

# Molecular biology, age and beauty

How do cells age? And how can we slow down or even reverse the process? These questions are as relevant to the cosmetic industry as they are to medical science. The focus is on senescent cells and the results are highly promising.

## The topic

Too much stress makes cells senescent. Senescent cells continue to metabolize but lose the ability to divide. They look different from cells that can still divide and they secrete a number of factors, including inflammatory mediators. Senescent cells tend to accumulate with increasing age, leading to chronic inflammatory reactions and to negative effects on the function of the tissues in question.

The cosmetic industry is naturally interested in the effects of aging on the skin. Senescent cells have two particularly problematic consequences: increased infections and the release of enzymes that break down connective tissue. The results include a decrease in elasticity, a loss of water and poorer healing of wounds. But tissues other than the skin are also affected. Senescent cells in blood vessels are associated with arteriosclerosis, in bones with osteoporosis and in the brain with neurodegenerative diseases such as Alzheimer's or dementia.

## CD Laboratory for Biotechnology of Skin Aging

### Head

Assoz.Prof. Dr. Johannes Grillari

### Operation

01.07.2013 – 30.06.2020

### Phasing-out period

until 31.12.2020

### Commercial partner

Chanel Parfums Beauté

## CD Laboratory for Skin Multimodal Analytical Imaging of Aging and Senescence

### Head

Assoz.Prof. Priv.Doiz. Mag. Dr. Florian  
Gruber

### Operation

01.09.2020 – 31.08.2027

### Commercial partner

Chanel Parfums Beauté

# Three questions to ...



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## Why is basic research so important for innovation?

Innovation offers consumers the best cosmetic solutions, i.e. the most relevant and the best performing. This requires a better understanding of the fundamental mechanisms of skin biology. Only basic science can help us discover these mechanisms and the way to act on them.

## What are the biggest challenges in collaborating with universities?

Universities are dedicated to generating knowledge and our company to applying it for product development. The challenge lies in finding the right way to work together to enable this transformation. Clear communication of both objectives is key and must be followed by discussions and joint decisions.

## What do you like most about the CD Laboratory funding scheme?

Chanel is always striving for excellence. The partnership enables us to finance academic research with the best experts, to address fundamental questions and to develop new scientific models. It gives us access to cutting-edge technology at the universities. Finally, the funding scheme enables us to contribute to scientific development and to the education of young researchers in a strategic research field.

## The research question

The current belief is that cells enter senescence after being hit by stressors, as the hits increase the risk that cells accumulate mutations if they continued to divide. For this reason, the researchers are not trying to encourage them to continue to divide but are instead looking for ways to suppress their negative properties, such as preventing the secretion of inflammatory mediators. Which substances are able to do so? In his CD Laboratory, Prof. Dr. Grillari is concentrating on senescent cells in the skin. He is studying their molecular biological mechanisms in great detail, enabling him to develop 3D models of the aging skin in a petri dish, which he is using to test various substances and to uncover the precise mechanism of their effects.

## Collaboration in the CD Laboratory

In Chanel Parfums Beauté, Prof. Grillari found an ideally innovative partner for research on senescence in the skin. The company has been working for 25 years on skin aging and has been investigating the mechanisms of cell aging for the past ten years. It also has wide-ranging experience in the production of plant extracts with beneficial effects on the skin. The CD Laboratory is thus able to test extracts and their components that have a good chance of being effective. The CD Laboratory's systematic studies of the molecules and the molecular description of their mode of action is helping the company in the precise identification of the effective substances.

## Results

And indeed: one of the plant extracts – based on the goldenrod *Solidago virgaurea alpestris* – inhibits the release of damaging substances by senescent cells. The epidermis becomes thicker and looks more youthful. A skin care product based on the extract has been on the market since 2018 and the company partner Chanel calls it “the best we have ever had”. Not only are the identification of the active ingredients that target cellular senescence and the decoding of their mechanisms of action of high interest to the cosmetic industry, they might even change the way we perceive aging and age-associated diseases. The results might pave the way for research on possible biomedical applications.

## Visions for the future

The next stage of the basic research will consider how to do more than merely suppress the negative properties of the senescent cells and will aim at eliminating them, i.e. at senolytic breakdown. The research is directed primarily at therapeutic/medicinal applications and the results will be relevant to all organs, with much of the work addressed at the kidney and the lung. Kidney transplantations represent only one of the possible applications.

## Scientific challenge

Much of the research in gerontology is addressing senescent cells. The primary aim is to obtain a detailed understanding of the molecular biological mechanisms of senescence. Concrete examples include biomarkers for senescent cells, the identification of harmful secretions and the research of secreted micro-RNAs. The results will be relevant to all organs, with much of the work addressed at the kidney and the lung. Kidney transplantations represent only one of the possible applications.

After the closure of the CD Laboratory in 2020, Chanel has been supporting an additional CD Laboratory that is analysing senescence. It is researching how metabolism, communication and “cellular quality control” collaborate in the acceleration of skin aging that is caused by environmental stress.

## Added value for the company

The CD Laboratory found that a plant extract based on the goldenrod (*Solidago virgaurea alpestris*) is particularly effective against the negative effects of senescence. The results of the basic research have been published and Chanel has patented the properties of the active ingredient. A skin care product based on the compound is on the market. Furthermore, the company is planning long-term basic research on senescent cells in the coming years.