Assessment of Spermatozoal Caspases in Oxidative Stress Mediated Apoptosis

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Objectives: Reactive oxygen species (ROS) are involved in the pathophysiology of male infertility via a variety of mechanisms that include apoptosis. Oxidative stress is also associated with the activation of effector caspase-3, the main executioner caspase. However, data on ROS dependent caspase activation remain controversial. The aim of our study was to study caspase activation response following exposure to ROS inducers such as hydrogen peroxide (H\textsubscript{2}O\textsubscript{2}) hypochlorous acid (HOCl), and superoxide anion (SO\textsuperscript{•-}).

Design: Prospective-controlled study.

Materials and Methods: A total of 20 ejaculates from 20 healthy donors were collected after a sexual abstinence of 2 to 3 days. Washed spermatozoa were incubated at 37\(^\circ\) with H\textsubscript{2}O\textsubscript{2} (200 µmol/L) or HOCl (10\textsuperscript{-3} mol/L) for 1 hour or 5 mM of reduced β-nicotinamide adenine dinucleotide phosphate (NADPH) for 3 hours to induce SO\textsuperscript{•-} generation. Control aliquots were incubated under identical conditions except that ROS inducer was replaced with PBS. Activated caspases-3 level was measured using carboxyfluorescein derivatives (CaspaTag\textsuperscript{TM}, Purchase, NY) by flow cytometry.

Results: No significant increase in caspase-3 activation was seen following exposure to the 3 ROS inducers compared with controls: H\textsubscript{2}O\textsubscript{2} (38.8 ± 16.8 vs. 33.3 ± 15, \(P > 0.05\)), HOCl (38.66 ±25.24 vs. 38.05 ± 9.85, \(P > 0.05\)), and NADPH (45.34 ± 33.34 vs. 39.3 ± 26.51, \(P > 0.05\)).

Conclusions: Our results indicate that caspase-3 activation may not be the main pathway in oxidative stress pathophysiology. Oxidative stress-induced apoptosis in human spermatozoa may be occurring by other caspase-independent pathways.

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