

## Cognizin® Citicoline Increases Brain Energy (ATP) by 14% and Speeds up Formation of Brain Membranes by 26% in Healthy Adults

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### Abstract:

Citicoline supplementation has been used as a potential treatment for ischemic stroke, traumatic brain injury, and memory impairment. Magnetic resonance spectroscopy (MRS) studies have previously demonstrated that oral citicoline supplementation alters phosphorus metabolites in brain. The ability to identify regional metabolite changes associated with citicoline treatment has been limited, however, given the use of low field strength scanners and large voxel sizes. In the current study, phosphorus (<sup>31</sup>P) metabolite data were acquired using a three-dimensional chemical-shift imaging (3D-CSI) protocol at 4 Tesla from sixteen healthy men and women who orally self-administered 500mg or 2000mg of Cognizin® Citicoline (Kyowa Hakko Kogyo Co., Ltd., JAPAN) for six weeks. An automated time-domain fitting routine was used to quantify individual <sup>31</sup>P metabolites from the anterior cingulate cortex and the parieto-occipital region. After six-weeks of Citicoline administration, regardless of dose, significant increases were seen in the anterior cingulate for levels of beta NTP ( $p=.045$ ), primarily reflecting levels of ATP, and phosphocreatine (PCr;  $p=.024$ ), reflecting the high energy phosphate buffer stores. In contrast, no significant changes in metabolite levels were observed in the parieto-occipital region after treatment. These data demonstrate that Citicoline-related alterations in brain neurochemistry are regionally specific and suggest that oral Citicoline administration improves cellular bioenergetics of the anterior cingulate cortex. These findings have important implications, given that maintenance of PCr and beta NTP levels have been shown to be neuroprotective.