

## Amazing Acetyl-L-Carnitine (ALCAR)

*This energizing, restorative neuroprotective agent:*

- *Stimulates the growth of new healthy neurites*
- *Powerfully protects the brain*
- *Appears to improve normal cognition*
- *Improves performance on tests of memory, attention, and verbal fluency*
- *Improves comprehension, problem-solving and motivation*
- *Improves measures of learning and reaction speed and reduces errors*
- *Improves cognitive abilities in patients with mild Alzheimer's or non-Alzheimer's cognitive deficits*

All you have to do today to see that much of the conventional wisdom about aging is being challenged is turn on the television or crack open a magazine. Science and research thunder ahead with the sheer force and momentum of a speeding train—leaving the media and many so-called experts struggling to keep up.

Two decades ago, we believed the human genome project would require more than a century to complete. In 1995, it was expected to require 15 years. The project was actually completed in *four years*. With a doubling of information technologies annually, the ever-accelerating rate at which we learn and discover new information has resulted in profound discoveries, many of which have been shown to improve brain health and longevity.

To date, teams of scientists from around the world have developed technologies that have powerful potential in the ongoing fight against age-related cognitive deterioration. Many of these technologies actually *restore healthy function* in aging individuals.

One avenue through which science is working to protect aging brains is protection of cellular organelles—“organs” that run individual cells—called

*mitochondria*. These little power stations, which appear in almost every cell of the body, maintain the brain's ability to produce vibrant energy. Their health and numbers are key for maintenance of cognitive ability and cell renewal throughout life.

### **Miraculous Mitochondria**

Mitochondria are small, complex structures that are found inside almost every one of the roughly 250 types of cells in the human body. Only red blood cells manage to function without mitochondria.

The mitochondria are frequently referred to as the “powerhouse” of the cell. They produce the energy needed for virtually all the functions of life. Each cell may have thousands of mitochondria, or as few as two, depending on the cell type and its need for energy. Organs that require massive amounts of energy to work properly, like the brain, are particularly dependent on healthy, optimally functioning mitochondria.

The mitochondria themselves are among the most complex structures within brain cells. They have both an outer and inner membrane, and most of the energy-producing reactions occur at the inner membrane, which is largely made of phospholipids. Like brain cells themselves, anything that compromises this phospholipid structure can undermine the ability of the mitochondria to produce energy. Here, again, you can see how phospholipids like PS and lipids like DHA play integral roles in keeping cells healthy and functioning at an optimal level.

Since mitochondria are the brain cells' energy factories, they oxidize — in essence, they “burn” — biological fuels like carbohydrates. They then convert the energy released from those fuels into *adenosine triphosphate* (ATP), the universal energy source for all plants and animals. When energy is required, ATP is broken into adenosine diphosphate (ADP) and a free phosphate (P). The breaking of the bond between ADP and the extra P releases energy, which is used to power the cells' various activities.

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Because of the massive energy demands of neurons and the sheer number of mitochondria that are present to supply all of this energy, the brain is a literal “hotbed” of activity. But the hard reality is that there is a price to pay for making all of this energy.

### **More Energy = More Free Radicals**

Every time a cell makes energy, it also produces toxic substances called oxidants, or free radicals. In other words: as they burn fuel and oxygen to make energy, mitochondria also produce massive amounts of damaging free radical molecules. And these free radicals can wreak havoc on the mitochondria themselves, as well as on brain cells and their DNA.

Of course, as the source of these toxic products, mitochondria are also their first victims. Like the glowing steel walls of a furnace, the mitochondria’s proximity to the free radical fires they produce, combined with their exceedingly intricate structure, make them particularly vulnerable to injury over time.

Not surprisingly, researchers have sought to understand this injury and have identified it as a critical part of the aging process. They have found that many common diseases of aging, such as Parkinson’s disease and Alzheimer’s disease, result in part from mitochondrial damage and failure in the brain and nervous systems. The aging process itself may be due to a lifetime of damage to mitochondria through oxidative stress, antioxidant depletion, and accumulated damage to mitochondrial proteins and DNA.

