

PREVENTING BREAST CANCER PART I: DARKNESS

by Ann Gerhardt, MD

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Wouldn't it be ironic if our sleep-deprived, harried lives and big-city lights were a major contributor to the breast cancer epidemic? If so, would we choose to change our lifestyles to prevent it? Or would we be human and assume it wouldn't happen to me? Can we afford to give up our myriad all-important activities that prevent sleeping in the dark for eight-plus hours a day?

In 1978 a glimmer of light in the science of darkness suggested that breast cancer cell growth is blocked by melatonin. Melatonin is a hormone produced by the pineal gland in the brain. Melatonin level rises in darkness and falls in bright light. It helps to regulate other hormones and the body's internal day-night "clock". It tells the brain that it is dark outside and it is time to go to sleep. You don't have to be asleep to make melatonin, any dark room or dark sky will do.

Doctors Blask and Stevens, in 1986, did test tube experiments studying the effect of melatonin on breast cancer cells. Melatonin damaged the cancer cells so they couldn't grow or make new ones, but only temporarily. Once they washed melatonin off the cells, the cancer cells started to grow again.

Further experiments verified that melatonin from human blood had the same effect. Animal breast cancers stopped making new cancer cells when flooded with melatonin-rich human blood. They grew well in the presence of daytime, melatonin-poor blood. Adding a melatonin blocker to the blood let the cancer cells grow as if the blood had low melatonin levels, confirming that the effect was due to melatonin.

So doctors and epidemiologists sought real-life evidence that melatonin deficiency might set a woman up for breast cancer. Compared to women routinely working day shifts, nurses and other night shift workers have a 50% greater risk of developing breast cancer. The largest study to confirm this was the Nurses' Health Study, involving thousands of nurses, many of whom work night shifts. In a 2006 study, the investigators did

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not see an association with evening shift work, but women who turned on lights at home during sleep hours had a 65% increased risk of breast cancer.

On the other end of the spectrum, high melatonin levels seem to protect against hormone-related cancer. Blind women, whose brain only "sees" dark, rarely get breast cancer and have unusually high levels of melatonin. Melatonin and light exposure don't have the same effect on skin, lung, liver, larynx, colon or uterine cells.

As Dr. Blask puts it, cancers are awake during the day and go to sleep in the dark. The thing that puts them to sleep is melatonin. Sleep doesn't deter breast cancer, dark does. But sleeping at night in a dark room with your eyes closed is a darn good way to get enough dark.

Three of four good prospective studies have reported a lower risk of breast cancer in women who report long sleep duration. A study of 12,222 Finnish women found that those who slept 9 or more hours per night had 1/3 the cancer risk of those who slept only 7-8 hours.

One-third less cancer doesn't mean zero. High-melatonin levels don't guarantee no cancer. So far the studies focus on cancer cells, suggesting that melatonin slows growth after cancer has started. We don't know if it keeps cancer cells from forming in the first place.

Older age, obesity, alcohol and heavy smoking are known risk factors for breast cancer. They also are associated with lower melatonin levels. Who knows which contributes more to cancer, the condition, substance, melatonin or something else? Maybe it takes a combination. For example, older women suffer more from insomnia, which lowers melatonin and causes carbohydrate craving, contributing to obesity. Which factor incites the breast cancer? Alternatively, if she stays up at night smoking and drinking with the lights on, she's suppressed her melatonin levels and ingested carcinogens, not a good way to avoid cancer.

Epidemiologists worry that cities no longer have dark skies at night. A major investigator in the field finds that

countries with higher levels of light at night (LAN) have higher rates of hormone-related cancers, after controlling for population. Countries with the highest LAN levels have 30-50% more breast cancer than those with the lowest. Do melatonin levels follow suit? Since sleep duration and artificial light at night contribute a huge amount to determining melatonin production, any study comparing melatonin levels in high vs. low LAN countries would have to control for those factors.

The way to get healthy melatonin levels is to sleep 8-9 hours per day in the dark. Experts in the field don't give clear recommendations about taking melatonin supplements. Adding melatonin to conventional cancer therapy may improve outcome, but remember that taking high doses of melatonin should make you sleepy. If you take them during the day, it will disrupt your internal clock and we don't know what effect that might have. Related substances, like serotonin and melatonin breakdown products don't have the same effect.

Recommendations:

- Avoid all carcinogens (see Preventing Breast Cancer, Parts II – IV in upcoming issues), so the melatonin doesn't have as much to suppress.
- Avoid exposure to blue, white or bright light at night. They all suppress melatonin production. Red and yellow lights suppress it much less. Put your extra red or yellow holiday lights in your night light.
- If you wake up to go to the bathroom at night do not turn on bright lights to find your way. Use your night light, and get back to bed and close your eyes.
- Avoid evening use of substances that block melatonin production, like alcohol and cigarettes.
- Short exposures to dim lights at night don't lower melatonin much. If you have insomnia, keep the lights low, read *No More Sleepless Nights* by Peter Hauri and get back to sleep as soon as you can.
- If you must do shift work, be sure to darken your bedroom and get at least eight hours of sleep during the day.
- Prioritize and delegate better, so you have more than eight hours in a day in which to sleep. More sleep will make you more efficient at all those important daytime activities.
- If you party all night, do it in the dark.

How does melatonin regulate breast cell growth?

Melatonin regulates a number of cell functions by blocking DNA translation. It reduces estrogen's

stimulatory effect on breast, so cancer is less likely to get its start. Melatonin does not directly block the estrogen receptor, it merely decreases the number of estrogen receptors, thereby reducing estrogen's effect on cell growth. It also regulates growth factors and inhibits tumor cell invasion and metastasis. It does this by antagonizing the gene expression mechanism for growth.

Melatonin also affects cancer cells' fat metabolism. It blocks their linoleic acid uptake, and possibly its conversion to energy in the cell, transiently starving them. In addition, it blocks conversion of the essential fatty acid linoleic acid to 13-hydroxyoctadecadienoic acid, which stimulates cancer cell growth.¶