Research interests and achievements

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Tumor bank and cancer research

Cancer research has changed from using cell lines and animals to tumor samples since the 1980s, thanks to rapidly growing applications of molecular technologies to clinical tissue specimens that have made revolutionary steps in medicine. Many different molecular biological methods, such as gene and protein expression, DNA-Microarray and immunochemistry, can now help to connect disease markers to the disease prognosis and natural history, which is an important step towards development of an individual therapy, and selection and prevention of possible complications in many human diseases. Tumor tissue-associated biomarkers have also become an important issue in selection for treatment and management of cancer patients.

Many diagnostic and therapeutic procedures require elimination of the diseased and surrounding normal tissue. However, the tissue not used for standard pathological diagnostics, is an extremely important resource for basic and translational research. As the field of tumor biomarkers has expanded fast over the last years, the need to establish common rules on how to collect, store and use tumor tissue, and how to enact quality control has become very important.

A tumor bank, in which tissue samples are stored and connected to the patient's history and data, can accomplish all these goals in a systematic way. Furthermore, it allows controlling cancer tissues before and after the treatment, to track evolution and development of the disease, to select the beast treatment course, and to predict the prognosis. On the research side, cell lines from tumor samples allow studying new diagnosis tools, and accelerate the rate of research by eliminating the need to wait for the next "right" patient. In short, a tumor bank allows direct application of cancer research to clinical medicine.

During my work at Children Hospital of Heidelberg University, I have managed the tumor bank from November 2001 until October 2004. I have been in charge of tumor sample collection from the operating room, preparation and storage, of the creation and management of the tumor bank database, and of preparing and working with cell lines. Using snap-frozen neuroblastoma tissue, cell lines of neuroblastoma and short-term neuroblastoma cell cultures, I have studied the importance of high quality tissue samples for use in medical research and clinical medicine. I

worked on the detection of spontaneous apoptosis using TUNEL method as diagnostic criterion for differentiating between stages 4 and 4s of neuroblastoma tumor. I found that the rate of spontaneous apoptosis varies widely within stage groups, with the highest rates in stage 4s at the time of diagnosis. Good prognosis tumors have a tendency to higher expression of CASP8 and CASP9, and it seems CASP8 is a good prognostic marker. I also found significant difference in quality between SHOCK frozen and paraffin embedded tumor samples, which might be explained by the different samples preparation procedure and tissue quality.

Aptamers

As a visitor at Iowa State University (ISU), Ames, IA, I have worked on the creation of aptamers specific for Max and c-Myc proteins. Aptamers are single stranded nucleic acids (DNA or RNA) that fold to form unique structures with specificity for selected target molecules. They are often presented as “artificial antibodies” and are expected to lead to a new level in diagnostics and treatment of diseases.

HIV infection in children

Part of my work at the Children Hospital at Heidelberg University, Germany, was dedicated to the evaluation of clinical markers in children with inborn and acquired immunological defects. I have studied immune defects in children with HIV, analyzed clinical and laboratory data, and worked on anti-viral therapy adherence. We have found that HIV infected children can be divided into 3 groups depending on virus level in blood, and on clinical and immunological presentation, greatly helping the treatment adjustment and personalization in each patient.

Ecological dependent diseases in children

While working as a pediatric researcher at Kazhakh State Medical University, Almaty, and the National Children’s Rehabilitation Center “Urpak”, I studied ecological dependent diseases in the Aral Sea region. In the last 25 years, the very hot and dry climate in summer and cold in winter, the constant strong winds, and the huge amount of salts and pesticides in soil, water and air left over by the dying Aral Sea have been strongly influencing the local population’s health condition, especially in kids and pregnant women. We have found and documented pathological changes in genetic apparatus, immunological and gastro-intestinal systems, lungs, kidneys, skin, and organized regular treatments for children from that area.