

# Research & Development Bulletin

## RAISING GLUTATHIONE USING CYSTEINE

*Enhancement of glutathione levels through cysteine supplementation has proven an important health benefit. But consumers have questions about the best available source of cysteine. Immunotec provides the answer.*

## IN SEARCH OF THE BEST STRATEGY FOR CYSTEINE SUPPLEMENTATION

*By Dr. Wulf Dröge, Senior Vice-President, Research and Development*



A series of clinical studies and complementary laboratory experiments has shown that aging is associated with a progressive decrease in plasma cysteine and intracellular glutathione concentrations. This decrease leads to (and can be viewed as a manifestation of) age-related oxidative stress. Cysteine and glutathione concentrations are particularly low during the night and early morning hours, i.e. during periods of starvation.

Several clinical studies have also shown that cysteine supplementation on top of the regular diet ameliorates several aging-related processes and improves amongst other parameters skeletal muscle functions and inflammatory cytokine levels. Most of these studies have been performed with N-acetylcysteine (NAC). This was the best choice for this purpose because the free amino acid cysteine is not very stable and cysteine-rich proteins such as IMMUNOCAL® contain various different amino acids and would not have been helpful in studies designed to identify cysteine as the most important amino acid in this context.

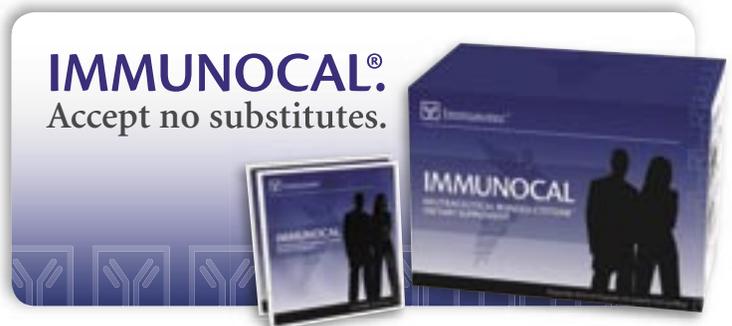
The search for the best strategy to supply additional amounts of cysteine to the average consumer is now raising a very different and practical question. Not surprisingly the answer is different.

Let us compare NAC with IMMUNOCAL®. NAC has some adverse effects which are not shared by IMMUNOCAL® and which render NAC unattractive as a source of cysteine over long periods of time. In addition, there are studies to suggest that dietary cysteine from any source is converted within the blood into its less accessible derivative cystine and within the liver into its breakdown product sulfate unless it is rapidly cleared from the blood by protein synthesis in skeletal muscle and other tissues. The undenatured whey protein IMMUNOCAL® provides all protein-forming amino acids and is known to stimulate rapid protein synthesis within less than 2 hours. This process allows the body to store cysteine until it is recovered by regulated protein breakdown during periods of starvation, i.e. during the night and early morning hours. IMMUNOCAL® is clearly superior to NAC in stimulating this process of cysteine storage.

### Dr. Wulf Dröge, Ph.D. –

*A world-renowned research scientist, Dr. Dröge has devoted more than forty years to basic and clinical research that form the basis for the design of safe, effective new Immunotec products.*

- Published over 260 times in peer-reviewed publications
- Postdoctoral fellowships at the Max Planck Institute and Harvard University
- Professor, Faculty of biology, University of Heidelberg and Head of the department of Immunochem., German Cancer Research Center.
- Continues to write articles and teach at McGill University



# CYSTEINE, N-ACETYL-CYSTEINE (NAC), AND IMMUNOCAL®

By Dr. Jimmy Gutman, Medical Consultant



Research over the past quarter century has shown that the limiting factor for our body's ability to make glutathione, is the availability of cysteine in our diet. There are several options, let's look at cysteine itself, N-acetylcysteine (NAC) and IMMUNOCAL®.

The amino acid cysteine can be found in supplement form in pills and powders. Unfortunately just eating cysteine has not proved to be an effective way to raise glutathione. Cysteine alone is quickly oxidized in the digestive system and does not make it to the cells in an appreciable quantity. Cysteine must be in a form that can survive the trip through the gut, into the bloodstream and across the cell membrane.

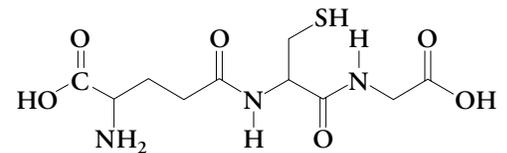
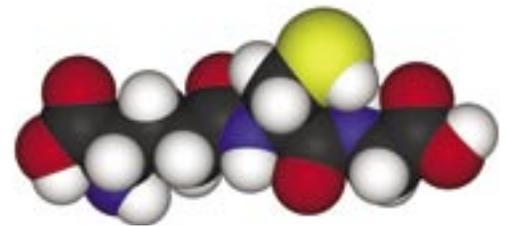
NAC is a form of cysteine that has been chemically modified to be able to make this long journey from your mouth to your cells. NAC is used as a drug to raise glutathione in critical medical situations such as acetaminophen overdose. It is also the drug most commonly used in research studies investigating glutathione augmentation.

NAC suffers from two drawbacks. It is effective in raising glutathione only for a short few hours, which is why doctors must give it to patients throughout the entire day. Individuals who take NAC pills experience a peak in glutathione and then levels may crash, occasionally below baseline values. The other complication of NAC is that side effects such as nausea, vomiting and diarrhea are common.

After years of investigation, Dr. Gustavo Bounous developed what we know as IMMUNOCAL®. This is a protein supplement that has the ability to deliver cysteine to our cells. It can be viewed as a "cysteine delivery vehicle". Being a complicated natural protein, the transformation of cysteine into glutathione starts quickly, but continues over many hours as our digestion and metabolism do their job. Side effects from IMMUNOCAL® are very rare.

It must be kept in mind that the amount of cysteine in IMMUNOCAL® is not as important as the form of cysteine. For example, if you were to boil IMMUNOCAL®, the amount of cysteine would remain the same, but the ability to raise glutathione would be destroyed, because the cysteine would no longer be in a deliverable form for the cell to properly utilize.

The advantages of IMMUNOCAL® over cysteine and NAC are clear once the physiology is understood.



Glutathione molecule and structure

