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# Niacinamide Enhances Natural Killer Cells to Beat Carcinomas

Analysis by Dr. Joseph Mercola Fact Checked | September 25, 2023

## STORY AT-A-GLANCE

- According to recent research, nicotinamide, also known as niacinamide (a form of niacin or vitamin B3), enhances natural killer (NK) cells' ability to defeat blood cancers
- Pretreating NK cells with an unspecified amount of niacinamide upregulated a lymphocyte homing molecule called CD26L, which improved the antitumor functions of the NK cells in several ways
- The combination of niacinamide-enhanced NK cells and monoclonal antibody treatment resulted in complete remission in 11 of 19 patients within 28 days, and three had partial response
- Niacinamide also protects your skin against ultraviolet radiation damage from the sun, thereby reducing your risk of skin cancer
- It's also been shown to improve survival after cardiac arrest, primarily by restoring tissue NAD+, and can help prevent heart failure

**According to recent research,[1,2] nicotinamide[3] (also known as niacinamide), a form of niacin (vitamin B3), enhances natural killer (NK) cells' ability to defeat blood cancers.**

**Scientists have previously tried to use infusions of monoclonal antibodies mixed with NK cells as a novel treatment for blood cancers, with limited success. Now, researchers at the University of Minnesota have discovered that the ability of NK cells to destroy cancer cells can be significantly augmented by pretreating them with niacinamide.**

> **“The combination of niacinamide-enhanced NK cells and monoclonal antibody treatment resulted in complete remission in 11 of 19 patients within 28 days, and three had partial response.”**

Doing so upregulated a lymphocyte homing molecule called CD26L, which improved the antitumor functions of the NK cells in several ways. Unfortunately, the paper doesn't specify the dose used to achieve these beneficial effects.

## Niacinamide Boosts NK Cells' Ability to Kill Cancer

As reported by Medical Xpress:[4]

> *"'Allogeneic natural killer cell adoptive transfer has shown the potential to induce remissions in relapsed or refractory leukemias and lymphomas,' writes Dr. Frank Cichocki and colleagues in the journal.*
>
> *'Strategies to enhance natural killer cell survival and function are needed to improve clinical efficacy. We demonstrated that natural killer cells cultured ex vivo with interleukin-15 — IL-15 — and nicotinamide exhibited stable induction of l-selectin, a lymphocyte adhesion molecule important for lymph node homing' ...*
>
> *In the small preliminary study, Cichocki and collaborators found that nicotinamide not only enhances the activity of natural killer cells but boosts their persistence in the blood and bolsters the capability of these cells not only to hunt down cancer cells, but to handily destroy them.*
>
> *The combination of nicotinamide-enhanced natural killer cells and monoclonal antibody treatment was safe in 30 patients, including 20 with relapsed or difficult-to-treat non-Hodgkin lymphoma.*

*Among 19 patients with non-Hodgkin lymphoma, 11 demonstrated a complete response and three had a partial response within 28 days of treatment.*[5] *Nicotinamide appears to protect the natural killer cells from oxidative stress, while enhancing their ability to home in on lymph nodes, the team found ...*

*Natural killer cells treated with nicotinamide in the lab also demonstrated an increased ability to generate an inflammatory and toxic response against cancer cells."*

## Niacinamide Restores NAD+ Levels

Another mechanism that can help explain how niacinamide improves the anticancer functions of NK cells is that it boosts the NAD+ (nicotinamide adenine dinucleotide) level in the cells. As explained in the featured study:[6]

*"Elevated NAD+ in NK cells cultured with NAM [niacinamide] may also account for their enhanced function. Recent work has shown that NAD+ concentrations are low in tumor-infiltrating lymphocytes relative to peripheral blood T cells, and NAD+ modulates human T cell function by regulating cellular energy metabolism.*

*In these studies, reduced NAD+ resulted in attenuated maximal respiratory capacity of mitochondria and concomitant decreases in adenosine 5′-diphosphate (ADP) and ATP.*

*In agreement with this work, we observed elevated ATP and increased mitochondrial oxidative phosphorylation in NK cells cultured with NAM. These metabolic alterations correlated with enhanced natural cytotoxicity, ADCC, and inflammatory cytokine production."*

## Niacinamide to the Rescue After Cardiac Arrest

That niacinamide boosts NAD+ has also been demonstrated in other studies. For example, a September 2023 animal study in PLOS ONE found that niacinamide improves survival after cardiac arrest, primarily by restoring tissue NAD+. As explained in the abstract:[7]

