

# Effects of Zinc Supplementation on Antioxidant Status and Lipid Peroxidation in Hemodialysis Patients

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**Objectives:** This study was designed to determine the effects of zinc supplementation on oxidative stress in hemodialysis (HD) patients through evaluating total antioxidant capacity (TAC), whole blood glutathione peroxidase (GSH) level, superoxide dismutase (SOD) activity, and malondialdehyde (MDA) level.

**Design and Setting:** Double-blinded randomized controlled trial from October 2006 to December 2007 at Tabriz Imam Khomeini Hospital.

**Subjects:** Sixty-five HD patients were randomly enrolled into 2 groups.

**Intervention:** Patients received placebo in group A and zinc (100 mg/day) in group B for 2 months. After a washout period for 2 months, the groups were crossed over and the study was continued for an additional 2 months.

**Main outcome measures:** Serum zinc concentration was measured using atomic absorption spectrophotometry. TAC, GSH level, and SOD activity were determined by commercial enzyme-linked immunosorbent assay kits. MDA level was measured using a thiobarbituric acid method.

**Results:** The levels of serum zinc, TAC, GSH ( $P < .001$  for all), and SOD activity ( $P < .001$  for group A and  $P = .003$  for group B) significantly increased after zinc supplementation whereas the serum level of MDA decreased after the same period ( $P = .003$  for group A and  $P < .001$  for group B).

**Conclusions:** Zinc supplementation for 2 months improved the serum levels of zinc, antioxidant status, and lipid peroxidation in HD patients.

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## Introduction

ZINC IS AN essential trace element that is required for the function of more than 300 enzymes and many other biological factors, including hormones, cytokines, peptides, and biomembranes.<sup>1</sup> In addition, zinc plays a critical role in gene expression, protein synthesis, bone formation, growth, reproduction, wound healing, transport processes, immune function, and behavioral responses.<sup>1</sup>

Zinc deficiency is a worldwide problem, and it is estimated that 25% of the world's population is at risk of zinc deficiency.<sup>2</sup> Lower levels of zinc were specifically reported in hemodialysis (HD) patients.<sup>3,4</sup> Deficiency of zinc has been associated with most of the uremic symptoms, including anorexia, hypogeusia, hyposmia, and disorders of sexual and immunological functions.<sup>1,3</sup> Studies have shown that zinc supplementation increases the serum level of zinc in HD patients<sup>5</sup> and improves uremic symptoms.<sup>6,7</sup>

Furthermore, the antioxidant properties of zinc have been clearly demonstrated and, for the most part, appear to be independent of zinc metalloenzyme activity.<sup>8-12</sup> The antioxidative action of zinc can be generally divided into acute and chronic effects. The acute effect involves two mechanisms: protection of protein sulfhydryls or reduction of hydroxyl formation from hydrogen peroxide through the antagonism of redox-active and transition metals including iron and copper.<sup>13</sup> The chronic effect involves exposure of an organism to zinc on a long-term basis, resulting in induction of some other substances that are the ultimate antioxidant such as metallothioneins.<sup>13</sup> Therefore, zinc deficiency in uremic and HD patients may result in increased oxidative stress, which is implicated in several pathologic processes such as cardiovascular disorders.<sup>9-12,14,15</sup>

On the basis of the antioxidative properties of zinc and its deficiency in HD patients, the study presented here aimed

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