

Cardamonin Shows Promise for Improving Tumor Therapy

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✓ Fact Checked

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STORY AT-A-GLANCE

- › Triple-negative breast cancer is among the most aggressive forms of breast cancer, which researchers showed responded positively in the lab when exposed to cardamonin, a compound found in the spice cardamom
- › The compound has received attention for over a decade for chemoprotective and chemotherapeutic properties, including against breast cancer and colon cancer, showing it could reduce cancer cell glucose uptake
- › The current study showed it produced a dose-dependent decrease in PD-L1, which is a protein found more plentifully in tumor cells and is how they evade the immune system
- › While some researchers are turning to medicinal plants to help treat cancers, others have incorporated nutritional ketosis with highly encouraging results

According to the American Cancer Society,¹ the average risk for a woman in the U.S. of developing breast cancer is about 13%. Said another way, there's a 1 in 8 chance of developing the disease, yet this also means there's a 7 in 8 chance that she will never develop breast cancer.

Research² presented at the Experimental Biology 2022 meeting in Philadelphia demonstrated how a compound found in the spice cardamom, could have therapeutic potential against triple-negative breast cancer.

Breast cancer is categorized as invasive or noninvasive.³ Noninvasive breast cancer has not spread to the surrounding tissue and is called ductal carcinoma in situ (DCIS) or

intraductal carcinoma. When breast cancer is invasive it has spread to the surrounding tissue. The two most common types are invasive ductal and invasive lobular carcinoma.

These make up between 70% and 80% of all diagnosed breast cancers, but there are two special types of invasive breast cancers that account for fewer diagnoses but are more difficult to treat.

Inflammatory breast cancer grows aggressively and blocks the lymph vessels in the skin. This causes the area over the cancer to have an orange peel appearance and the skin to look inflamed. It is rare, accounting for up to 5% of all breast cancers. Triple-negative breast cancer is also an especially aggressive cancer and accounts for up to 15% of all breast cancers that are diagnosed.

Triple-negative breast cancer gets its name from testing negative for estrogen and progesterone receptors, and negative for the protein called HER2.⁴ The lack of hormonal receptors in the cancer cells means the tumor doesn't respond to hormonal therapies or those that target HER2. This type of breast cancer is more common in women younger than 40, Black women and women with the BRCA1 genetic mutation.

Current treatments include surgical resection and a combination of one or more treatments of radiation therapy, chemotherapy and immunotherapy, which have also been referred to as cut, burn and poison. Unfortunately, this has been the sum of the treatments available in Western medicine. Researchers are now seeking treatment from medicinal plants and have found one compound extracted from cardamom and other herbs may have anticarcinogenic properties.⁵

Compound in Cardamom Shows Promise in Breast Cancer Treatment

The compound — cardamonin — has received attention for over a decade for chemoprotective and chemotherapeutic properties.⁶ Cardamonin belongs to a group of flavonoids called aromatic enones that are often responsible for the yellow color in

plants. The group of flavonoids is called chalcones and has a history in medicinal chemistry.

One study⁷ published in 2019 noted that cardamonin has anti-inflammatory and antitumor activity, but the mechanism it uses to inhibit breast cancer had not been identified. They found that cardamonin inhibited the Nrf2-dependent reactive oxygen species (ROS) scavenging system. The accumulation of ROS induced apoptosis in the cancer cells.

They also found that the compound reduced glucose uptake and lactic acid production, which affects cancer cell metabolism. A second study⁸ in 2020 wrote that the compound "is well-known to inhibit proliferation, migration, invasion and induce apoptosis ... The good biosafety and pharmacokinetic profiling of cardamonin satisfy it as an attractive molecule for the development of an anticancer agent."

Past research has also demonstrated that cardamonin has antineoplastic activity against colon cancer.⁹ The current study presented at Experimental Biology 2022 meeting had encouraging results against triple-negative breast cancer, showing the compound affected the genetic pathway that cancer cells use to avoid the immune system.

The current lab study used cell lines of triple-negative breast cancer from women with African-American ancestry and another cell line from women of European origin.¹⁰ According to the press release, the researchers investigated how the compound affected programmed cell death of the ligand 1 (PD-L1) gene found more plentifully in tumor cells than in normal cells.¹¹

The overexpression of this gene plays a vital role in how cancer cells can evade the immune system. There was a dose-dependent decrease in cell viability across both cell lines, but a reduction in PD-L1 expression only in the Caucasian cell line. The researchers wrote:¹²

"The data show that cardamonin may alter the production of PD-L1 at the transcription level in MDA-MB-231 [Caucasian] TNBC cells, but not in MDA-MB-

468 [African American] cells, corroborating with literature showing differences in the tumor microenvironments between African Americans and non-African Americans.

