New infrared marker for bio-imaging

Neuherberg, 09.09.2014. The recently developed fluorescent protein Amrose is now being used for advanced near-IR imaging procedures. With the aid of a novel evolutionary platform technology, scientists at the Helmholtz Zentrum München have developed this infrared marker as part of a combined effort to improve the quality of tissue imaging. The results have been published in the scientific journal PLOS ONE.

Image: Randolph Caldwell, Source: Helmholtz Zentrum München

Far-red shifted fluorescent tissue markers make it possible to visualize structures and processes with advanced bio-imaging. This permits new insights into organisms and creates the potential for a wide range of applications – from more exact delineation of tumor and metastasis through to tracking drug responses within whole-body imaging.

The team of scientists headed by Dr. Ulrike Schoetz, Dr. Nikolas Deliolanis, Dr. Wolfgang Beisker, Professor Horst Zitzelsberger und Randolph Caldwell from the Helmholtz Zentrum München have succeeded in developing novel fluorescent markers that excite in the far-red and emit in the infrared spectrum. Depending on the light spectrum used and the organism under examination, these can now deliver better-quality images. The tests confirming the spectral properties were conducted in cooperation with the Max Planck Institute for Neurobiology (Martinsried) and the Federal Institute for Materials Research and Testing (Berlin).

Amrose variants with different spectral properties
A high level of diversification occurs naturally in the B cells of the immune system, which produce antibodies. When genetic material is introduced into these cells, this evolutionary mechanism can be co-opted to create new genetic and protein variants. The scientists were thus able to transfer the genetic information from the known fluorescent protein eqFP615 into the DT40 chicken B cell line in order to produce protein variants of the new infrared marker Amrose with different spectral properties.

“Here we have demonstrated the further use of this novel technology to develop highly sought after biologically relevant fluorescent markers quickly and easily for different imaging needs,” says Caldwell, who led the study.

The Helmholtz Zentrum München aims to make basic research findings available quickly for clinical application as well as to develop new approaches to diagnostic and therapeutic procedures and prevention.

Further Information

Original publication:
Schoetz, U. et al. (2014). Usefulness of a Darwinian system in a biotechnological application: evolution of optical window fluorescent protein variants under selective pressure, PLOS ONE, doi: 10.1371/journal.pone.0107069

Link to publication

Helmholtz Zentrum München, as German Research Center for Environmental Health, pursues the goal of developing personalized medical approaches for the diagnosis, treatment and prevention of major widespread diseases such as diabetes mellitus and lung diseases. To achieve this, it investigates the interaction of genetics, environmental factors and lifestyle. The head office of the Center is located in Neuherberg in the north of Munich. Helmholtz Zentrum München has a staff of about 2,200 people and is a member of the Helmholtz Association, a community of 18 scientific-technical and medical-biological research centers with a total of about 34,000 staff members.

The Research Unit Radiation Cytogenetics (ZYTO) investigates radiation-induced chromosome and DNA damage in cell systems and human tumours. The focus is on clarifying the mechanisms associated with radiation-induced carcinogenesis and radiation sensitivity of tumour cells. The aim of this research is to find biomarkers associated with radiation-induced tumours in order to develop personalized radiation therapy for the stratification of patients. ZYTO is a part of the Department of Radiation Sciences (DRS).

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