface both early in the morning, at 7AM, and later in the evening, at 7PM. Then, we obtained metabolomic profiles at the skin surface — measuring all the small molecules, including lipids, sugars, amino acids and peptides. What we found is that most of the young and healthy skin metabolites follow a circadian rhythm, with completely different metabolite profiles in the morning and the evening. This is an essential adaptation to our environment. During the daytime, sun exposure and the environment can cause a lot of damage and inflammation in the skin. That damage must be repaired at night so that skin can, in effect, start anew the next day. Young skin is extremely efficient at this process, while aging skin is losing its natural rhythm, resulting in an accumulation of visible damage. To combat this, our product promotes skin’s natural rhythm in aging skin.

What is the next step in your work?

The ultimate goal for us is to move to more personalized skin treatment. We have already characterized two extremes — young and mature skin. Now we want to define metabolomic profiles associated with acne, sensitive skin, dry skin and more. That research is ongoing, and the big challenge now becomes interpreting all of the data, so we can understand how the various bionetworks of the skin all relate to skin’s appearance.

How will you grow your team in the future to keep up with the science?

We have many world-class scientists and we’re always looking for more to join us. Lately, we have been hiring a number of people to analyze and interpret big data, which requires a different skillset and expertise than what we had originally in the lab. Of course, we can’t have all the expertise in-house, so we also partner with scientists around the world. Practically all of our big research projects are in collaboration with industry or academia. Good partners are always welcome.



THE ESTÉE LAUDER COMPANIES
RESEARCH & DEVELOPMENT

INVENTING THE FUTURE OF BEAUTY

At The Estée Lauder Companies, invention is at our core. Our employees engage in global research and development efforts across a wide variety of disciplines including advanced technologies in physics, chemistry, biology, and engineering. These skills paired with expertise in state-of-the-art technologies and manufacturing practices enable our brands to be at the forefront of our industry while ensuring the highest safety, quality and performance standards.



