

Although education has helped to improve the diet of Americans, not everyone has time to eat perfectly balanced meals three times a day. But even with a perfect diet, we're still going to age, and when we do, intracellular enzyme and chemical deficiencies increase—no matter how healthy a diet and lifestyle are maintained.

Not even regular vitamin supplements can eradicate naturally occurring cellular metabolic damage that happens over time as part of the aging process.

Although it has not yet been deemed the fountain of youth, scientists, including Dr. Bruce Ames who is a professor of molecular and cell biology at UC Berkeley's Lester Packer Laboratory, and anti-aging doctors alike are discovering the importance of adding acetyl L-carnitine (ALC) to daily diets—and, they say, the suggested time to begin is around age 40.

## ACETYL L-CARNITINE— Anti-Aging Super Molecule

by Gina Ladinsky

What's all the fuss about? Mitochondria, known as the power plants of the cell, provide a steady flow of energy via the metabolism of oxygen to produce adenosine triphosphate, or ATP. Mitochondria metabolize as much as 90 percent of the oxygen we breathe.

Since the mitochondria metabolize so much oxygen, they also create the largest amount of damaging free radicals.

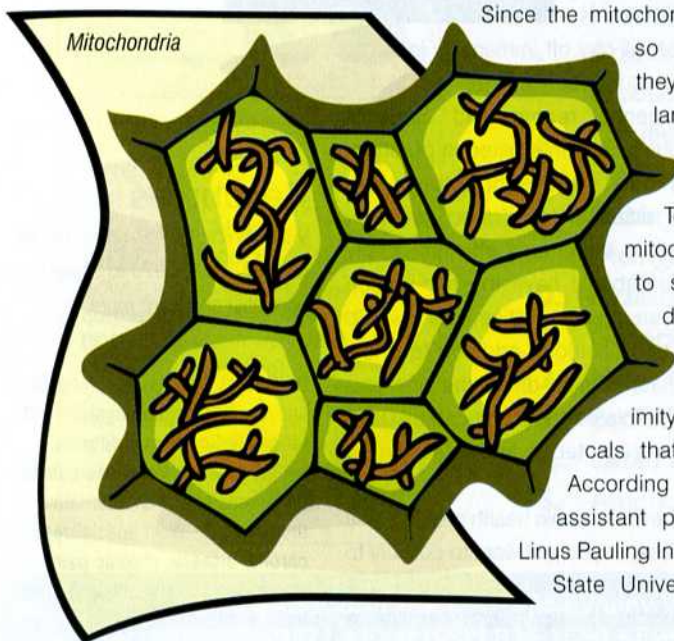
To make it worse, mitochondria happen to suffer the most damage, since they are in the closest proximity to the free radicals that they produce.

According to Tory Hagen, assistant professor at the Linus Pauling Institute at Oregon State University, the mito-

chondria are "right in the neighborhood of the dangerous free radicals they just created." As a result, they're also the first victims. This oxidative damage that occurs in mitochondria worsens as we age and, according to Hagen, adds to other aspects of the aging process. For example, the oxidative damage from free radicals to DNA can cause cancer, and damage to neurons can cause cognitive dysfunction and general mitochondrial decay, which promotes aging and degenerative diseases.

According to the University of Washington, ALC is produced naturally in humans and can be found in the brain, liver and kidneys. ALC is the acetyl ester of the amino acid L-carnitine, which transports fatty acids into the mitochondria.

Once inside the mitochondria, the fatty acids are converted into energy. According to Hagen, the free radicals that are produced as a result of normal mitochondrial metabolism have the same result as nuclear radiation. This process is a natural occurrence and cells are able to repair themselves, especially via antioxidants. But it's not a perfect world, and this normal oxidative process



adds up and eventually causes aging of the mitochondria. According to Ames, mitochondria are the "weak link" in aging due to the "accumulation of destructive free radicals."

### **ALC FIGHTS DAMAGE TO CELL ENERGY FACTORIES**

The good news is that recent studies have revealed breakthrough scientific information that suggests a reversal of the cellular aging process is possible. Two separate research teams found that mitochondrial metabolism can have its clock reset to mimic its youthful performance through the addition of ALC supplements to the daily diets of lab animals. These two studies have shown both a reversal of memory loss in old rats associated with brain mitochondrial decay as well as a restoration in metabolic mitochondrial activity by the addition of an ALC supplement.

Damaged nerve cells in the brain are believed to contribute to both Parkinson's and Alzheimer's disease. According to Liu, Head, et al., at UC Berkeley's Division of Biochemistry and Molecular Biology, aging causes a decline in memory along with a decline in cognitive performances and locomotor activities. This same study suggests that animals treated with ALC show a reversal of mitochondrial decay. Reversal of mitochondrial decay may reverse age-associated declines in other areas, such as your nerves, heart, eyes and ears, along with an improvement in general physical strength, and motivation. Feeding old rats ALC reduced oxidative mitochondrial damage. The study suggests that by increasing the intake of ALC in humans, brain aging and age-associated neurodegenerative diseases may be diminished.

The theory tested in a second study performed by Hagen, Liu, et al. was that mitochondrial health reflects overall health during aging, suggesting that a decline in mitochondrial function not only lowers overall metabolism but also results in an increase of memory deficits and cognitive function deficits. It was found that mitochondrial membrane potential in old rats, which is a key indicator for mitochondrial function, became similar to that of young rats with the addition of ALC. The researchers found the best results by adding an antioxidant supplement with ALC. The combination not only reversed mitochondrial decay but also lowered oxidative dam-

age. The addition of ALC alone improved short-term memory deficits and cognitive function in elderly subjects.

Although it's impossible to avoid the aging process, it is possible to keep cellular performance at its highest level and oxidative damage at its lowest level. By supplementing your daily diet with ALC, you can take an active role in actually decreasing the negative side effects of aging at the cellular level. Consider it a mitochondrial tune-up. ■

#### REFERENCES

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