



Metformin is one of the most commonly prescribed drugs for the treatment of high blood sugar (hyperglycemia) and diabetes, with nearly 120 million prescriptions filled yearly worldwide. Now researchers want to know whether it can be used to treat other diseases like breast cancer.



Learn more about diabetes and breast cancer

<http://sgk.mn/1sUwKae>

We know from research that cancer cells need sugars, like glucose, to grow and survive. We also know that insulin, a hormone that helps control glucose levels, is often elevated in pre-diabetes and can act as a growth factor in breast cancer.

Metformin can kill cancer cells because of this dependency. Research also suggests that metformin may help chemotherapy work better in diabetic people with breast cancer. But we do not yet know if metformin can be used to treat breast cancer in people without diabetes.

Several Komen grantees, including Dr. Ann Thor, Professor of Pathology at the University of Colorado, Denver, and Dr. Pamela Goodwin, Director of the Marvella Koffler Breast Centre at Mount Sinai Hospital, University of Toronto Mount Sinai Hospital, are working to answer this question.

Metformin belongs to a class of drugs called biguanides, which are used to treat high blood sugar or diabetes. Several studies suggest metformin may also reduce the risk and increase survival of some cancers like breast cancer. But study results are inconsistent, and how metformin affects cancer outcomes is not entirely clear – it may act by lowering insulin and glucose levels – it may also act directly on cancer cells, independent of insulin and glucose.

With a Komen grant, Dr. Ann Thor and her University of Colorado colleagues studied the effects of high sugar levels and metformin on 17 different types of breast cancer cells, representing the different subtypes of breast cancer.



**Fun Fact!** Biguanides are derived from the herb *Galega officinalis* (French lilac, also known as Goat's Rue or Italian Fitch). Their use dates back to ancient Egypt and medieval Europe, where a tea infused with French lilac was used for relief of frequent urination and halitosis (a sweet odor on the breath), both now well-known symptoms of diabetes.



Dr. Ann Thor

She found that high levels of glucose, as occurs in diabetes, can cause breast cancer cells to grow, become more aggressive, and more easily move away from the tumor to spread to other parts of the body (metastasize).

The breast cancer type most affected by high glucose levels was triple negative breast cancer. However, Dr. Thor also found that metformin could kill breast cancer cells and decrease their ability to spread, but the amount needed depended on the amount of glucose in the cell. Under lower or normal glucose levels, less metformin was needed; compared to higher glucose levels, where more metformin was needed to be effective.

*"When you drop glucose down [to normal levels], metformin has an even bigger effect [at slowing the growth of breast cancer cells],"* Thor says.



Dr. Pamela Goodwin

Building on previous studies done in cells, Dr. Pamela Goodwin tested how metformin affects the biology of breast cancer in a small group of women with early breast cancer. In a Komen-funded clinical trial, 39 women with operable, invasive breast cancer were treated with metformin before undergoing surgery.

Dr. Goodwin found that not only could metformin reduce the growth of cancer cells and increase cancer cell death, but it also resulted in lower weight, body-mass index and insulin levels in the trial participants. Specifically, she found that metformin worked by slowing down the growth signals that can occur when insulin levels are high.

*"To our knowledge, this is the first study to report an increase in breast cancer cell*



## Science Buzz!

### Can a Common Diabetes Drug Help Treat Breast Cancer?



*death with the use of metformin in the neoadjuvant (before surgery) setting" says Goodwin. "Short-term use of metformin before surgery was well tolerated and resulted in clinical and cellular changes consistent with beneficial anti-cancer effects," she adds.*

Together, these studies suggest that metformin may not only help treat diabetic people with breast cancer, but all breast cancer patients, particularly those with triple negative breast cancer. Using metformin may also have other health benefits that could affect breast cancer survival such as weight loss.

However, Dr. Goodwin cautions that larger clinical trials are needed to adequately determine whether metformin can be routinely used to treat breast cancer in people without diabetes. She is currently conducting a Phase III clinical trial of the effect of metformin on breast cancer outcomes. So far, 3649 breast cancer patients have been accrued. Results of the trial will be available in 2 to 3 years.

Dr. Thor's studies were published in the December 2013 issue of the journal [Cell Cycle](#).

Dr. Goodwin's studies were published in the October 2012 issue of [Breast Cancer Research and Treatment](#).