In conclusion, cardamonin may have the therapeutic potential to decrease the levels of PD-L1 in the tumor microenvironment combating the cancer cells' effectiveness of evading the immune system."

Patricia Mendonca, Ph.D., is the assistant professor and research analyst at Florida A&M University who presented the research in Philadelphia. She stated in a press release:¹³

"The fact that cardamonin has been used for centuries as a spice and, more recently, as a supplement shows that its intake is safe and may bring health benefits. Our research shows that cardamonin holds potential for improving cancer therapy without as many side effects as other chemotherapeutic agents."

The War on Cancer Starting to Focus on Medicinal Plants

Mendonca also stressed the importance of investigating medicinal plants, saying:¹⁴ "It has been challenging to develop a targeted therapy for triple-negative breast cancer that is safe and effective at the same time. Because of this, there is a critical need to investigate medicinal plants as a new way to combat this cancer."

It was in the mid-1970s when scientists believed they understood the molecular basis of cancer. The hypothesis was that cancer was caused by sequential mutations that could then be precisely targeted using gene-based therapies. This ushered in the era of targeted therapy, which has been a bitter disappointment. While scientists were excited by lab results, targeted therapy has barely moved the needle on cancer death rates.

During my interview below with Travis Christofferson, author of "Tripping Over the Truth: How the Metabolic Theory of Cancer is Overturning One of Medicine's Most Entrenched Paradigms," and Dr. Abdul Kadir Slocum from the ChemoThermia Oncology Center in

Turkey, Christofferson commented on the broken system of investigating and choosing chemotherapeutic agents:^{15,16}

"An example of that is Tarceva, which was approved about 10 years ago. It's got a pretty bad side effect profile. It's expensive. It boosts median survival for pancreatic cancer patients by 10 days. That's what we're dealing with, those kinds of things.

Ironically, we have this Catch-22 in the system where Big Pharma is incentivized to de-risk this process because it's so expensive and makes these marginal improvements.

In the meantime, we have these non-patentable therapies sitting on the sidelines, that could potentially be game changers for cancer, but they cannot get the billion-dollar backing to push through these huge trials to get the burden of proof to where the oncology community will actually incorporate them to the clinic.

The arsenal we have today compared to the '70s is so much more rich [with therapies] that we could use. We have all these interesting metabolic therapies. We have repurposed drugs that we could use.

In the epilogue in my book, I ask the question, What would it look like today if we had a less onerous regulatory environment like they did in the '70s, and good oncologists were allowed to ... try some of these therapies in the clinic and see what happens? That's why I'm so happy we have Dr. Slocum here, because he's given us his first glimpse of what metabolic therapies will look like when they're incorporated into the clinic."

Cancer Is a Metabolic Disease

Cancer, including breast cancer, is a metabolic disease that can respond to nutritional ketosis. In this interview with Christofferson and Slocum, we discussed how Slocum and his team at ChemoThermia Oncology Center in Turkey are using fasting to support their

chemotherapy efforts with cancer patients. The patients are first put on a ketogenic diet, which creates metabolic stress in the cancer cells.^{17,18}

Before administering chemo, the patients do a 14-hour fast, which increases the metabolic stress. Typically, blood glucose levels are around 80 milligrams per deciliter (mg/dL) when the team then applies glycolysis inhibitors that create additional stress, since the cells are already starved of glucose.

Next, the patients receive insulin to lower their blood glucose levels even further before chemotherapy is administered. In the days after chemotherapy, the team uses hyperbaric oxygen therapy and hyperthermia, plus a daily infusion of glycolysis inhibitors with high dose vitamin C (50 grams) and dimethyl sulfoxide (DMSO).

The results have been notable and published in several papers,^{19,20,21,22} including treatment of stage 4 triple-negative breast cancer.²³ Thomas Seyfried, Ph.D., professor of biology at Boston College, is also a leading expert and researcher in the field of cancer metabolism and nutritional ketosis.

His book, "Cancer as a Metabolic Disease: On the Origin, Management and Prevention of Cancer" is a foundational textbook on this topic, and in August 2016, he received the Mercola.com Game Changer Award for his work. In a past interview,²⁴ we discussed the mechanisms of cancer and the influence of mitochondrial function, which plays a crucial role in the development and treatment of this disease.

His landmark cancer theory²⁵ was first published in 2010. Many of his views are encapsulated in his paper²⁶ "Mitochondrial Substrate-Level Phosphorylation as Energy Source for Glioblastoma: Review and Hypothesis," published online December 27, 2018. He's also published several other papers^{27,28,29,30,31,32,33} on the metabolic underpinnings of cancer.

