

# Nrf2 and Cancer - The Studies

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'Nrf2' is a powerful protein that is dormant within each cell in the body, unable to move or operate until it's released by an Nrf2 activator. When Nrf2 is triggered in the nucleus, it activates the powerful anti-inflammatory processes of the body!

Nrf2 is perhaps the body's most important cell defense and survival pathway – protecting cells and tissues from a variety of toxicants and carcinogens. More than one thousand scientific publications describe the relationship between Nrf2 activation and various types of cancer. These studies span the entire range of scientific study design, from clinical supplementation trials in humans to mechanistic studies in specific cell cultures, gene activation studies, and even specialized studies of Nrf2 metabolism in different models of chronic diseases. Because Nrf2 activation increases dozens of cellular protective functions, researchers from the National Cancer Institute stated in their review of several studies, "the findings implicate Nrf2 as a promising molecular target for cancer prevention" (Cancer Prevention Research, 2018). Other researchers from China stated that "an increasing body of evidence supports the premise that the Nrf2/ARE pathway plays a critical role in the

protective mechanism of cells" (Food Science and Human Wellness, 2013). And recently, results from a Rutgers University-based study found that "Defense enzymes mediated by Nrf2-antioxidative stress and anti-inflammatory signaling pathways can contribute to cellular protection against carcinogens" (Pharmacology & Therapeutics, 2019). While more research is still needed, these studies and others comprise a growing body of evidence demonstrating that Nrf2 is indeed a potentially powerful weapon against cancer.

## The Science

### Skin Cancer

Researchers from the Department of Pharmacology, Toxicology & Neuroscience at Louisiana State University found that Protandim Nrf2 could suppress both the development and spread of skin cancer. Elevated levels of protective antioxidant enzymes led to a 57% reduction in the number of skin tumors in a mouse model skin of cancer (PLoS One. 2009;4(4):e5284)

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0005284>

In a follow-up study using the same model, the same research group found that Protandim Nrf2 significantly reduced the development of skin cancer following exposure to carcinogenic (cancer-causing) chemicals (PLoS One. 2010 Jul 30;5(7):e11902)

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0011902> – suggesting that the multiple modes of action of Protandim Nrf2 could potentially be used as a chemopreventive agent due to their ability to modulate underlying mechanisms involved in carcinogenesis (Enzyme Res.2011;2011:409295).

### Colon Cancer

Due to the multiple modes of action of Protandim Nrf2, researchers from the Department of Medicine at the University of Colorado at Denver used an advanced assay method to screen DNA from blood vessels to investigate its effects on the activation of Nrf2 and dozens of cellular protection genes (Mol Aspects Med. 2011 Aug;32(4-6):234-46). Protandim Nrf2 significantly modulated 25 of 28 (89%) colon carcinoma-specific gene targets, leading the authors to conclude that "Nrf2 activators may well spawn a new class of treatment to target the so-called 'diseases of aging,' including cancer, cardiovascular diseases, inflammatory and autoimmune diseases, and neurodegenerative diseases."

<https://bit.ly/therapeuticpotentialofNrf2activation>

### Breast Cancer

Protandim Nrf2 was shown to suppress the growth and spread of breast cancer by researchers at Louisiana State University (The FASEB Journal. 2012;26:1118.5). The study of isolated breast cancer cells compared the potential of both Protandim Nrf2 and Tamoxifen (an existing drug used to treat breast cancer) to reduce the growth/spread of human breast cancer cells. Results showed that both Protandim Nrf2 and Tamoxifen were effective in reducing breast cancer cell growth by many of the same biochemical signals. In eight of the ten studies, Protandim Nrf2 outperformed Tamoxifen, the most profound being the ability of Protandim Nrf2 to prevent oncogenesis (new cancer formation).

[https://faseb.onlinelibrary.wiley.com/doi/10.1096/fasebj.26.1\\_supplement.1118.5](https://faseb.onlinelibrary.wiley.com/doi/10.1096/fasebj.26.1_supplement.1118.5)

### Ovarian Cancer & Myeloma (Bone Marrow Cancer)

Researchers from the Mayo Clinic College of Medicine (Prasongsook, Biomedical Sciences Thesis, 2014) showed that Protandim Nrf2 produced a range of significant anti-cancer effects against ovarian cancer and myeloma (bone marrow cancer). In a series of studies funded by the National Institutes of Health (NIH), Protandim Nrf2 was shown to have anti-cancer effects in ovarian cancer cells and myeloma (bone marrow cancer) cells, while sparing normal healthy cells. Protandim Nrf2 showed anti-tumor and antiproliferative effects (reduced tumor formation and growth) across 8 different ovarian cancer cell lines, including both chemotherapy-sensitive and chemotherapy-resistant cells (Cisplatin/cisplatinum and Taxol/paclitaxel). Protandim showed selective cytotoxicity (cell-killing) effects in ovarian cancer cells and myeloma cells while sparing normal (non-cancerous) cells.

<https://www.semanticscholar.org/paper/Translational-Studies-of-Protandim%28RTM%29-as-a-to-Prasongsook/882b76468c2e129a6efb10eb0fc935c443003d61>

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### Other Considerations

When it comes to undergoing active treatment for cancer (i.e. chemo or radiation therapy), it is typical for oncologists to want zero supplements in the mix. This is because every type of cancer, regimen, treatment, and patient is a unique collection of variables. As such, it's prudent to remove the potential variable of any supplements and the potential for cancer cells to be "protected" by those supplements from the pro-oxidizing effects of chemo/radiation therapy.

Another reason for discontinuing all dietary supplements during cancer therapy is that chemotherapy and radiotherapy doses have been determined in groups of people who were not taking any supplements, making it prudent for the patient to be in a similar condition to the clinical trial groups. In many situations, oncologists will want patients to stop any supplements during active therapy, but then allow Protandim Nrf2 to be added back into the mix after the therapy is completed thus supporting the Nrf2 induction benefits for immune system function and normal cellular defenses.