

Several million euros in funding for systems biologists at DKFZ

In February and March of this year, three new research consortia have started work at DKFZ. They are funded by the Federal Ministry of Education and Research (BMBF) as part of its program "Systems Biology in Cancer Research – CancerSys" and will receive funds amounting to nine million euros over a three-year period. The networks, called *LungSys-II*, *CancerEpiSys* and *MYC-NET*, combine experimental measuring methods with mathematical models with the aim of exploring the complex molecular processes involved in the development of cancer. To this end, DKFZ researchers collaborate closely with researchers at Heidelberg and Ulm University Hospitals and with companies such as Roche.

Studying resistance of cancer cells

In the "MYC-NET" consortium, a team of researchers from DKFZ and Heidelberg University headed by Dr. Frank Westermann, Prof. Dr. Thomas Höfer and Dr. Stefan Pfister is investigating the molecular mechanisms that make cancer cells of pediatric brain tumors resistant to chemotherapy or radiotherapy. In many patients, these treatments cause mutations which help cancer cells to become resistant to therapy. In order to understand how these mutations impact the finely tuned balance between cell death and cell division, the group combines genetic, biochemical, systems-biological and mathematical approaches. In particular, they plan to observe under the microscope, for the first time, how cancer cells respond to chemotherapy in order to characterize the variability of cellular behavior and the selection of therapy-resistant cancer cells at individual cell level.

Packaging also plays a role

How can we treat one of the most frequent types of blood cancer in the Western world, chronic lymphocytic leukemia, more effectively? This question is being explored by scientists in the research network "CancerEpiSys".

The fact that cancer cells do not behave like normal cells is not only due to alterations in the genetic information as such, but also in its "packaging". Changes affecting the packaging can lead to the genetic information not being read correctly. As a result, an affected cell may turn off genes that normally prevent carcinogenesis. The research discipline that studies the manifold interactions of "packaging" and genetic information is called epigenetics. "We try to filter out epigenetic connections that are key to the development of and fight against chronic lymphocytic leukemia," said Dr. Karsten Rippe of the German Cancer Research Center and Dr. Daniel Mertens of the Department of Internal Medicine III of Ulm University Medicine, the coordinators of the new research network. At the same time, the researchers endeavor to find out how anticancer drugs with epigenetic working mechanisms influence these factors.

Optimum treatment of advanced lung cancer

In Germany, lung cancer is the most frequent cause of cancer-related death in men and the third most frequent in women. Most patients are treated by chemotherapy, which often leads to anemia as a side effect. Therefore, patients are frequently treated with a drug called erythropoietin (EPO) alongside chemotherapy; EPO promotes the formation of red blood cells, thus securing oxygen supply. However, in recent years researchers have found receptors for EPO on tumor cells, too, so that the drug, fatally enough, also promotes their growth.

Which effect will ultimately be stronger in a treatment with EPO is determined by a multitude of factors which mutually impact each other. The resulting complexity can best be captured by a systems biology approach, which processes data from experimental research in

mathematical models. Scientists in the group of Prof. Dr. Ursula Klingmüller from DKFZ are networking in the “LungSys II” consortium in an effort to use systems biology to make the treatment of lung cancer patients with erythropoietin safer.

The German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) with its more than 2,500 employees is the largest biomedical research institute in Germany. At DKFZ, more than 1,000 scientists investigate how cancer develops, identify cancer risk factors and endeavor to find new strategies to prevent people from getting cancer. They develop novel approaches to make tumor diagnosis more precise and treatment of cancer patients more successful. Jointly with Heidelberg University Hospital, DKFZ has established the National Center for Tumor Diseases (NCT) Heidelberg where promising approaches from cancer research are translated into the clinic. The staff of the Cancer Information Service (KID) offers information about the widespread disease of cancer for patients, their families, and the general public. The center is a member of the Helmholtz Association of National Research Centers. Ninety percent of its funding comes from the German Federal Ministry of Education and Research and the remaining ten percent from the State of Baden-Württemberg.

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