Fasting May Drastically Reduce Risk of Breast Cancer

Cancer is a metabolic disease deeply rooted in mitochondrial dysfunction. In a nutshell, cancer cells burn glucose, which generates far more ROS than fat and ketones. To burn

fat, the cell must be healthy and normal, so a high-fat, low-sugar diet essentially starves cancer while nourishing healthy cells.

To be clear, unless you're on a drug that requires you to eat at certain times or when you take it, time-restricted eating and a ketogenic diet can safely and easily be implemented even if you're going through conventional cancer treatment. In fact, as Slocum has demonstrated, it can make chemotherapy more effective.

It goes without saying that when using metabolic therapies, the patient carries a significant responsibility for their own outcome. The doctor cannot cook your food, force you to take supplements or withhold food when it's time to fast. You must be very diligent and disciplined to follow the specified regimen.

Essentially, if you have a life-threatening condition like stage 4 cancer, you need to be a bit obsessive and follow the regimen to the letter. You cannot veer from the protocol if you expect to achieve the kind of results Slocum has found in his treatment facility.

That said, if you're seeking to optimize your health or slow down the aging process, cycling through "feast and famine" – as opposed to continuously remaining in nutritional ketosis – appears to be a better approach. If you do it continuously, it can actually be highly counterproductive. This applies to using nutritional ketosis for optimal health or cancer treatment. As Slocum describes the treatment protocol at the center:³⁴

"As an example, patients come and they're on a ketogenic diet. When they will be coming in for chemotherapy after a 14-hour fast, then that would apply a glycolysis and insulin to lower the glucose and then apply chemotherapy.

After applying chemotherapy, on the day of chemotherapy, they are able to eat whatever they want, especially because of the mild hypoglycemia that is caused by supplying insulin. The day of chemotherapy is when they get as much carbohydrate as they want."

Patients being treated for cancer must also have days where they eat more net carbs and more protein, especially with strength training, to prevent sarcopenia that is

common in cancer. This is because when cancer cells are deprived of glucose, they can break down muscle tissue to extract glutamine.

Interestingly, Seyfried is working with a glutamine inhibitor called DON to prevent this from happening, thereby making the therapy even more effective. It is important to understand that the "metabolic magic" actually occurs during that refeeding phase when net carbs and protein are increased, which increases muscle growth.

After a day or two, you then cycle back into nutritional ketosis. Typically, this is done once a week. To a degree, Slocum uses this technique on cancer patients as well, although they're only allowed to eat higher amounts of net carbs once every two or three weeks, on the day they receive chemotherapy.

Sources and References

- ¹ [American Cancer Society, Key Statistics for Breast Cancer](#)
- ^{2, 5} [NewsWise, March 25, 2022](#)
- ³ [American Cancer Society, Types of Breast Cancer](#)
- ⁴ [BreastCancer.org, Triple-Negative Breast Cancer, group of bullets - 1, 2, 3](#)
- ⁶ [Journal of Medicinal Foods, 2014;17\(6\)](#)
- ⁷ [Journal of Experimental and Clinical Cancer Research, 2019, 39\(377\)](#)
- ⁸ [Exploration of Targeted Anti Tumor Therapy, 2020;1](#)
- ⁹ [Scientific Reports, 2017, 7\(13945\)](#)
- ^{10, 13, 14} [NewsWise, April 3, 2022](#)
- ^{11, 12} [Experimental Biology 2022, Pathology, April 3, 2022](#)
- ^{15, 17} [Bitchute, October 6, 2021](#)
- ¹⁶ [Interview Transcript, page 2 para 3, 4, 5](#)
- ¹⁸ [Interview Transcript](#)
- ¹⁹ [Cureus, 2021; doi.org/10.7759/cureus.14686](#)
- ²⁰ [Inonu University Research Information System, 2016;17\(1\)](#)
- ²¹ [Complementary Medicine Research, 2020;27](#)
- ²² [Nigerian Journal of Clinical Practice, 2020;23\(5\)](#)
- ²³ [Cureus, 2017; doi.org/10.7759/cureus.1445](#)
- ²⁴ [Bitchute, August 7, 2019](#)
- ²⁵ [Nutrition and Metabolism, 2010; 7\(7\)](#)
- ²⁶ [ASN Neuro December 27, 2018](#)
- ²⁷ [Carcinogenesis 2014 Mar; 35\(3\): 515–527](#)
- ²⁸ [Frontiers in Cell and Developmental Biology 2015; 3: 43](#)

- ²⁹ Clinical Nutrition, 2021;40(3)
- ³⁰ Nutrition Journal, 220;19(1)
- ³¹ iScience, 2020;23(11)
- ³² Pharmaceutics, 2021;13(7)
- ³³ Molecular Metabolism, 2021;54:101389
- ³⁴ Interview Transcript, page 14 para 2