IJAE
Vol. 117, n. 2 (Supplement): 169, 2012
ITALIAN JOURNAL OF ANATOMY AND EMBRYOLOGY

Production of nitric oxide and peroxynitrite by human spermatozoa: a role in male infertility?

Eleonora Salvolini[1], Arianna Vignini[2], Guendalina Lucarini[1], Eddi Buldreghini[1], Monia Orciani[1] and Giancarlo Balercia[1]

[1] Dipartimento di Scienze Cliniche e Molecolari – Istologia, Università Politecnica delle Marche, Ancona, Italy
[2] Dipartimento di Scienze Cliniche Specialistiche ed Odontostomatologiche, Università Politecnica delle Marche, Ancona, Italy

A growing body of evidence confirms the importance of oxidative stress in male infertility (Agarwal and Saleh, 2002). Spermatozoa generate small amounts of $O_2^{\cdot-}$ and nitric oxide (NO), that, at high concentrations, combine to produce peroxynitrite, which can rapidly react with proteins, lipids, and DNA. In particular, the nitration of protein residues gives rise to 3-nitrotyrosine, a widely used marker of peroxynitrite production.

NO is produced by three isoforms of NO synthase (NOS). The inducible NOS (iNOS) seems to negatively affect sperm function through the production of large amounts of NO (Yang et al., 2005).

Our aim was to determine NO and $ONOO^-$ production in semen samples from fertile donors and infertile patients affected by idiopathic asthenozoospermia, as well as their correlation with sperm cell kinetic features; in addition we evaluated the tyrosine nitration in the same samples, to clarify any pathogenic involvement in sperm cell functional impairment. Furthermore, we assessed the expression of iNOS by means of immunohistochemical and Western blot analyses.

NO and $ONOO^-$ production was significantly lower in controls than in asthenozoospermic patients and inversely correlated with the kinetic parameters. Moreover, the Western immunoblots showed an increase in tyrosine nitration and iNOS expression in the asthenozoospermic samples, in agreement with immunohistochemical findings. The present data confirm a critical negative effect of NO and peroxynitrite on sperm cell motility, supporting the role of an increased NOS activity, and an excess of tyrosine nitration in the pathogenesis of idiopathic asthenozoospermia that causes male infertility.

References

Agarwal and Saleh (2002) Role of Oxidants in Male Infertility: Rationale, Significance and Treatment. Urol Clin N Am 29: 817–827.

Yang et al (2005) The Role of Inducible Nitric Oxide Synthase in Gamete Interaction and Fertilization: a Comparative Study on Knockout Mice of Three NOS Isoforms. Cell Biol Int 29: 785-791.

Keywords: Asthenozoospermia, nitric oxide, nitrotyrosine, peroxynitrite.