Joint Press Release by the German Cancer Research Center and Heidelberg University Hospital

Award-winning agent developed for prostate cancer diagnosis and treatment

Scientists at the German Cancer Research Center (DKFZ) have developed an agent called PSMA-617, which is capable of attaching specifically to prostate cancer cells. This agent can be labeled with various radioactive substances. When chemically bound to a weakly radioactive diagnostic radionuclide, it can detect prostate tumors and their metastases in PET scans. If labeled with a strongly radioactive therapeutic radionuclide, PSMA-617 can specifically destroy cancer cells. A first clinical application of this radiopharmaceutical at Heidelberg University Hospital has now delivered promising results.

Prostate-specific membrane antigen (PSMA) is a surface protein that is normally present on healthy prostate cells, but is found at much higher levels on prostate cancer cells. It is barely found in the rest of the body. “Therefore, PSMA is an ideal target for diagnostic purposes as well as targeted therapies against prostate cancer,” says biotechnologist Dr. Matthias Eder of the German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ).

Eder’s group has developed a small molecule (PSMA-617) that is capable of specifically attaching to PSMA and can be labeled with various radioactive substances, called radionuclides.

When chemically bound to gallium-68, a weakly radioactive diagnostic radionuclide, PSMA-617 can be used to visualize even the smallest assemblies of prostate cancer cells in PET (positron emission tomography) scans. “In this way, physicians are able to detect small secondary tumors in other organs or closely monitor response to therapy. Diagnostic approaches that have been used in the clinic so far have not come close to this sensitivity,” says Eder.

Alternatively, the researchers can also bind a therapeutic radionuclide called lutetium-177 to PSMA-617. This radiopharmaceutical is taken up by tumor cells that carry the PSMA target molecule and then destroys these cells from the inside. This might be a promising treatment option, particularly in cases of hormone-resistant prostate carcinoma, which is very difficult to treat.

At Heidelberg University Hospital, a team led by nuclear medicine specialist Prof. Dr. Uwe Haberkorn has already used radioactively labeled PSMA-617 to treat individual patients with advanced prostate cancer. The physicians made use of the therapeutic nuclides lutetium-177 and actinium-225. After treatment with the lutetium-labeled radiopharmaceutical, levels of the prostate cancer marker PSA fell sharply in 70 percent of cases; after treatment with the actinium-labeled radiopharmaceutical, this effect was observed in all patients.

In addition, PET/CT images confirmed that metastases had shrunk or were no longer detectable. “The results were so promising that we plan to go ahead with a clinical trial as soon as possible to examine whether PSMA-617 is superior to other therapy methods,” says Haberkorn.
“Other agents that target PSMA and can be coupled with strong or weak radiation emitters are already being developed,” explains Prof. Dr. Klaus Kopka, a chemist and departmental head at the DKFZ. “However, only a few of these agents have turned out to be ideal. Most of them are too unstable, accumulate insufficiently in cancer cells and wash out too slowly from healthy organs. By contrast, PSMA-617 accumulates in large quantities in tumors and metastases and is stored well in cancer cells. As a result, prostate cancer can be irradiated from the inside, so to speak.”

Matthias Eder, radiochemist Martina Benešová, Klaus Kopka, Uwe Haberkorn and their co-workers have now received the Image of the Year Award and the Berson-Yalow Award at the 2015 Annual Meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI) in Baltimore, USA for their development of PSMA-617.


The German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) with its more than 3,000 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. The staff of the Cancer Information Service (KID) offers information about the widespread disease of cancer for patients, their families, and the general public. 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. In the German Consortium for Translational Cancer Research (DKTK), one of six German Centers for Health Research, DKFZ maintains translational centers at seven university partnering sites. Combining excellent university hospitals with high-profile research at a Helmholtz Center is an important contribution to improving the chances of cancer patients. DKFZ is a member of the Helmholtz Association of National Research Centers, with ninety percent of its funding coming from the German Federal Ministry of Education and Research and the remaining ten percent from the State of Baden-Württemberg.

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Heidelberg University Hospital and Medical Faculty:
Internationally recognized patient care, research, and teaching

Heidelberg University Hospital is one of the largest and most prestigious medical centers in Germany. The Medical Faculty of Heidelberg University belongs to the internationally most renowned biomedical research institutions in Europe. Both institutions have the common goal of developing new therapies and implementing them rapidly for patients. With about 12,600 employees, training and qualification is an important issue. Every year, around 66,000 patients are treated on a fully or partially inpatient basis and over 1,000,000 patients have
been treated on an outpatient basis in more than 50 clinics and departments with 1,900 beds. Currently, about
3,500 future physicians are studying in Heidelberg; the reform Heidelberg Curriculum Medicinale (HeiCuMed) is
one of the top medical training programs in Germany.

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