Why does night shift increase the risk of cancer, diabetes and heart disease? Here's what we know so far

November 29 2022, by Frederic Gachon

Credit: Laura James/Pexels

Shift work means businesses and organizations can be productive for 24-hours a day. It was initially adopted to protect camps or cities against predators, enemies or disasters.

Since the industrial revolution and the development of artificial lighting, manufacturing, service and retail sectors have used shift work to

increase productivity and profitability, and provide continuous health care and emergency services.

Around 20% of the workforce are now shift workers, with 25–30% of those working nights.

But working when you're supposed to sleep and rest disrupts your normal physiology.

More cancer, heart attacks and diabetes

Before the 1990s, little was known about the impact of shift work on health.

Then a landmark study using clinical data from the mid-1990s found nurses working at night had an increased risk of breast cancer. This risk increased with the number of years spent performing shift work.

This and other studies led the International Agency for Research on Cancer to conclude in 2007 that night shift work should be classified as "probably carcinogenic to humans" (Group 2A), meaning experts suspect it increases the chance of cancer. This statement was confirmed in 2019.

Since then, studies have shown shift work, particularly rotating shift work, also increases the risk of heart disease, obesity and type 2 diabetes , dementia, and overall premature death.

It is also associated with decreased alertness and a higher risk of accidents.

What's behind the increased risk?

Growing evidence points to the disruption of the circadian clock caused by being active or awake at night when we are supposed to sleep.

During evolution, living species—from bacteria and plants to humans—have acquired a circadian clock to optimize bodily processes in an environment that changes throughout the day.

Consequently, almost all aspects of behavior, physiology and metabolism are rhythmically organized to anticipate these daily changes.

Muscle strength, the immune system, and cognitive performances, for example, are higher during the day when the body is also storing nutrients from food. These functions decrease in the night when the body starts to use the stored nutrients during this period of fasting.

These circadian clocks are present in almost every cell of our organism. The central clock in the brain acts as a kind of conductor of an orchestra that synchronizes all these clocks and is synchronized every day by the environmental light.

If these clocks now get input from other sources like food at night, or if the conductor gets distracted with something like light during the night, this synchrony gets lost.

This leads to increased weight gain, type 2 diabetes, increased blood pressure, and compromised immune response. This is seen even in cases of low-intensity light in the bedroom such as a TV screen.

In studies using animal models, this lost synchronicity leads to an increased incidence of breast cancer and faster tumor growth. It also exacerbates the symptoms of Alzheimer's disease in studies of mice.

Why does the circadian disruption wreak so much

havoc?

There is no simple explanation, and it likely involves multiple components.

Like in animal models, the disruption of the well-organized physiology caused by light at night or feeding at the wrong time disturbs the organs' natural function, particularly the capacity to store and use nutrients during the proper period.

Circadian disruption is also associated with a disturbance of the autonomous nervous system that orchestrates our basic functions like breathing or keeping our heart beating. This impacts the connection between the brain and surrounding tissues, and their proper function.

Finally, shift-work simulation in humans showed an impact on the immune system. This contributes to a higher risk of infection among shift workers, notably COVID, and could also play a role in cancer progression.

Altogether, this contributes to a globally increased predisposition to several illnesses, including cancer diabetes and heart disease.

The circadian clock also plays a critical role in the efficacy and toxicity of most drugs, including cancer chemotherapy. And a sustained circadian rhythm impacts the response to treatments.

What can we do about it?

The first step should be to limit rotating shift work as much as possible. While people can adapt to work at the "wrong" time to some extent, it's impossible to adapt to schedules that constantly change.

Several trials studying the impact of lighting showed bright light increases alertness during the night and help the organisms to adapt to night work by shifting the phase of the circadian clock. However the long-term impact on health is still to be determined.

Controlling and limiting the time during which people are eating (for example ten hours during the day and not eating overnight) appears to be a promising approach that could be beneficial for heart and metabolic health, and seems compatible with shift work. It also reduces tumor growth in animal studies of breast cancer.

However, there is no optimal solution. A reasonable approach would be to limit shift work to essential services (hospital, emergency services, and so on) and reverse the global trend towards a 24-hour society to decrease shift work for better health.

Provided by The Conversation