

Whey protein rich in α -lactalbumin increases the ratio of plasma tryptophan to the sum of the other large neutral amino acids and improves cognitive performance in stress-vulnerable subjects¹⁻³

C Rob Markus, Berend Olivier, and Edward HF de Haan

ABSTRACT

Background: Cognitive performance often declines under chronic stress exposure. The negative effect of chronic stress on performance may be mediated by reduced brain serotonin function. The uptake of the serotonin precursor tryptophan into the brain depends on nutrients that influence the availability of tryptophan by changing the ratio of plasma tryptophan to the sum of the other large neutral amino acids (Trp-LNAA ratio). In addition, a diet-induced increase in tryptophan may increase brain serotonergic activity levels and improve cognitive performance, particularly in high stress-vulnerable subjects.

Objective: We tested whether α -lactalbumin, a whey protein with a high tryptophan content, would increase the plasma Trp-LNAA ratio and improve cognitive performance in high stress-vulnerable subjects.

Design: Twenty-three high stress-vulnerable subjects and 29 low stress-vulnerable subjects participated in a double-blind, placebo-controlled, crossover study. All subjects conducted a memory-scanning task after the intake of a diet enriched with either α -lactalbumin (α -lactalbumin diet) or sodium caseinate (control diet). Blood samples were taken to measure the effect of dietary manipulation on the plasma Trp-LNAA ratio.

Results: A significantly greater increase in the plasma Trp-LNAA ratio after consumption of the α -lactalbumin diet than after the control diet ($P = 0.0001$) was observed; memory scanning improved significantly only in the high stress-vulnerable subjects ($P = 0.019$).

Conclusion: Because an increase in the plasma Trp-LNAA ratio is considered to be an indirect indication of increased brain serotonin function, the results suggest that dietary protein rich in α -lactalbumin improves cognitive performance in stress-vulnerable subjects via increased brain tryptophan and serotonin activities. *Am J Clin Nutr* 2002;75:1051-6.

KEY WORDS α -Lactalbumin, tryptophan, serotonin, stress, cognitive performance, whey protein, large neutral amino acids, Netherlands