Biotinylated bioluminescent probe (YuLu) for the detection of luciferase

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Technology description

The global preclinical imaging market is estimated to reach 910 million in the US alone by 2021, including utilizing bioluminescent probes to study biological processes in vitro and in vivo in real time, image cancer cells, monitor gene delivery and adoptively transferred cells and track pathogen clearance, detect apoptosis and research signal transduction. Current limitations with many bioluminescence probes are the need for an external light source to excite the probe. Lucerifase based probes overcome this issue, however, D-luciferin or other small molecule substrates only last a very short time (15-20 minutes). This requires multiple applications for ongoing imaging, and would not be practical for applications such as tumor removal. There remains a need for a novel bioluminescent luciferase based probe, which does not rely on external light sources and is long lasting.
MUSC researchers have synthesized a novel luciferase-based biotin containing bioluminescent probe, B-YL. This probe contains an aminoluciferin unit as the reporter, a PEG-1000 link for improving cell penetration and a biotin tail for binding to streptavidin. For proof-of-concept, the probe was fitted with an EGF peptide that binds to the EGF receptor, which is overexpressed in high-grade gliomas. In vivo bioluminescence signals of xenograft U87-luc brain tumors was done using the EGF-B-SA-B-YL probe and compared with an untargeted B-SA-B-YL probe. Maximum bioluminescence for the probe was recorded at 24 hours and lasted for six days. In addition, the probe targets are numerous and can be easily modified because of the SA and biotin system.
Overview:Recently, fluorescence imaging has been suggested for use in both cancer detection and resection; however, it is a light dependent method. This strategy uses an external light source to excite exogenously-added fluorescence agents and is not very versatile because many biological molecules present in the body absorb light, and the required external excitation required to generate a response from the fluorescent molecules cannot penetrate body tissues to reach the area of interest.
Although humans and animal models of cancer do not have naturally occurring bioluminescent genes, such as luciferase, the genes or proteins can be introduced via imaging purposes. For instance, either genetically modifying mammalian cells or introducing bacteria encoded with a luciferase gene can be used for cancer detection in vivo. Tumor bioluminescence can be a useful tool during surgery as shown in an animal model. Bioluminescence is able to precisely detect both tumors preoperatively and intra-operatively.

Key Words:Research tool, bioluminescence, diagnostic, medical, cancer research, in vivo imaging, animal model, surgery

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Application area

In vivo imaging, in vitro imaging, tumor imaging, monitoring tumor growth, monitoring gene delivery, tracking pathogen clearance, detecting apoptosis and researching signal transduction.

Long lasting probe which does not rely on external excitation, plug-and-play system

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