



 Federal Ministry
Republic of Austria
Education, Science
and Research

Christian Doppler
Forschungsgesellschaft 

Understanding cancer means fighting cancer

A detailed understanding of a protein complex that is frequently mutated in tumours enables the targeted development of highly effective treatments.

What is at issue?

Targeted therapies play an important role in modern cancer treatment. These therapies specifically attack cancer cells, but leave normal cells virtually unaffected and are therefore very effective and have very few side effects. As a developer and manufacturer of cancer therapies, Boehringer Ingelheim is interested in knowing more about possible “targets” and in identifying molecules that might be suitable for potential drugs. A promising field of research is the BAF complex; this is a protein complex that is mutated in cancer cells in about 20% of all human cancers, and in ovarian cancer and some forms of lung cancer this figure can go up to 80%.

The research question: How can cancer cells be identified and attacked?

The BAF complex allows sequences of DNA to be read by shifting histones, around which the DNA is wound like a spool, thereby playing a part in regulating which parts of the DNA are transcribed. It thus controls which different properties are expressed by different cells despite identical DNA, for example whether they are skin or muscle cells or how they react to environmental influences. The complex consists of 29 proteins encoded by 29 genes.

CD Laboratory for Chemical Epigenetics and Antiinfectives

Head

Dr. Stefan Kubicek; CeMM Research Center for Molecular Medicine of the Austrian Academy of Sciences

Duration

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Company partners

Boehringer Ingelheim RCV GmbH & Co KG, HAPLOGEN GmbH

Three questions for ...



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Why is basic research so important for innovation?

For us as a pharmaceutical company, basic research provides us with an understanding of the function of certain organisms and their interactions; this in turn is the basis for applied research and allows us to develop new products. It shows industrial researchers that one needs patience and perseverance in order to discover new scientific interactions.

What are the major challenges in collaborating with universities?

Universities of course focus on basic research and teaching, while our company concentrates on innovative solutions for patients, which can also lead to different expectations regarding the timescale of projects. It is nevertheless obvious that nowadays basic research and applied research need each other in order to cope with increasing scientific complexity.

What do you value most about the CD Laboratory funding model?

The funding model is unique because the projects are selected jointly by the university and industry, which I believe improves the chances of success. Cooperation with CD Laboratories also means that industry can afford to take the risk of obtaining fundamental knowledge before developing a drug for patients.

In tumour cells, one of these genes is mutated. The protein is not produced, instead it is replaced by other – wrong – proteins. This is where a successful drug has to attack in order to target the mutated cells as precisely as possible. The aim is therefore to gain an in-depth understanding of the BAF complex in order to find substances that kill the mutated cells or inhibit their reproduction. Scientists are looking for small organic molecules that are readily bioavailable, which means they can reach the BAF complex in the cell nucleus when taken orally.

Cooperation in the CD Laboratory

Although the BAF complex has been known for some time, there are still many open questions. It is hoped that academic research will provide more biological knowledge and a better understanding of the molecules involved: How exactly does the BAF complex work, what factors affect it, can its function be predicted? How is gene expression regulated, which genes are active? Or more specifically: What characterises a cancer cell, how does it work? Dr. Kubicek and his team are part of the scientific community and are able to work on these questions to the required depth and at the highest scientific level. The CD Laboratory thus provides the best systematic analysis of the BAF complex.

This allows the company early access to basic research results and gives it a head start; relevant results are patented. The scientific publications by the CD Laboratory position Boehringer Ingelheim as a research-based company enabling it to expand its network in the scientific field.

Results

The CD Laboratory provided a better understanding of the structure and the subunits of the BAF complex, to which Boehringer Ingelheim has had access one to two years earlier than its competitors. Furthermore, two target proteins have already been identified. This opens up new possibilities in the search for new active substances that have the potential to be approved as drugs in a few years' time. Boehringer Ingelheim's in-house research is based on these results.

Scientific challenge

Each cell of the human body has the same 23.000 genes, yet they perform different functions. They can be brain cells or skin cells, or they adapt their function to environmental conditions. This works because of chromatin, which is a highly complex structure that regulates which of these genes are read and how active they are. The field of epigenetics seeks to gain a better understanding of this regulation and describe it scientifically. The BAF complex plays an important role in this. Studying it not only advances cancer research, it is also important for the treatment of some neurological diseases.

Added value for the company

The understanding of the BAF complex, its structure and its subunits has been significantly enhanced.

Two potential targets for targeted drugs have been identified.

On this basis, the company is working on the development of new drugs.