

## Effects of Oral Supplementation with Pyrroloquinoline Quinone on Stress, Fatigue, and Sleep

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### ABSTRACT:

Seventeen adult male and female subjects participated in a clinical trial using an open-label trial to evaluate the effectiveness of pyrroloquinoline quinone (PQQ) on stress, fatigue, quality of life and sleep. They ingested 20 mg of PQQ daily for 8 weeks. Changes in stress, fatigue, quality of life measures and sleep were evaluated using various inventories and questionnaires. For example, the results of the Profile of Mood States-Short Form revealed that all six measures of vigor, fatigue, tension-anxiety, depression, anger-hostility and confusion were significantly improved following PQQ administration compared with scores for those measures before administration of PQQ. Measures for quality of life, appetite, sleep, obsession and pain, also improved significantly. The results of the Oguri-Shirakawa-Azumi Sleep Inventory (Middle Aged and Aged version) showed significant improvement in sleepiness at awakening, sleep onset and maintenance, and sleep duration. For validation, the Pittsburgh Sleep Quality Index Japanese version also showed significant improvement in sleep-related behavior. Furthermore, the changes in these global scores were correlated with

changes in the cortisol awakening response ( $R = -0.55$ ), i.e. the effects of PQQ on improvement of sleep quality are supported by a biomarker.

**Keywords:** Pyrroloquinoline quinone, stress, fatigue, quality of life, sleep