Innovations
UNIVERSITY OF COLORADO
ANSCHUTZ MEDICAL CAMPUS

# Body Heat Activated, Storable, Near-Infrared Self-Illuminating Nanoprobes

## Category

Diagnostics – Assays and Analyses

## Problem

Current optical imaging has short tissue penetration depth (below 2 cm) due to light scattering and autofluorescence

## Technology Overview

Body heat activated nanoprobes can detect early-stage cancers located deep in the tissue with high sensitivity and low toxicity

## IP Status

- Patent pending
- Available for Exclusive or Non-Exclusive Licensing

## Value Proposition

- Long timescale luminescence for enhanced resolution and tissue penetration (> 4cm)
- Requires no external input and can be stored infinitely at low temperatures

## Market Attractions

- Preclinical Imaging Market valued at $700M with a CAGR of 6.2%
- Market driven by increasing incidences of cancer
- Novel MOA for luminescent dyes


**Contact**
Doreen Molk
Doreen.Molk@cuanschutz.edu
Ref# CU4747H

t. 303-724-0221
f. 303-724-0816
innovations.ucdenver.edu


**Problem:**

Optical imaging is a popular research and diagnostic tool for performing quick, cost-effective and simple imaging of tumors and understanding disease pathology. The use of non-ionizing radiation, such as visible, UV, and infrared, and fast time scale proves to be a safe procedure for patients and additionally provides clinicians with the ability to perform multiple scans to track the progression of a disease. However, current fluorescent dyes require a short wavelength excitation to induce luminescence which can only penetrate soft tissue up to 2 mm. Although the emission is safe, the poor penetration depth can result in inaccurate images, specifically during animal experiments. There are no emitters currently on the market which do not require an external input to activate the luminescence of the dye.

**Technical Solution and Key Value Propositions:**

Jung-Jae Lee and co-workers at the University of Colorado have fabricated biocompatible glycol-chitosan nanoparticles (CNPs) which do not need any input for induction of luminescence for cancer imaging. CNPs contain FDA approved probes and singlet oxygen release agents, emitting near-infrared light for up to 48 hours only when they are warmed to body temperature. This provides the end user with an imaging depth of more than 4 cm (an additional order of magnitude greater than the current standard) due to reduced light scattering and better signal-to-noise ratio associated with near-infrared radiation. The combination of a greater tissue penetration depth and long timescale of luminescence should translate to sharper image resolution and easy implementation in the clinic. Additionally, the CNPs show low toxicity in cells and animals, can be infinitely stored at low temperatures, and selectively target cancers at early stages with target ligands, such as folic acid, on the surface of CNPs.

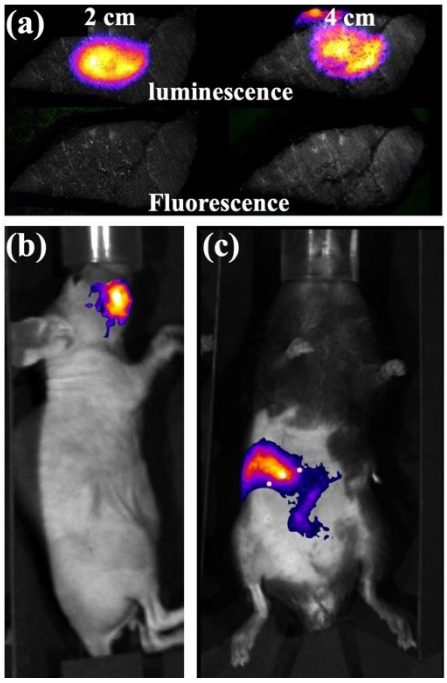


**Figure 1.** (a) Images show the strong luminescent intensity (top) of the CNPs through increasingly thick pieces of pork tissue while the fluorescent signal (bottom) is near background intensity. This is corroborated in a whole-body in vivo luminescent image of head and neck cancer mouse model (b) and pancreatic cancer mouse model (c) at 24h post intravenous injection of CNPs. The results clearly show that CNPs detect the cancers with deep tissue penetration.

**Key Documents and Sources:**

Provisional Patent Application filed October 16, 2018 available under CDA.