DETECTION OF CHROMOSOMAL ABNORMALITIES AND "DNA" FRAGMENTATION IN IDIOPATHIC INFERTILE MEN

Submitted By

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B.Sc. of Science, Faculty of Science, Cairo University, 2003

Master in Sci. (Organic chemistry), faculty of science, Helwan University, 2012

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

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APPROVAL SHEET

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ABSTRACT

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The association between infertility and sperm disomy is well documented. Results vary but most report that men with severely compromised semen parameters have a significantly elevated proportion of disomic sperm. Recently, many studies have found a decrease in semen quality due to occupational hazards. There is growing evidence that aspects of a man's environment and lifestyle can affect sperm DNA integrity through a variety of physical, chemical and biological factors. Several occupational and environmental exposures and toxins have known or suspected deleterious actions to male reproductive function. For some specific agents, such as smoking, addiction, heat, ionizing radiation, inorganic lead, DBCP, EDB, some ethylene glycol ethers, carbon disulfide and welding operations, the evidence is strongly supported in well-designed epidemiological studies. Generally, occupational exposures have been divided into physical exposures (heat and radiation), chemical exposures (solvents and pesticides), psychological exposures (distress), exposure to metals and welding. This study aimed to determine the incidence of chromosomal abnormalities, sperm disomy and to evaluate sperm DNA fragmentation in infertile men with idiopathic severe oligoasthenoteratozoospermia (OAT) and in idiopathic infertile males with normal semen parameters who were exposed to various environmental factors. Fifty male subjects were included in this study twenty infertile men with severe iOAT (group I), twenty with idiopathic infertile men with normal semen parameters (group 2) and ten fertile male as control (group C). The participants of both groups (group I and group II) were exposed to

various hazardous environmental factors such as physical and chemical factors and personal habits .Through clinical examination and lab investigations semen analysis and hormonal assays were done. Cytogenetic studies were done that included FISH assessment of sperm using cocktail X, Y prope to detect the disomic level of chromosomes X and Y. Alkaline Comet Assay was done to sperm DNA fragmentation. There was highly significant inverse relationship between age and semen parameters in group I and group II. A highly significant direct relationship between age and percentage of both total disomy and sperm DNA damage in group I and II was observed. In addition, there was highly significant inverse correlation between total disomy percent and semen parameters among the three studied groups. Moreover, a positive correlation between DNA damage and total disomy percent was observed. sperm DNA fragmentation percentage is increased in idiopathic infertile men (group II) than in severe iOAT patients (group I) and total disomy percentage showed a higher increase in the spermatozoa of men with severe iOAT (group I) than in those of idiopathic infertile men with high semen quality (group II), compared to controls group (C). Total disomy percent showed highly significant positive correlation with increasing the number of environmental factors in severe OAT patients and idiopathic infertile patients.

Keywords: Chromosomes, FISH, Comet assay, DNA fragmentation, male infertility, semen, spermatozoa, environment, lifestyle.

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