



Smart Science.

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The two chief components of alcoholic beverages responsible for alcohol toxicity are **ethanol**, the primary product of fermentation, and by-products known as **aldehydes**. **Acetaldehyde** is the primary molecular toxin in alcohol. It enters the body both from the drink itself and as a byproduct of the metabolism of ethanol in the stomach and liver. These biochemical reactions take place in two steps:

First, ethanol is converted to acetaldehyde by an enzyme called **alcohol dehydrogenase** (ADH) in the presence of a chemical cofactor called **NAD**. In the process, NAD is used up and converted to **NADH**.

Second, the acetaldehyde produced in the breakdown of ethanol is converted to acetic acid by an enzyme called Aldehyde Dehydrogenase (ALDH). This reaction also uses the chemical cofactor NAD, converting it to NADH in the production of acetic acid. This is where nasty morning after hangovers begin.

The average individual can efficiently process less than an ounce of alcohol per hour. Beyond this, the ADH uses up the liver's supply of NAD. Insufficient NAD remains to convert the acetaldehyde to acetic acid using ALDH. As a result, acetaldehyde remains in the blood, exerting toxic effects at dangerous levels.

Succinic acid as a bio-stimulant has been shown to stimulate neural system and recovery processes. Succinic acid activates the second half-cycle of tricarboxylic acids to help accelerate the decomposition of acetaldehyde and the energization of the oxidation processes in the mitochondria.

In the mitochondria, two reactions are

linked to convert NADH to NAD. In this case, NADH oxidase converts NADH to NAD, while succinic acid, in the presence of the enzyme succinic acid dehydrogenase, drives a reaction converting another cofactor, FAD, to FADH₂. This is one of the most important reactions of energy production in mitochondria. Cheerz® contains succinic acid.

Alcohol inhibits the availability of glucose through an insulin-mediated mechanism. **L-glutamine** and **N-acetyl cysteine** contain a sulfhydryl group effective in scavenging acetaldehyde and to help the liver manufacture glutathione, one of the body's most important naturally occurring antioxidant and detoxifier. N-acetyl cysteine helps increase the oxidation cycle of ethanol, lowering acetaldehyde levels in the blood, liver and brain. L-glutamine helps speed up the process of reducing NADH back to NAD⁺ via the malate-aspartate shuttle, to correct the cellular imbalance in the NADH/NAD⁺, believed to be one of the metabolic effects of ethanol intoxication. L-glutamine also appears to reduce cravings for sugar and carbohydrates. Cheerz® contains L-glutamine and N-acetyl cysteine.

L-alanine is an amino acid that is produced from pyruvate by transamination. It is involved in sugar and acid metabolism, increases immunity, and provides energy for muscle tissue, brain, and the central nervous system. Alanine plays a major role in transferring nitrogen from tissue sites in the body to the liver, where it plays a significant role in maintaining the body's blood sugar balance. Cheerz® contains L-alanine.

Silymarin (milk thistle seed extract) is a flavonoid found in the seeds of the dried milk thistle herb. Silymarin is a powerful

proven blood and liver antioxidant that helps protect liver cells (and other cells in the body and brain) from toxicity. Silymarin and its components scavenge free radicals that can damage the liver. Silymarin has been shown to promote liver cell protein synthesis and decreases the oxidation of glutathione. Early research indicates that silymarin may also have anti-cancer properties. In one study, silymarin retarded the development of alcohol-induced hepatic fibrosis (a scarring response to liver damage) in baboons. Milk Thistle Extract is standardized to 80% silymarin. Cheerz® contains silymarin.

L-malic acid, a fruit-derived amino acid, is a key intermediate in the major biochemical energy-producing cycle in cells known as the citric acid or Krebs cycle located in the cells' mitochondria, where it plays an essential role in the production of energy. L-malic acid is absorbed from the gastrointestinal tract from whence it is transported via the portal circulation to the liver. It also helps remove high levels of phosphorous and aluminum from the body. Cheerz® contains L-malic acid.

Additionally, Cheerz® substitutes **calcium ascorbate** for ascorbic acid because it is more gentle on the stomach lining.

This is a simplified view of how and why Cheerz® is effective in preventing and/or reducing the debilitating effects of alcohol toxicity and hangover. It is intended to illustrate the sound biochemical reasoning behind the formulation of Cheerz, based on practical and accepted scientific principles.

For more information, log on to:
www.CheerzHangover.com