> *"Metabolic suppression in the ischemic heart is characterized by reduced levels of NAD+ and ATP. Since NAD+ is required for most metabolic processes that generate ATP, we hypothesized that nicotinamide restores ischemic tissue NAD+ and improves cardiac function in cardiomyocytes and isolated hearts and enhances survival in a mouse model of cardiac arrest.*
>
> *Mouse cardiomyocytes were exposed to 30 min simulated ischemia and 90 min reperfusion. NAD+ content dropped 40% by the end of ischemia compared to pre-ischemia.*
>
> *Treatment with 100 $\mu$M nicotinamide (NAM) at the start of reperfusion completely restored the cellular level of NAD+ at 15 min of reperfusion. This rescue of NAD+ depletion was associated with improved contractile recovery as early as 10 min post-reperfusion.*
>
> *In a mouse model of cardiac arrest, 100 mg/kg NAM administered IV immediately after cardiopulmonary resuscitation resulted in 100% survival at 4 h as compared to 50% in the saline group.*
>
> *In an isolated rat heart model, the effect of NAM on cardiac function was measured for 20 min following 18 min global ischemia. Rate pressure product was reduced by 26% in the control group following arrest.*
>
> *Cardiac contractile function was completely recovered with NAM treatment given at the start of reperfusion. NAM restored tissue NAD+ and enhanced production of lactate and ATP, while reducing glucose diversion to sorbitol in the heart.*

> *We conclude that NAM can rapidly restore cardiac NAD+ following ischemia and enhance glycolysis and contractile recovery, with improved survival in a mouse model of cardiac arrest."*

The 100 micromolar niacinamide solution used at the start of reperfusion equates to just 12.2 milligrams of niacinamide. But this was in an in-vitro cell study, not a human, and the key point is that this is still a very low dose and in line with the dose I have been recommending to optimize health, of 50 mg of niacinamide up to three times a day.

## NAD+ Is Crucial for Optimal Health and Longevity

As detailed in "**The Crucial Role of NAD+ in Optimal Health**," which features my interview with Nichola Conlon, Ph.D., a molecular biologist and antiaging specialist, NAD+ is one of the most important biomolecules in your body.

It's involved in the conversion of food to energy, maintaining DNA integrity and ensuring proper cell function, including the maintenance and repair of cells.

Your NAD+ level declines with age, which is thought to be a major contributor to aging and age-related disease. The good news is there's a simple and inexpensive way to boost your NAD+ level, namely niacinamide supplementation.

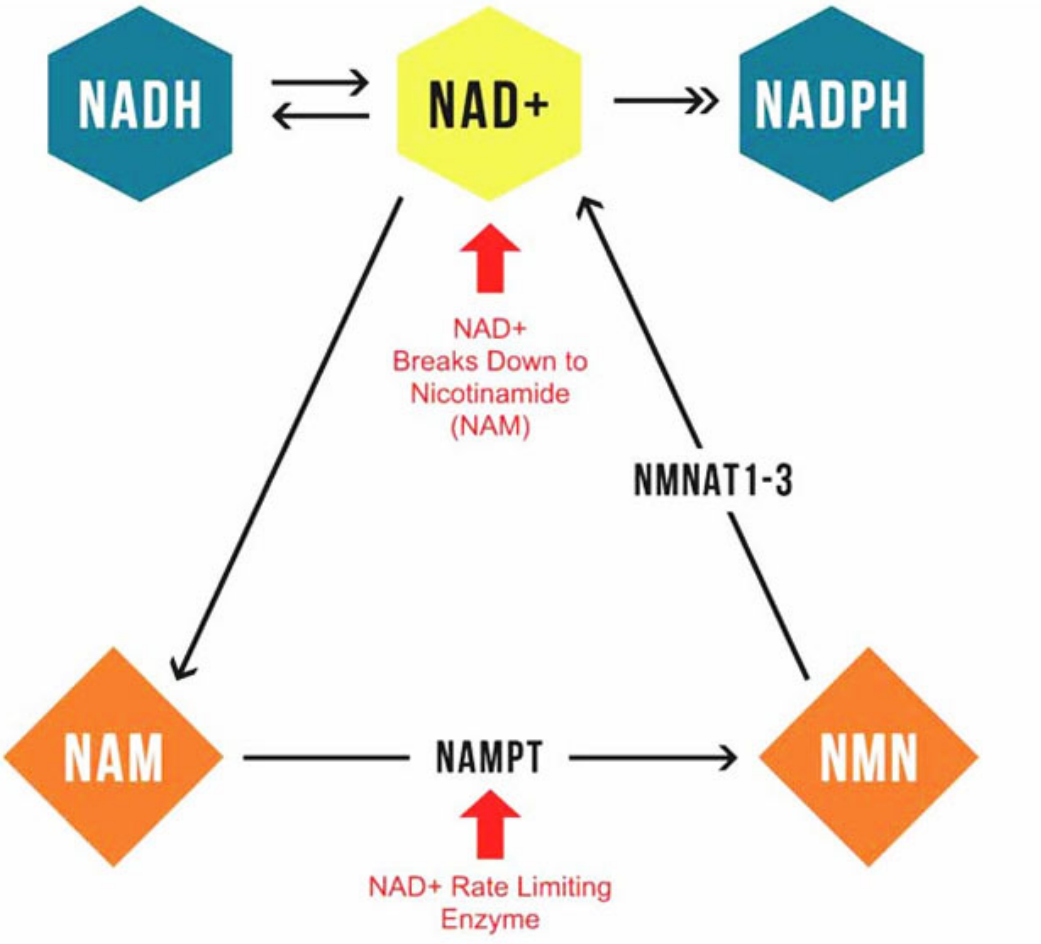
While other NAD+ precursors are typically recommended, like NR or NMN, they're hundreds of times more expensive, and may be less effective. The reason I'm convinced niacinamide is the best NAD+ precursor is because it's the immediate breakdown product of NAD+.

