

Altered antioxidant enzymatic and non enzymatic status in seminal plasma of men with different reproductive problems

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Seminal plasma is a natural reservoir of antioxidants that protects spermatozoa from oxidative damage and it is demonstrated that impairments in seminal antioxidants status play an important role in physiopathology of male infertility. Endogenous and exogenous factors can stimulate the Reactive Oxygen Species (ROS) production and/or the decrease of antioxidant defenses inducing a condition called oxidative stress (OS). OS is described as a major cause of male infertility. The aim of this study was to assess the antioxidant enzymatic and non enzymatic defense systems in the seminal plasma of forty four men with different reproductive pathologies. Selected patients were divided into two groups according to their clinical diagnosis: genitourinary infection and varicocele. Ten normospermic fertile men were considered as control group. Semen quality was assessed by light and transmission electron microscopy. Transmission electron microscopy data was quantified with a mathematical formula able to obtain a fertility index and the percentage of sperm apoptosis, immaturity and necrosis. The levels of malondhyaldehyde (MDA), ascorbic acid (AA), reduced (GSH) and oxidized glutathione (GSSG), glutathione reductase (GR) and catalase (CAT) activities were determined according described methods. Scrotal Eco-color Doppler was used to detect the presence of varicocele. Infected patients had a positive bacteriological semen analysis. Higher levels of MDA in infection and varicocele groups ($p<0.001$ and $p<0.01$ respectively *versus* fertile men) indicated a peroxidative damage. Infection and varicocele groups showed a significantly reduction of AA levels ($p<0.05$ in both groups) and an increase of seminal CAT activity ($p<0.01$ and $P<0.05$ respectively) when compared to fertile men. In varicocele group a significantly lower value of GSH ($p<0.01$) and of GSH/GSSG ratio ($p<0.05$) respect to fertile men was also observed. The novelty of this research resides in the categorization the patients based on their clinical diagnosis instead of sperm parameters. In varicocele group the decrease of AA, associated with the decline of seminal GSH/GSSG ratio, shows that this antioxidant not enough to counterbalance the GSH depletion. The consequent OS produces a damage highlighted by increased level of MDA. In infection group we suppose that the "sparing effect" of AA on GSH is predominant and can contribute to preserve the GSH/GSSG balance even if it is not sufficient to counteract the excess of ROS and the consequent oxidative damage. As regards the determination of antioxidant enzymatic status, CAT activity results significantly increased in infection and varicocele groups respect to fertile group and this allows to suppose that CAT is the preferentially enzymatic antioxidant pathway used. This is in contrast with that observed by Abd-Elmoaty et al. (2010) in men with varicocele, but the different patients selection must be considered.

We concluded that the evaluation of a single parameter of oxidative stress/antioxidant system has not a clinical value to estimate male fertilizing potential and the infertility causes, since multifactorial mechanisms are involved in different reproductive pathologies. The identification of the implicated parameters could be useful in the diagnosis, prognosis and in the choice of a possible treatment as specific antioxidant supplement.

References

Abd-Elmoaty MA, Saleh R, Sharma R & Agarwal A. (2010) Increased levels of oxidants and reduced antioxidants in semen of infertile men with varicocele. *Fertil Steril* 94, 1531-1534.