

# Abstract

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## Dietary choline deprivation impairs rat brain mitochondrial function and behavioral phenotype.

Pacelli C, Coluccia A, Grattagliano I, Cocco T, Petrosillo G, Paradies G, De Nitto E, Massaro A, Persichella M, Borracci P, Portincasa P, Carratù MR.

Department of Medical Biochemistry, Biology and Physics, University of Bari, Bari, Italy.

**OBJECTIVE:** Dietary choline deprivation (CD) is associated with behavioral changes, but mechanisms underlying these detrimental effects are not well characterized. For instance, no literature data are available concerning the CD effects on brain mitochondrial function related to impairment in cognition.

**METHODS:** Therefore, we investigated brain mitochondrial function and redox status in male Wistar rats fed a CD diet for 28 d. Moreover, the CD behavioral phenotype was characterized.

**RESULTS:** Compared with rats fed a control diet (CTRL), CD rats showed lower NAD-dependent mitochondrial state III and state IV respiration, 40% lower complex I activity, and significantly higher reactive oxygen species production. Total glutathione was oxidatively consumed more in CD than in CTRL rats and the rate of protein oxidation was 40% higher in CD than in CTRL rats, reflecting an oxidative stress condition. The mitochondrial concentrations of cardiolipin, a phospholipid required for optimal activity of complex I, was 20% lower in CD rats than in CTRL rats. Compared with CTRL rats, the behavioral phenotype of CD rats was characterized by impairment in motor coordination and motor learning assessed with the rotarod/accelerod test. Furthermore, compared with CTRL rats, CD rats were less capable of learning the active avoidance task and the number of attempts they made to avoid foot shock was fewer.

**CONCLUSION:** The results suggest that CD-induced dysfunction in brain mitochondria may be responsible for impairment in cognition and underline that, similar to the liver, the brain also needs an adequate choline supply for its normal functioning.

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