Fortunately, researchers have also identified substances that can reduce the damage or injury that mitochondria sustain over time. And one of the most powerful protectors of the mitochondria is ALCAR.

### **The Super-Nutrient For Your Mind**

Want a razor-sharp memory? The ability to learn, assimilate and apply new information quickly and accurately? Of course you do—otherwise, you wouldn’t be reading this book. By now, you understand that to have all this, you need to optimize the health and vitality of your brain cells. And to do this, you need to

ensure that each of those cells has what it needs to produce energy. Each of these self-contained cells must produce its own energy. They can't borrow energy from each other or obtain energy from any other source.

One potent strategy is to increase the levels of acetyl-L-carnitine (or ALCAR) in your brain. ALCAR is a form of the amino acid carnitine that protects, maintains, and energizes the neurons that are so critical to your memories, learning, mental energy, and overall brain health.

Your brain is hungry for natural ALCAR—a kind of super-nutrient for your mind. Scientists have confirmed that this form of carnitine is the most bioavailable and energetically useful form for your brain. Like GPC and PS, ALCAR supports your brain's optimal synthesis of acetylcholine, the neurotransmitter that is critical for learning and memory and that tends to be depleted in people with Alzheimer's disease.

Researchers in one clinical trial concluded that their results, which confirmed the therapeutic importance of ALCAR in the treatment of elderly patients with mental impairment, were successful because of the effect of ALCAR on acetylcholine deficits.<sup>21-22</sup> But this is not ALCAR's most important role in brain health.

ALCAR's starring role in brain function is in maintaining, protecting, and improving cellular energy production. This abundance of energy is then utilized to create neurotransmitters and keep the brain in top shape. Once ALCAR is available to the brain in meaningful quantities, it has some effects on brain cell energy production that could only be described as miraculous.

### **Healthy Mitochondria = Healthy Neurons**

Being that they are the literal *power plants for the brain*, mitochondria provide the energy that neurons need to grow, extend new neurites and neural connections, maintain electrical charges, produce neurotransmitters, and move nutrients into the cells while moving waste products out of the cells before they can build up and cause damage. In fact, if mitochondria fail to produce sufficient cellular energy, toxicity and increased rate of cell death will result.

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Researchers have identified that oxidative damage to mitochondria over time results in decreased output of energy within the neurons. Like a fire that rages out of bounds when left unchecked, excessive oxidation spills out of the damaged mitochondria, further damaging other cellular molecules such as proteins, lipids, and nucleic acids. This negative chain of events first disrupts the healthy function of the mitochondria, then disrupts energy production and hampers the function of the cell. Without the proper energy needed for cellular maintenance, oxidation and toxicity build up and burn up like a tiny nuclear reactor. Ultimately, this “nuclear fallout” poisons the cell and the whole structure dies.

This chain of events has been implicated in several neurodegenerative diseases, including Alzheimer’s Disease (AD). Because this low-energy scenario leads to the death of brain cells in multiple ways, this dysfunction then plays a role in the early development of AD.<sup>1,2</sup> Even individuals who never develop Alzheimer’s disease can have cognitive impairment that puts a serious cramp in their enjoyment of their “golden years,” and this has been linked back to oxidative damage to brain cells.

An important note from a therapeutic standpoint: ALCAR and dietary antioxidants are able to prevent much of this mitochondrial damage before it can even get started. By adding ALCAR and these antioxidant factors to your diet now, you can halt the damage, allowing your brain to divert its energy reserves to restoring much of the neuronal loss caused by oxidative stress. Maintaining neuronal energy metabolism in the earliest stages of brain dysfunction is a major anti-aging strategy that can eradicate “senior moments” before they worsen. Either way, cells are given the restored energy levels they need for maintenance and repair.

This is where ALCAR works wonders.