

# Abstract

J Intern Med. 2005 Mar;257(3):299-310.

## Chronic fatigue syndrome: assessment of increased oxidative stress and altered muscle excitability in response to incremental exercise.

Jammes Y, Steinberg JG, Mambrini O, Brégeon F, Delliaux S.

Laboratoire de Physiopathologie Respiratoire (UPRES EA 2201), Faculté de Médecine, Institut Fédératif de Recherche Jean Roche, Marseille, France

**OBJECTIVES:** Because the muscle response to incremental exercise is not well documented in patients suffering from chronic fatigue syndrome (CFS), we combined electrophysiological (compound-evoked muscle action potential, M wave), and biochemical (lactic acid production, oxidative stress) measurements to assess any muscle dysfunction in response to a routine cycling exercise.

**DESIGN:** This case-control study compared 15 CFS patients to a gender-, age- and weight-matched control group (n=11) of healthy subjects.

**INTERVENTIONS:** All subjects performed an incremental cycling exercise continued until exhaustion.

**MAIN OUTCOME MEASURES:** We measured the oxygen uptake (VO<sub>2</sub>), heart rate (HR), systemic blood pressure, percutaneous O<sub>2</sub> saturation (SpO<sub>2</sub>), M-wave recording from vastus lateralis, and venous blood sampling allowing measurements of pH (pH<sub>v</sub>), PO<sub>2</sub> (PvO<sub>2</sub>), lactic acid (LA), and three markers of the oxidative stress (thiobarbituric acid-reactive substances, TBARS, reduced glutathione, GSH, and ascorbic acid, RAA).

**RESULTS:** Compared with control, in CFS patients (i) the slope of VO<sub>2</sub> versus work load relationship did not differ from control subjects and there was a tendency for an accentuated PvO<sub>2</sub> fall at the same exercise intensity, indicating an increased oxygen uptake by the exercising muscles; (ii) the HR and blood pressure responses to exercise did not vary; (iii) the anaerobic pathways were not accentuated; (iv) the exercise-induced oxidative stress was enhanced with early changes in TBARS and RAA and enhanced maximal RAA consumption; and (v) the M-wave duration markedly increased during the recovery period.

**CONCLUSIONS:** The response of CFS patients to incremental exercise associates a lengthened and accentuated oxidative stress together with marked alterations of the muscle membrane excitability. These two objective signs of muscle dysfunction are sufficient to explain muscle pain and postexertional malaise reported by our patients.

PMID: 15715687