

Your biopsy tissue could be helping important cancer research

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Credit: AI-generated image (disclaimer)

If you've ever had a tumor removed or biopsy taken, you may have contributed to life-saving research. Though you probably won't have been told exactly what research your cells would be used for, tissue samples like these are vital for helping us understand and improve diagnosis and treatment of a whole range of illnesses and diseases. But



once they're removed, how are these tissue samples used exactly? How do they go from patient to project?

When tissue is removed from a person's body, most often it is immediately put into a chemical preservative. It is then taken to a lab and embedded in a wax block. Protecting the tissue like this retains its structure and stops it from decomposing so it can be stored at room temperature for long periods of time.

This process also means that biochemical molecules like protein and DNA are preserved, which can provide vital clues about what processes are occurring in the tissue at that stage in the person's illness. If we were looking at, for example, whether molecule A occurs in one particular tumor type but not in others (which would make it helpful for diagnosis) we would want a large number of each type to test. But there may not be enough patients of each type currently in treatment, so it is useful to have a library of samples to draw from.

Or we might want to test if patients with tumors containing molecule B are less likely to survive for five years than those without this molecule. This sort of question requires samples with a follow-up time of at least five years. But the answer may help doctors decide whether they need to treat their current patients with B more aggressively or with a different kind of treatment.

To analyse tissues, lab scientists cut very thin slices from the wax blocks and view them under a microscope. The slides are stained with dyes that show the overall tissue structure, and may also be stained with antibodies to show the presence of specific molecules.

Studies often need large numbers of samples from different patients to adequately answer a research question, which can take some time to collect. Take my work for example. My team is interested in finding



more about a protein called brachyury, and how it relates to bowel cancer. But to do this we need to compare lots of samples, so we are using tissue from 823 bowel cancer patients and 50 non-cancer patients in our research.

When not in use, the tissue blocks are—with patient consent—placed in a store that researchers can access. The UK has several of these stores, known as biobanks or biorepositories, holding all kinds of tissues. Some cancer biobanks also store different kinds of tumors and blood samples.



Credit: Michelle Leman from Pexels



While there are <u>no reliable figures</u> available on how many samples are held in all biobanks, or how often they are used, we do know these numbers are significant. The Children's Cancer and Leukaemia Biobank alone has banked <u>19,000 samples since 1998</u>. The Northern Ireland Biobank <u>reports that</u> 2,062 patients consented for their tissues to be used in research between 2017-2018, and 4,086 samples were accessed by researchers in that period.

Identifying biomarkers

Projects that use biobanks are often trying to identify biomarkers. These are any biological characteristics that give useful information about a disease or condition. Our team is looking at whether the protein brachyury is a useful biomarker to improve <u>bowel cancer</u> diagnosis.

Brachyury is essential for early embryonic development, but it is switched off in most cells by the time you are born. However, <u>several</u> <u>studies imply that</u> finding brachyury in a tumor indicates a poorer outcome for the patient. But to work out if this link is correct, we need to look at <u>biobank</u> samples. Doing this will help us work out more accurately which patients are at higher risk of cancer recurrence or metastasis. This is important when doctors are deciding on the best course of treatment.

In our research, we also need clinical details, such as what happened to the patient and all the information available at the time of diagnosis. Then we can assess whether testing for brachyury would have added useful information to the diagnosis. Information that accompanies each block is anonymized, which means the researcher analyzing the data won't know the patient's name or be able to identify them from the sample. But they can see any relevant clinical details such as tumor stage, age, sex and survival.



Biobank samples have had already improved treatment of childhood acute lymphocytic leukemia. Samples from the Cancer and Leukaemia Biobank were used to demonstrate that children with an abnormality in chromosome 21 had poorer outcomes that those without it. This led to treatment being modified for these children so they are <u>no longer at a disadvantage</u>.

People are often applauded for raising money for research by undertaking grueling or inventive challenges. Patients who decide their <u>tissue</u> can be used in research should be similarly applauded. Without their unique and valuable gift, we wouldn't be able to further our understanding, diagnosis and treatment of all kinds of illnesses and diseases.

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