



# N-ACETYL-CYSTEINE

## What it is:

N-Acetyl-Cysteine (NAC) is an acetylated form of the amino acid cysteine. NAC is a powerful antioxidant and a premier antitoxin and immune support substance, and as such is considered an important life extension supplement by some. Antioxidants neutralize free radicals, which are produced by normal metabolic activity. When free radicals are left unchecked they cause damage to cells and DNA and are considered by scientists to be a major factor in the cancer and aging processes.

## How it Works:

GLUTATHIONE is a tri-peptide composed of three amino acids: Cysteine, Glutamic Acid and Glycine. Glutathione and the enzymes it forms, such as **Glutathione peroxidase**, are essential to all life and are found in tissues of virtually all plants and animals. Glutathione peroxidase is one of the body's most important naturally occurring antioxidants. Glutathione is present in all human cells, with the highest levels found in the liver, lung, lens of the eye, pancreas, spleen and kidneys.

## Glutathione:

Glutathione acts as a powerful antioxidant. It is a key protector against all types of pollution. Glutathione protects against cellular peroxidation caused by exposure to pesticides, toxic herbicides like paraquat, plastics, benzene and carbon tetrachloride. It also protects against the toxic effects of heavy metals, cigarette smoke, smog, drugs like Tylenol (acetaminophen), solvents, dyes, phenols and nitrates, and the side-effects of anti-cancer drugs like cyclophosphamide and adriamycin.

Glutathione works to inhibit the formation of free radicals, dangerous agents that suppress the immune system and promote the formation of mutagens and carcinogens. Free radicals also speed up the aging process, and it is due to this antioxidant activity that Glutathione is considered useful in the prevention and treatment of a wide range of degenerative diseases. Supplemental N-Acetyl Cysteine may exert its anti-aging effect by increasing glutathione levels.

Studies at the Louisville School of Medicine have shown that Glutathione possesses a unique ability to slow the aging process. While Glutathione aids in the protection of all cells and membranes, a study at Harvard Medical School found that glutathione is especially able to enhance immune system cells, protecting against damage from radiation and helping to reduce the side effects of chemotherapy, x-rays, and alcohol. As a detoxifier of metals and drugs, glutathione also aids in the treatment of blood and liver disorders.

The key to NAC's protection may be the sulfur and sulfhydryl groups contained in N-Acetyl Cysteine and its derivative, Glutathione. Both Cysteine and Methionine are good precursors of glutathione, but N-Acetyl Cysteine is better. L-Cysteine loses approximately 85% of its sulfur group (which becomes the active part of glutathione) in the digestion process, while N-Acetyl Cysteine, a more stable compound, loses only 15%. This means that NAC has almost six times more effective sulfur groups left after digestion.

### **Chelation:**

There is a theory proposed by some that toxic metals can accumulate in the body over time from many sources such as drinking water, foods, and possibly even from tooth fillings made of silver-mercury amalgam. NAC may function as a mild chelator of heavy metals. In other words, NAC binds to toxic heavy metals such as mercury and lead, and helps to remove them from the body. Most chelating agents, such as EDTA, must be given intravenously. NAC is a mildly effective "nutritional" oral chelating agent. Taken regularly over a period of time, NAC may help remove toxic heavy metals from the body. This is of course a slow process as it is a natural supplement.

### **Exercise and Weight Training:**

NAC is one of the most underrated supplements on the sports nutrition market. Numerous studies lend credibility to its potent bodybuilding potential. Exercise and weight training have been shown to generate large amounts of catabolic free radicals. These free radicals may damage muscle tissue. NAC supplementation increases blood serum glutathione levels and it is believed that this is responsible for many of the positive influences NAC has on preserving and increasing lean body mass.

### **Liver:**

NAC can help to prevent damage to the liver caused from overuse of acetaminophen (Tylenol). NAC is the standard medical treatment for acetaminophen overdose. It is prudent to take NAC whenever one uses acetaminophen.

N-Acetyl Cysteine also helps to prevent damage by aldehydes, which are breakdown products of alcohol, including the small, but potentially harmful, amounts of methanol produced by the metabolism of aspartame (Nutrasweet). Before the next party, remember that research has shown that with consumption of alcohol, a toxic compound called acetaldehyde (AH) is formed in the liver. AH is normally broken down by specific enzymes, but heavy and repeated drinking may overwhelm natural defenses and allow production of millions of free radicals which, in turn, attack the liver. N-Acetyl-Cysteine, Silymarin, and other anti-oxidants help protect and defend the body from AH damage. For those occasions when you do decide to imbibe, start out with NAC and other free radical fighters for your best nutritional protection.

**Lung:**

NAC is an excellent mucolytic agent. It keeps the membranes of the respiratory system moist, thereby lessening the irritation of dry air, dust, and pollutants. It also helps the immune system to do its job properly in the respiratory tract. NAC is available as a prescription drug for this purpose, but you can buy NAC over the counter for far less money.

**Skin:**

The cysteine in NAC is an essential component in hair and nails. Some people find that it enhances nail growth and makes nails less brittle.

**Precautions:**

While N-Acetyl Cysteine is a more stable compound than taking oral cysteine, as it is metabolized, some NAC may be oxidized and become insoluble. This may form kidney stones. It is therefore recommended that persons taking NAC take at least as much vitamin C as NAC. Diabetics should consult their physician before using N-Acetyl-Cysteine, since it may have an insulin-blocking effect.

**How to take it:**

N-Acetyl Cysteine is currently the dietary supplement of choice for boosting or conserving the body's stores of glutathione, cysteine, and other sulfhydryl antioxidants. NAC is a much better source of glutathione than taking glutathione itself, because less than half of supplemental glutathione is absorbed from the digestive system. This greater efficiency is important since cellular glutathione levels tend to drop 30% to 35% with age.

N-Acetyl Cysteine is well tolerated, is well absorbed, resists enzymatic breakdown, and has been proven to raise glutathione levels when taken orally.

Typical supplemental doses of N-Acetyl Cysteine are 500-1500 mg. per day.