The rate limiting enzyme in the salvage pathway to restore niacinamide back to NAD+ is NAMPT. As you can see in the graphic below, niacinamide is first converted to NMN before NAD+. This is likely why many promote NMN.

However, the enzyme NMNAT1-3 that converts NMN to NAD+ is not the rate limiting enzyme. NAMPT controls how much NAD+ you make, so flooding your body with NMN

is not going to be as useful as using small amounts of niacinamide and activating NAMPT.

Recent animal research[8] demonstrated that a low dose of 2.5 mg per kilo of body weight daily for three weeks — which is about 170 mg a day for a 150-pound person — **increased cellular NAD+ by 30%**. So, taking 50 mg of niacinamide three times a day appears ideal for most.




## Niacinamide for Heart Failure Prevention

Niacinamide may also act as a preventive against heart failure[9] — again because heart failure is a localized symptom of energy deficiency and mitochondrial dysfunction. When your NAD+ level drops, your ATP level also drops, and this puts stress on the cardiomyocytes in your heart.

Cardiomyocytes are specialized cells in your heart that generate contractive force. Thusly stressed, the cardiomyocytes release pro-fibrotic mediators that further suppress mitochondrial function. Over time, this leads to cell death, collagen deposition and fibrosis, which are hallmarks of heart failure.

Research[10] published in February 2023 found that replenishing NAD+ prevented this energetic dysfunction, and therefore the subsequent development of heart failure. Here, the human-equivalent of 3.5 mg per kilo of bodyweight was administered via daily injection for two months, but I believe that oral niacinamide might be just as effective, although you might have to use it for a longer period of time.

## Niacinamide in Skin Cancer

Getting back to niacinamide's potential role in cancer treatment, a 2015 study[11] found it helps protect your skin against ultraviolet radiation damage from the sun, thereby reducing your risk of skin cancer.

Three hundred eighty-six participants who'd had two or more nonmelanoma skin cancers in the previous five years were divided into two groups. The treatment group received 500 mg of niacinamide twice a day for 12 months while controls received a placebo.

The participants were evaluated by dermatologists at three-month intervals for 18 months. The primary end point was the number of new nonmelanoma skin cancers (i.e., basal-cell carcinomas plus squamous-cell carcinomas) during the 12-month intervention period.

At 12 months, the rate of new nonmelanoma skin cancers in the treatment group was 23% lower than among controls. They also had a 20% lower rate of new basal-cell carcinomas, and a 30% lower rate of new squamous-cell carcinomas. As a result, the authors concluded:

> *"Oral nicotinamide was safe and effective in reducing the rates of new nonmelanoma skin cancers and actinic keratoses in high-risk patients."*

A 2020 safety and efficacy review of niacinamide also pointed out that:[12]

> *"Nicotinamide (or niacinamide), a form of vitamin B3 that is often confused with its precursor nicotinic acid (or niacin), is a low-cost, evidence-based oral treatment option for actinic keratosis, squamous cell carcinomas, basal cell carcinomas, and bullous pemphigoid."*

## General Niacinamide Recommendations

As a blanket recommendation for optimal health, I recommend taking 50 mg of niacinamide three times per day. Niacinamide will only cost you about 25 cents a month if you get it as a powder. Typically, one sixty-fourth of a teaspoon of niacinamide powder is about 50 mg.

The reason I recommend getting it in powder form is because in most supplement brands, the lowest available dose is 500 mg, and that will decrease NAD+ due to negative feedback on NAMPT, which is the opposite of what you're looking for.

Also note that although niacinamide and niacin are both classified as vitamin B3, niacin will not activate NAMPT like niacinamide, so it is best to use niacinamide. Additionally, niacinamide, unlike niacin, will not cause flushing which is due to a large release of histamine.

### Sources and References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