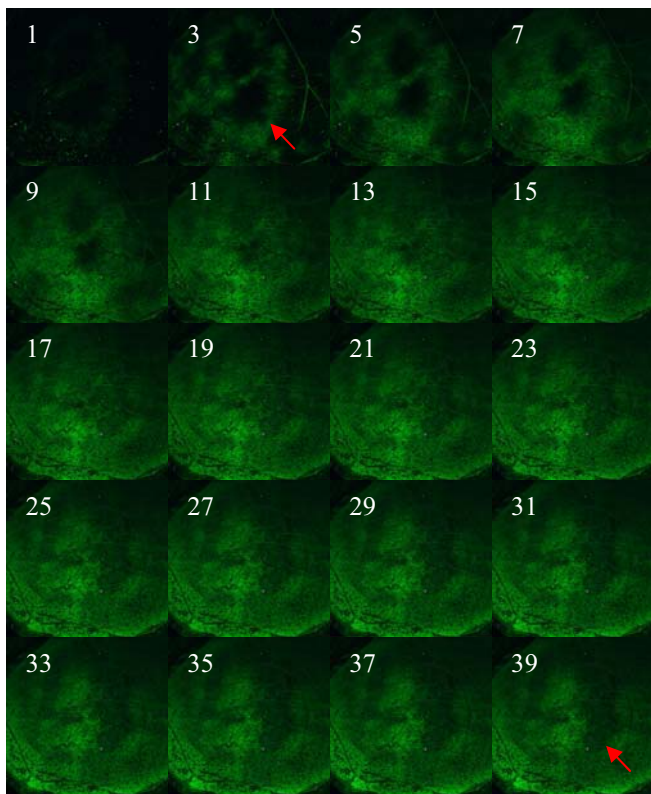


Glucose Analogues as Tumor Tracers

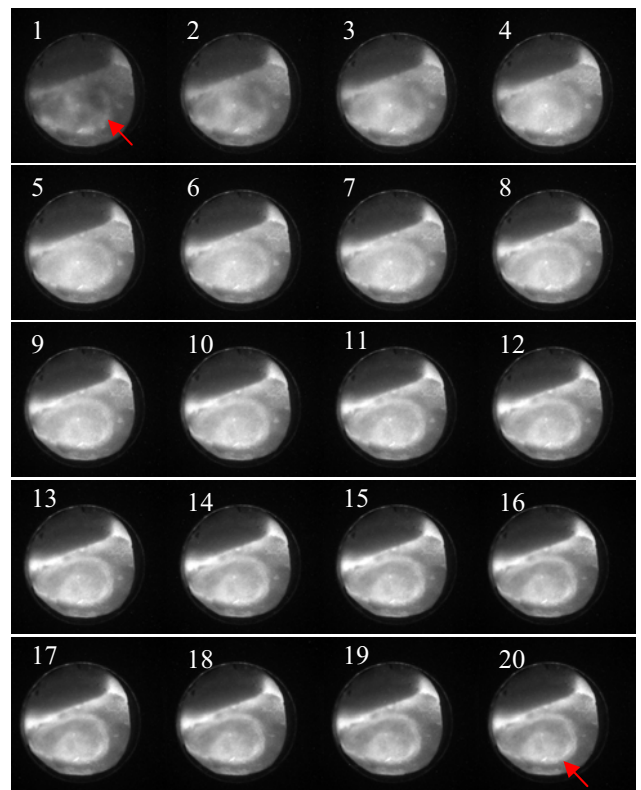
Tumor cells consume more glucose than normal ones to feed their proliferation and to compensate their insufficient use of glucose. Glucose analogue is therefore an excellent tumor-diagnosis tracer whose uptake level correlates with tumor aggressivity. 18-F-FDG has been very successful in positron imaging of tumors such as PET. In the Center for Gamma-Ray Imaging, our group has been collaborating with the researchers at the Department of Radiology to investigate new glucose analogues that can be used in gamma-ray imaging or fluorescence imaging, namely 99m-Tc-ECDG (Cell>Point) and fluorescent 2-NBDG (Molecular Probe).

A planar tumor model has been developed in a skin-fold clamped by a dorsal skin chamber on the back of a mouse. The model is being applied to study the glucose analogues on a colon cancer cell line transfected with red fluorescent protein (RFP) implanted in mice. The dynamic fluorescence images of 2-NBDG show a faster uptake and washout rate in tumor cells than in normal ones. The dynamic electron images of 18-F-FDG with our novel high-resolution high-sensitivity electron imager confirm the characteristic uptake dynamics of FDG and a higher FDG accumulation in tumor cells. The electron images of 99m-Tc-ECDG show differential uptakes between tumor cells and normal ones. These initial data suggest that 2-NBDG does not appear to be retained in tumor cells, behaving somewhat differently from FDG. ECDG appears to be retained more in tumor cells than normal ones, similar to FDG. The achievable labeling efficiency of Tc-99m onto ECDG in our lab is less than that reported by its manufacturer, which requires further improvements.

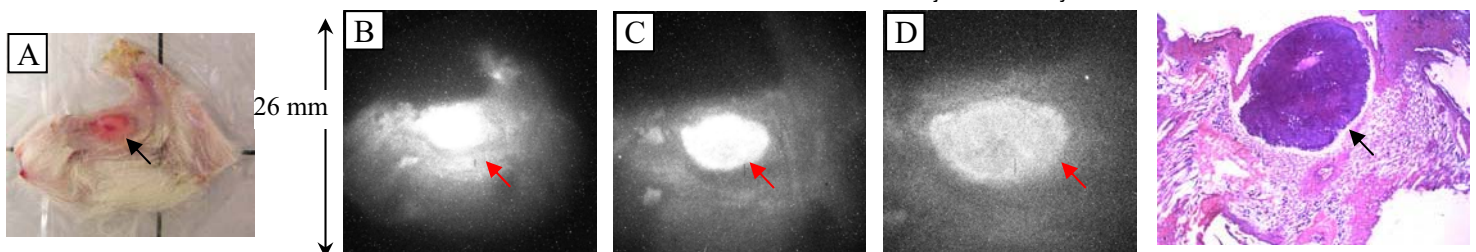
The results are still inconclusive to date, and more studies are necessary to understand the mechanisms of the new tracers. The current findings are valuable, and the new investigation methods are original. A number of manuscripts to report the current findings and the methods are in preparation.



Fluorescence image (2-sec exposure every 30 secs) sequence of the 2-NBDG uptake in the tissue with tumor in dorsal skin chamber during the first 40 minutes after injection on Day 1.



Positron image (2-min exposure every 2.5 mins) sequence of the 18-F-FDG uptake in the same tissue in dorsal skin chamber during the first 50 minutes after injection on Day 6.



Photograph of the excised skin tissue in the chamber (A), and the images of the conversion electron emissions from the tissue at 1X (B), 1.7X (C), and 2.7X (D) on Day 10.

Pathological slice (H&E) of the tissue with tumor.