

# Short-Term Fasting and Chemotherapy— Where the Science Stands

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Sickness often turns us to comfort foods such as chicken noodle soup, but this dietary approach may not be ideal for all patients with serious illness. In oncology research and practice, fasting for disease treatment has become a popular subject. Studies on calorie restriction through short-term fasting just before chemotherapy—defined as a complete lack of food and caloric beverages (noncaloric beverages such as water are allowed) for 72 hours or less—has demonstrated a wide range of beneficial effects. Prechemotherapy short-term fasting has been shown to help reduce tumor growth by supporting chemotherapies' efficacy; evidence also suggests it can lessen chemotherapies' damaging side effects. Initial studies looking at fasting a few days before chemotherapy in mice and dogs yielded positive outcomes, spurring small trials in humans. Additional clinical research trials are now underway.

## Proposed Mechanism

In the body's normal, nonfasting state, healthy cells grow and reproduce, but during fasting their energy shifts towards repairing and protecting existing cells. Researchers in two literature reviews, one published in 2014 and the other in 2017, posit that the external stress of energy restriction results in rapidly reproducing cancer cells failing to respond and protect themselves as quickly as they would under homeostatic circumstances. This failure is known as differential stress resistance. It's likely that, in extreme environments, cancer cells are unable to quickly adjust to metabolic pathways. As a result, chemotherapy agents have a greater

impact on cancer cells since they target rapidly dividing cells. In addition, during energy restriction, healthy cells are in self-maintenance mode, causing them to metabolically slow down and be protected from chemotherapy's toxic effects.

## A Dive Into the Research

Some studies, including a small 2016 cohort trial and a 2014 mouse model, only found benefit after 48 to 72 hours of fasting. These studies analyzed cancer patients or mice in different cohorts of fasting for periods of 24, 48, or 72 hours before chemotherapy and eating normally in between each infusion cycle. A limitation is that the first study allowed participants to consume <200 kcal per day. Overall, however, these studies indicated that fasting substantially suppressed tumor progression, improved survival, and decreased chemotherapy side effects, such as organ damage, toxicity, immunosuppression, and chemo-induced death. Short-term fasting also helped restore cardiac function and relieved bone marrow suppression in some participants. Fasting for 48 to 72 hours was crucial for achieving positive effects of fasting therapy.

A 2017 systematic review of 22 studies investigated short-term fasting and its role in cancer treatment. Eighteen studies were conducted in mice and dogs and four in humans. Animal studies were randomized controlled trials and adopted the same fasting cohorts. Ten studies identified chemoprotective effects, and 15 showed tumor suppression in groups fasting for 48 or 72 hours. Although results of animal studies

don't necessarily translate to humans, these studies reveal the 24-hour fasting period may be insufficient for potential fasting benefits.

This review also suggested that when fasting therapy was paired with chemotherapy, the antitumor effect of chemotherapy drugs increased. A synergistic effect seems to appear when combining short-term fasting and chemotherapies rather than using either treatment method alone. No studies in the review limited food intake during the period of reintroducing food. Overfeeding is common in the reintroduction period, and study subjects typically regained the weight lost during the short-term fasting period; this weight regain is generally desirable in order to reduce the risk of malnutrition.

## Considerations and Precautions

Fasting isn't ideal for every cancer patient. It may not be advised in those with diabetes, kidney disease, liver disease, heart disease, low blood sugar, low blood pressure, an autoimmune disease, history of an eating disorder, cachexia, or malnutrition. Fasting might only be advised for certain types of cancers, as head and neck, lung, pancreatic, stomach, liver, ovarian, and metastatic cancers cause hypermetabolism, resulting in unintentional weight and muscle loss. In addition, some drug therapies have a better response with weight gain over weight loss.

For patients taking oral chemotherapy, they shouldn't fast if pills cannot be taken on an empty stomach. Some oral chemo drugs must be taken with

food for best absorption and may have very specific recommendations for the amount of carbohydrates, fats, and proteins to consume.

### **Take-Home Messages**

If short-term fasting is appropriate, it potentially may be an effective, inexpensive strategy to decrease side effects, suppress tumor progression, protect patients against the effects of chemo-toxicity, and further improve prognosis when used with chemotherapy. Additional clinical trials with more patients are still needed before short-term fasting could be used in standard practice. The studies conducted reveal that short-term fasting of 48 to 72 hours prior to chemotherapy appears to be more effective than intermittent fasting. Further research is necessary to determine which cancers, at which stages, and in which combinations of fasting prove most effective.

The application of fasting therapy with cancer patients should be used very cautiously, as the science needs to be more firmly established. A long fasting duration should be avoided to prevent severe calorie insufficiency and weakening of the body. If undertaken for too long, it can do more harm than good, resulting in treatment delays, dose reductions, or other side effects. Always have patients ask their oncologists before fasting. If patients are able to fast, make sure they continue to drink water, as preventing dehydration is key to avoid delays in treatments and protect their kidneys. Despite some of the limitations and unknowns, short-term fasting is an exciting area of research with great potential.