

Breast cancer spreads at night: Surprising findings from cancer research

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Breast cancer is one of the most common forms of cancer, according to the World Health Organization (WHO). Each year, around 2.3 million people worldwide contract the disease. If doctors detect breast cancer early enough, patients usually respond well to treatment. However, things become much more difficult if the cancer has already metastasized. Metastasis occurs when circulating cancer cells break away from the original tumor, travel through the body via blood vessels and form new tumors in other organs.

To date, [cancer research](#) has not paid much attention to the question of when tumors shed metastatic [cells](#). Researchers previously assumed that tumors release such cells continuously. However, a new study by researchers at ETH Zurich, the University Hospital Basel and the University of Basel has now come to a surprising conclusion: circulating [cancer cells](#) that later form metastases mainly arise during the sleep phase of the affected individuals. The results of the study

have just been published in the journal *Nature*.

Circadian rhythm-regulated hormones control metastasis

"When the affected person is asleep, the tumor awakens," summarizes study leader Nicola Aceto, Professor of Molecular Oncology at ETH Zurich. During their study, which included 30 female [cancer](#) patients and mouse models, the researchers found that the tumor generates more circulating cells when the organism is asleep. Cells that leave the tumor at night also divide more quickly and therefore have a higher potential to form metastases, compared to circulating cells that leave the tumor during the day.

"Our research shows that the escape of circulating cancer cells from the original tumor is controlled by hormones such as melatonin, which determine our rhythms of day and night," says Zoi Diamantopoulou, the study's lead author and a postdoctoral researcher at ETH Zurich.

Adjusting therapies to the tumor

In addition, the study indicates that the time in which tumor or [blood samples](#) are taken for diagnosis may influence the findings of oncologists. It was an accidental finding along these lines that first put the researchers on the right track, "Some of my colleagues work early in the morning or late in the evening; sometimes they'll also analyze blood at unusual hours," Aceto says with a smile. The scientists were surprised to find that samples taken at different times of the day had very different levels of circulating cancer cells.

Another clue was the surprisingly high number of cancer cells found per unit of blood in mice compared to humans. The reason was that as nocturnal animals, mice sleep during the day, which is when scientists collect most of their samples.

"In our view, these findings may indicate the need for [healthcare professionals](#) to systematically record the time at which they perform biopsies," Aceto says. "It may help to make the data truly comparable."

The researchers' next step will be to figure out how these findings can be incorporated into existing cancer treatments to optimize therapies. As part of further studies with patients, ETH Professor Nicola Aceto wants to investigate whether different types of cancer behave similarly to [breast cancer](#) and whether existing therapies can be made more successful if patients are treated at different times.

More information: Nicola Aceto, The metastatic spread of breast cancer accelerates during sleep, *Nature* (2022). DOI: [10.1038/s41586-022-04875-y](https://doi.org/10.1038/s41586-022-04875-y). www.nature.com/articles/s41586-022-04875-y

Provided by ETH Zurich

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