The International Cancer Genome Consortium

The PedBrain tumour project, which is coordinated by the German Cancer Research Center (DKFZ) in Heidelberg, aims to carry out a systematic analysis of the molecular genetic causes of the commonest pediatric brain tumours, namely medulloblastoma and pilocytic astrocytoma. The results obtained to date indicate that tumours that are indistinguishable under a microscope may have fundamentally different genetic profiles. This finding has already contributed to a revised medulloblastoma subtype classification. In cooperation with a German pharmaceutical company, a drug is currently being developed to arrest the growth of the tumour for one of these subgroups. In the case of pilocytic astrocytoma, defects have been discovered in various genes that are all involved in a particular molecular signalling pathway. In preliminary clinical trials, affected children will be given drugs that are already available in order to block components of the signalling cascade. The research project is being funded by the BMBF and the German Cancer Aid.

The ICGC project on prostate cancer is coordinated at the Martiniklinik of the University Hospital Hamburg-Eppendorf and the DKFZ. Prostate cancer is generally considered a disease that occurs in elderly men; however, in rare cases, prostate cancer is diagnosed at the age of 50 years or less. The first results have indicated that early onset prostate cancer differs at the molecular level from that occurring in later years. In young men, relatively small numbers of genetic changes that are almost always identical can be observed, which may well be the cause of tumour development. Using these findings for the early detection of cancer could expedite the diagnosis and allow for optimal treatment regimens.

The Christian-Albrechts-University in Kiel manages the ICGC project on malignant lymphomas. Lymphomas are cancers that develop from cells of the immune system, the lymphocytes. Among the over 50 different subgroups, Burkitt’s lymphoma is the most frequent variant of childhood lymphomas. In the ICGC project, scientists have succeeded in establishing that the genomic DNA of the tumour cells in Burkitt’s lymphoma is characterised by over 2,000 mutations compared to normal cells. In the process, the researchers discovered a gene that is mutated in more than two thirds of all Burkitt’s lymphomas. This finding is the starting point for further research. Therapy studies aim to develop a drug that is effective in treating the disease in patients affected by this subgroup of Burkitt’s lymphoma with this gene variant.

Contact
DLR Project Management Agency, Health Research
Heinrich-Konen-Strasse 1
53227 Bonn
Dr. Axel Aretz
Tel. +49 228 3821-1151
E-mail: axel.aretz@dlr.de
For further information:
www.gesundheitsforschung-bmbf.de
www.icgc.org

Published by
Bundesministerium für Bildung und Forschung/
Federal Ministry of Education and Research (BMBF)
Referat Methoden und Strukturentwicklung
in den Lebenswissenschaften/
Unit for Development of Methods and Structures
in the Life Sciences
11055 Berlin

Orders
In writing to
Publikationsversand der Bundesregierung
Postfach 48 10 09, 18132 Rostock
Germany
E-mail: publikationen@bundesregierung.de
Internet: http://www.bmbf.de
or by
Phone: +49 30 18 272 272 1
Fax: +49 30 18 10 272 272 1
September 2014

Printed by
BMBF

Layout
W. Bertelsmann Verlag, Bielefeld; Christiane Zay, Potsdam

Photo credits
Cover: thinkstock, sciencephoto.com,

Edited by
Dr. A. Aretz, Dr. M. Leuer, U. Porwol, DLR Project Management

This flyer is part of the public relations work of the Federal Ministry for Education and Research; it is to be distributed free of charge and is not intended for sale.
Cancer is one of the greatest challenges facing modern medicine today. Every year, cancer kills more than eight million people worldwide – and this figure is increasing. This is primarily due to our unhealthy habits and lifestyle, but increasing life expectancy and the general population growth are also contributory factors.

Therefore, the central goal of the ICGC (International Cancer Genome Consortium) is a systematic study of the molecular mechanisms of cancer. Hundreds of leading scientists around the world are collaborating in the large-scale biomedical research project. The best research institutes in 24 countries have been working together on this project since 2008.

The Federal Ministry of Education and Research (BMBF) is one of the primary driving forces, providing a total of EUR 25 million in funding to the German ICGC research projects.

The challenge – every tumour is different

In recent decades, cancer research has shown that there is no way to offer a standardised therapy, simply because the disease itself is complex and highly individual. Every tumour is different.

Cancer occurs as a result of mutations in the genome, leading to uncontrolled cell growth and thus to the development of tumours. These changes in the genetic material DNA can occur at random, may be hereditary or caused by environmental factors. Depending on the type of tumour, the number and nature of the underlying mutations may vary. Today, more than 200 different types of cancer have been identified.

To date, cancer diagnosis and therapy have been based on the organs affected, for example lung, breast or prostate cancer. However, many forms of cancer that appear to be clearly defined are, in fact, extremely diverse. They may be triggered by various types of mutations in the genome, ranging from isolated changes in key genes right through to the loss of entire chromosome regions. Therefore, in order to fully understand the process of oncogenesis, it is imperative that any mutations in the genomes of the different tumours be identified and analysed.

The strategy – focusing on tumour DNA

Today, researchers are able to identify and systematically catalogue the genomes in tens of thousands of tumour samples from the commonest cancer types. Only by pooling resources, expertise and capacities is it possible to collect, record and analyse the enormous quantity of data required in the process.

With each group focusing on a particular cancer type, the more than 70 ICGC research projects systematically examine a large number of samples and map any molecular changes in the tumour’s genomic profile. Thus, the Consortium covers the commonest forms of cancer.

The goal – individualised cancer treatment

Rigorous quality standards have been jointly defined in the ICGC for each project phase and are implemented by the research groups. This unique approach is the only way to enable a direct comparison of all tissue samples from around the world. The results are quality controlled and immediately made available to the entire cancer research community for scientific analysis, including researchers who are not members of the Consortium. In future, all cancer treatments will begin with an accurate identification of the tumour genome because, ultimately, this is what determines which abnormalities at cellular level will lead to uncontrolled tumour growth. It is our vision to be able to treat each cancer patient individually according to the DNA profile of his or her tumour.