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Influence of Oxidative Stress Biomarkers on Cognitive Decline

Frédéric Revel[a,b], Thomas Gilbert[a,*], Sylvain Roche[c,d,e], Jocelyne Drai[f,g], Emilie Blond[f,g], René Ecochard[c,d,e] and Marc Bonnefoy[a,b,g]

[a]*Service de Médecine Gériatrique, Centre Hospitalier Lyon-Sud, Hospices Civils de Lyon, Pierre-Bénite, France*
[b]*Université de Lyon, Lyon, France*
[c]*Université Lyon 1, Lyon, France*
[d]*Service de Biostatistique, Hospices Civils de Lyon, Lyon, France*
[e]*CNRS UMR 5558, Laboratoire de Biométrie et Biologie Evolutive, Equipe Biostatistique Santé, Villeurbanne, France*
[f]*Service de Biochimie et de Biologie Moléculaire, Centre Hospitalier Lyon-Sud, Hospices Civils de Lyon, Pierre-Bénite, France*
[g]*INSERM U1060, Laboratoire CarMeN (cardiovasculaire, métabolisme, diabétologie et nutrition), Université Claude Bernard Lyon 1, Pierre-Bénite, France*

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Abstract.
Background: Abnormal oxidative stress is an established feature of Alzheimer's disease (AD). Markers of lipoperoxidation and deficits in serum antioxidants could have a predictive value for identifying subjects at risk of dementia and to predict cognitive decline.
Objective: Search for relationships between the levels of some oxidative stress biomarkers and cognitive function decline that would help predict this decline.
Methods: The study solicited and included 97 patients aged 63 to 93 years with various suspected neurodegenerative diseases (35 with AD). They were followed up at six-month intervals over two years (2010–2012). The study: i) assessed the blood levels of glutathione peroxidase, glutathione, and malondialdehyde; ii) performed the Mini-Mental Status Examination (MMSE), the Clock Drawing test, the free/cued recall task with 16-item lists, the cue percentage and the Trail Making Test; and iii) acquired brain magnetic resonance imaging or tomodensitometry. The primary outcome measure was the MMSE score.
Results: The MMSE score was correlated with the score of each neuropsychological test, the age at baseline, and the glutathione level. On average, the decline in the MMSE score was 1.63 points per six months. A 100 International Unit increase in glutathione peroxidase was associated with an average loss of 1.19 MMSE points per six months ($p = 0.002$). A 100 μmol/L increase in glutathione was associated with an average loss of 1.80 MMSE points per six months ($p = 0.014$).
Conclusion: Oxidative stress biomarkers, especially glutathione peroxidase and glutathione, may predict the course of cognitive decline in patients with AD or other neurodegenerative disorders.

Keywords: Alzheimer's disease, biological markers, glutathione, glutathione peroxidase, malondialdehyde, oxidative stress

INTRODUCTION

The determinants of cognitive decline are still unknown. An imbalance in the oxidative balance with high concentrations of oxidative components and lower defense mechanisms may favor the development of Alzheimer's disease (AD) [1]. Several factors may be involved in the oxidative processes and exert pro- or antioxidative effects. In fact, genetic disorders [2, 3], mitochondrial anomalies [4–7], metallic catalysts [8–10], disequilibrium in the oxidative balance [1, 7, 11–13], or combinations of these factors

*Correspondence to: Dr. Thomas Gilbert, Service de Médecine Gériatrique, Centre Hospitalier Lyon-Sud, 165 Chemin du Grand Revoyet, F-69495, Pierre-Bénite Cedex, France. Tel.: +33 4 78 86 15 80; Fax: +33 4 78 86 57 27; E-mail: thomas.gilbert@chu-lyon.fr.

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