

VIENNA, AUSTRIA, October 07, 2013 **/24-7PressRelease/** -- The Chinese hamster ovary cells (CHO cells) are an indispensable part of modern medicine, because they are the most sought after vehicle for production in pharmaceutical industry. A group of researchers led by Prof. Nicole Borth (University of Natural Resources and Life Sciences Vienna - BOKU) has now decrypted the genome of the Chinese hamster - a result of the research partnership between the Austrian Centre of Industrial Biotechnology (acib), the University of Natural Resources and Life Sciences and the University of Bielefeld (CeBiTec). "We now understand better how the cells function and can adjust them to the desired requirements", explains the scientist and thinks of new biopharmaceuticals and treatments.

Because the hamster genome is comparable in its size to the human one, it was necessary to cope with huge amounts of data. "We produced 1.4 billion short segments of DNA," says Karina Brinkrolf. She was responsible for sequencing at CeBiTec. The challenge was to assemble these parts like a puzzle to get the entire genome, which is spread over 11 pairs of chromosomes. Whether antibodies, blood clotting factors, rheumatism therapy or anti-cancer drugs - the pharmaceutical industry brings more and more therapeutic proteins on the market. Unfortunately agents in human medicine are not knit in a simple pattern. There are chemically simple varieties, consisting of single molecules with a few atoms. Therapeutic proteins, however, are complex structures made up of hundreds of amino acids. In contrast to the simple products, these proteins must be perfectly adapted to the human organism, so that no secondary or defensive reactions can happen.

"Since 1987 the most common production vehicle for these substances have been artificially cultured Chinese hamster ovary cells", says Nicole Borth. The first active agent produced this way was a drug administered to heart attack patients to stimulate the dissolution of blood clots. Actually 70% of the active pharmaceutical ingredients are produced via CHO cells. However, Hamsters need not die for this anymore, because industry and researchers reproduce the cells that were once isolated in 1957.

The in vitro cultivation, however, also leads to difficulties: "These cells are subjected to natural changes over time," says researcher Borth, "the activity of genes is different in all laboratories that develop and grow hamster cells. The original genetic material is subject to constant change." This is an advantage - considering the adaptability of cells - and a disadvantage, because it may happen that, for the specific purpose, important elements of the genetic material have changed. The sequenced genome of the "original hamster" is the perfect reference to examine and adapt the genetic material of the production cells. To enable access to the data for as many researchers as possible the scientist has founded the online platform www.chogenome.org together with two colleagues where a lot of work material regarding the Chinese hamster ovary cells is available. Nicole Borths vision: "We can produce agents more efficiently and cheaper - at prices that any average health system can afford; ideally even in Third World countries."

The research results were published in August 2013 in the journal Nature Biotechnology: <http://www.nature.com/nbt/journal/v31/n8/full/nbt.2645.html>

How production with hamster cells works: A gene is inserted into the genome of many CHO cells, which tells the cells that they should produce a new protein, namely the active ingredient. Using sophisticated methods, the researchers are looking at thousands of cells and finally choose the best one for production. This cell is propagated and used for cultivation, which happens in a liquid nutrient solution in special bioreactors. Cleaning procedures following the production ensure that only the pure substance is left. "From one liter of nutrient solution approximately 2 to 5 g of product is obtained. The average drug dose for a human is about 1 g, resulting in annual costs of EUR 10-40.000 for each patient," says researcher Nicole Borth.

About acib The Austrian Centre of Industrial Biotechnology (acib) is a leading international research centre with 25+ years of experience in industrial biotechnology with locations in Vienna, Graz, Innsbruck, Tulln (A), Hamburg, Bielefeld (D) and Pavia (I). As a research centre of excellence, acib is an international partnership of currently 80+ international universities and industry partners, including large companies such as BASF, DSM, Sandoz, Boehringer Ingelheim, Jungbunzlauer, F. Hoffmann-La Roche, Novartis, VTU Technology or Sigma Aldrich. Owners are the Universities of Innsbruck and Graz, Graz University of Technology, the University of Natural Resources, Vienna and Joanneum Research.

At acib, 170+ scientific employees work in more than 40 research projects. Public funding (58% of the budget) comes from the Research Promotion Agency of the Republic of Austria (FFG), the country Tyrol, the Styrian Business Promotion Agency (SFG) and the Technology Agency of the City of Vienna (ZIT). The EU funds additional projects such as CHEM21.

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