Advancements in molecular imaging technology -- capable of "seeing" a patient's biochemistry down to the cellular level -- will likely play a big role in the personalized cancer treatments of the future, and a University of Minnesota bioengineering lab is preparing to introduce what could be a vital new product in the field.

One of the great promises of molecular imaging technology (formerly called nuclear medicine) is its ability to allow doctors to zero in on the minute characteristics of cancerous cells and thus detect the presence of the disease at an extremely early stage.

By modifying existing imaging technologies such as photon emission tomography, or PET scanning, it's now possible for doctors to non-invasively study a patient's individual genetics and cell biology, not only detecting cancer early, but also "stratifying" patients as candidates for varying kinds of treatments.

The tremendous potential of molecular imaging for individualized medicine is already recognized by big med-tech players such as GE Healthcare, Philips and Siemens, who are producing the hardware and software. But just as important is the refinement of the "tracer probes" that are injected into the body, bind to the cancer targets and deliver radioactive contrast agents to illuminate tumors on the PET scans.

In fact, developing effective molecular imaging probes is perhaps the most important element of the entire enterprise. They must be made to effectively target the right biomarkers and be transported safely through the body -- and the laboratory of Ben Hackel, an assistant professor in the U of M's department of chemical engineering and materials science, is on the verge of commercializing just such a cancer-sniffing probe, which employs a unique protein-based "scaffolding" to deliver the goods.

Hackel this summer was the recipient of a MN-REACH award. MN-REACH, supported by a $3 million National Institutes of Health grant and $3 million in matching university funds, is based out of the school's Office for Technology Commercialization. It is one of three "research evaluation and commercialization hubs" established by the federal agency around the country, whose missions are to distribute grants of up to $150,000 for health care technologies that both address unmet medical needs and are within "a few actionable steps" of commercialization.

The U of M researcher told TCB his lab has succeeded in producing a molecular imaging probe targeting the epidermal growth factor receptor, which is overexpressed in cancer cells, and enhances the ability of doctors to stratify patients by likely prognoses.

"What we're making is a particular imaging agent for going after a particular biomarker (EGFR) that is important in numerous cancer types, including colorectal cancer and breast cancer," Hackel said. "We are developing a molecule that can target EGFR in the human body and be detectable by a PET scan.

"It's a way of identifying which patients are likely to respond to a particular type of therapy versus patients who aren't likely to respond -- it's a personalized medicine approach. Clinics right now don't have a very good way of
differentiating between these two patient populations, so we propose that a PET imaging approach would be able to provide that.”

What Hackel and his U of M associates have done thus far is to develop the protein scaffolding molecule and test it in mouse models of breast and colorectal cancers.

“It has performed well, and so the MN-REACH funding -- $30,000 to begin with and up to $150,000 ultimately -- is to take it the last few steps before commercialization,” he continued. “It's focused on making some small but important modifications in the molecule so that it will perform more effectively at the human patient level.”

Hackel is working closely with the U’s tech commercialization office as to how the patent-pending molecular probe should be presented to investors in advance of the human clinical trial process.

“There are two paths it could take,” he said. “One is licensing it to the large current players in the molecular imaging space, companies like GE Healthcare, for instance, which already have a lot of investments in this technology.

“A second pathway is to continue its development through a newly created company. We have not yet spun out a company on this particular technology but we are already very actively engaged in discussions with local investors if that’s going to be the appropriate path to go down.”

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