

How the immune system can help us diagnose cancer

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One of the deadliest forms of cancer is biliary tract cancer. Only one in three patients diagnosed with the disease is operable. The rest must settle for life-sustaining treatment.

The reason why this cancer is so deadly is that it is difficult to diagnose, and therefore, most patients are not diagnosed with the disease until after the cancer has had time to spread.

Nevertheless, new research from the University of Copenhagen can pave the way for early detection of [biliary tract cancer](#) and other serious cancers.

Biliary tract cancer

- Biliary tract cancer, also referred to as [bile duct cancer](#), is a tumor that arises in the mucosa of the bile duct (the tubes carrying bile between the liver, [gall bladder](#) and intestines).
- The tumor either develops in the liver or, which is more often the case, outside it.
- Biliary tract cancer is a [rare disease](#), and on a global scale, it represents only three percent of all cancers in the digestive system.
- Biliary tract cancer is most common among people aged 55 or more and is rarely seen in people below the age of 40.

In Denmark, we get around 150 new cases of biliary tract cancer each year.

"Our study shows that biliary tract cancer causes the immune cells to change behavior, resulting in a unique expression of microRNA molecules in the patient's blood. These changes enable us to diagnose biliary tract cancer much earlier than with existing tests," says Associate Professor Jesper Bøje Andersen. He is head of the group of researchers from the Biotech Research & Innovation Centre at the University of Copenhagen who are responsible for the new study.

"Sometimes tumors, including the ones you find in the biliary tract,

differ considerably, and developing a comprehensive measure for these tumors can therefore be difficult. But one thing all cancers have in common is the fact that they affect the immune system," says Ph.D. Dan Høgdall, who is first author of the study and a doctor at the Department of Oncology at Herlev and Gentofte Hospital. He adds that "we need to focus attention on how cancer affects the body as a whole instead of focusing solely on the cancer cells. Among other things, such a broad approach has paved the way for brand new treatments involving immunotherapy, which is targeted at the immune cells instead of the [cancer cells](#). Adopting a broad approach can also provide us with important knowledge about early diagnostics."

Cancer causes the immune cells to change behavior

The researchers have examined more than 200 [blood samples](#) from people with and without biliary tract cancer. They have analyzed the cells in the blood, a large part of which were immune cells. More specifically, they have conducted microRNA analyses. MicroRNA is a group of genes, which play a key part in the complex development of the human genome.

"By comparing the different levels of microRNA in the blood, we identified four microRNAs, and this enabled us to distinguish patients with biliary tract cancer from healthy participants. Other types of blood analyses were unable to do that. All in all, the data indicates that microRNAs change in patients with biliary tract cancer," says Jesper Bøje Andersen.

The new study is not the first to research cancer and the [immune system](#), but it is the first to do so in relation to biliary tract cancer.

"The research method is also new. We look at the blood as a whole and thus at all the [cells](#), which largely consist of [immune cells](#). A lot of

research seeks to identify methods for early detection of cancer. But it is like looking for a needle in a haystack, as the goal is to find the tumors while they are still very small. The idea behind this approach is to look not for the needle, but for small changes in the haystack," explains Dan Høgdall.

Even though the researchers have completed the study, it will be a while before the new method can be used to diagnose patients.

"This is basic research, which means that it will take some time. But it does suggest that it makes sense to look at the systemic impact of [cancer](#). It will require more in-depth research, though," he says.

The research is published in the *Journal of Hepatology*.

More information: Dan Høgdall et al, Whole blood microRNAs capture systemic reprogramming and have diagnostic potential in patients with biliary tract cancer, *Journal of Hepatology* (2022). [DOI: 10.1016/j.jhep.2022.05.036](https://doi.org/10.1016/j.jhep.2022.05.036)

Provided by University of Copenhagen

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