

THE POWER OF NEUROSCIENCE Neuron and mitochondria

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Abstract

Dementia among elderly people is one of the major problems since the ages over 65 years have been steadily increased in the past decades. The mitochondria in a neuron plays important roles of the brain functions, and dysfunctions of the organelle might be related with the cognitive disorder. Simulations of the additional mitochondrial enzymes such as succinic acid dehydrogenase (SDH) and nicotinamid adenine dinucleotide tetrazolim reductase (NADH-TR) add to the energy sources to adenocine triphosphatase. The important roles of SDH and NADH-TR are discussed. Stimulations of these enzymes may prevent dementia of the aging group.

Subject terms: Neuron Mitochondria Energy transfer Cognitive disorders

Introduction

The mitochondria (MC) is known to be the power house in neurons. The major roles of respiratory chain to the conversion of food energy to ATP (adenosine triphosphate) are by ATPase in MC. The best functions of the phosphorolysis complexes are performed under aerobic conditions. In addition to ATPase, other enzymes in MC, namely SDH (succinic acid dehydrogenase) and NADH-TR (nicotinamid adenine dinucleotide tetrazolim reductase) supply additional energy to the neurons. NADH is also involved a process of the oxidation of the neutral fats (triglycerides) which are also known to be the sources of very low density lipoprotein (VLDL) and low density lipoprotein (LDL). They are the causes of various cardiovascular disorders. With speedy exercises, increase oxidative functions of SDH and NADH in MC and the increased energy transfer in the neurons may prevent dementia in the aging process.

Aging dementia

Large populations based surveys have shown the marked increased prevalence of dementia within 5 years from 4.1% over 70 (1) to 32% over 85 (2-6). Internationally, the populations over 65 years of age are expected to grow an annual rate of 2.4% to 410 millions (7), and the largest increase in the size of the population over 80 years in the UK by 2025 (8).

The brain functions during a normal aging process are different as compared with the presenile dementia of Alzheimer's disease (AD). The presenile group has shown the development of multiple cognitive deficits: a decline over at least 6 months in memory, deterioration in judgment and thinking, a disturbance in executive functions and decline in emotional control or motivation. In the normal aging group on the contrary, mental complications are affected under various conditions including cardiovascular diseases, metabolic disorders, infections and brain
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injury. These basic diseases can be treated. The people age over 65 years without these disorders also experience a loss of glasses, misplacement of cell-phone and occasional forgetfulness of names and events. However, these complications are slight, and disorientations are inconsistent. In addition, their judgment, personal care and independent functions are preserved. Therefore, the normal aging people could prevent further deterioration of the brain with additional energy supplies by SAD and NADHA-TR.

Mitochondria

The electron transport chains in MC supply energy-rich molecules, such as glucose, are metabolized by a series of oxidation reactions. ATP proceeds continuously in MC through a high-energy phosphorylation complex. Succinic acid and nicotinamide adenine dinucleotide are reduced by their dehydrogenases and are metabolized by the series of oxidation reactions to supply energy in MC. Interesting complex activities are observed between SDH, NADH-TR and ATPase in muscles (9). The muscles have two types of the fibers, namely types I and II. The type I muscles contain SDH and NADH-TR (9). The type II muscles have ATPase. The type I muscles have relatively the higher concentration of oxidative enzyme activities than the II. Physiological functions are slow in type I as compared with the rapid type II (9).

Conclusion

The people in growing populations of aging should have enjoyable and healthy lives. There are many supplements to prevent their mental deteriorations. However, only a few of them have been proven to their benefits. On other hand, the enzyme activities of MC in neurons take the major roles in brain functions. Especially, additional supplies of oxygen and energy created by the powers of SADH and NADH-TR in MC produce increased blood circulations by speedy exercises. The fuels from actions of these enzymes give the greatest support to glucose regulator ATPase and enhance the brain functions. Furthermore, cardiovascular dementia and risks of strokes can be avoided by the reductions of triglycerides with NADH. Therefore, the activities of MC may play the major roles of neuronal functions including the prevention of dementia in the process of aging.

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