



Epigenetic Influences on Female Infertility and PCOS in Proteomics Analysis

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DESCRIPTION

The most prevalent diseases currently turning a significant number of women infertile around the world are endometriosis, PCOS, and unexplained infertility. Due to its harmful effects on proteins and nucleic acids, oxidative stress is thought to be one of the key molecular processes underlying the differential expression of proteins and various illnesses. Proteins involved in the cell cycle, including antioxidants, the Extracellular Matrix (ECM), and cytoskeleton, as well as their relationship to oxidative stress in conditions related to female infertility, has all been identified thanks to the developing area of proteomics. The relationship between oxidative stress and protein expression in reproductive microenvironments, including reproductive tissues, serum, and fluids such endometrial fluid, peritoneal fluid, and follicular fluid in Polycystic ovary syndrome (PCOS).

According to latest statistical data in 17% of couples struggle with infertility. This infertility can have a variety of factors that can impact either the male or the female. About 50% of these are brought on by the female factor and related conditions in the female reproductive system. It has been observed even though characterizing infertility, couples are said to be infertile if they are unable to conceive after 12 months of unprotected and regularly spaced sexual activity. Women all across the world have a natural drive to procreate. Many improvements in medical technology have made it feasible for many women to realise their dream of becoming mothers. Moreover, it has been indicated that one of the risk factors for women's depression is the desire to have children. Also, the increased financial strain hinders economic status because these women are more likely to pay for assisted Reproductive Technologies (ART). The incidence of the female infertility is associated with an increase in oxidative stress levels in the many key micro (or) microenvironments in the body. As a result, ART clinics have been established all over the world to help infertile couples achieve pregnancy. Reactive Oxygen Species (ROS) rise when antioxidant capacity of the cells to scavenge and eliminate these free radicals declines, leading to oxidative stress.

The residue of the respiration process occurring in the

mitochondria is ROS. In cells, ROS molecules frequently interact with proteins, lipids, carbohydrates, or DNA molecules, damaging biological components like cell membranes and genetic material. Changes in cellular pathways and transcription factors as well as epigenetic alterations can occur from an imbalance of ROS. According to studies, oxidative stress changes specific protein pathways, and aberrant protein expression may contribute to the pathophysiology of female infertility. Superoxide Dismutase (SOD), Paraoxonase (PON), hemopexin, apolipoproteins, and heat shock proteins are examples of binding proteins that may bind oxidants and antioxidants. The abnormally expressed proteins may also be antioxidants or different binding proteins that may bind oxidants and antioxidants. Proteomics is the science of how various proteins express themselves in a cell or tissue over time and space. This relatively new method has been developing extraordinarily quickly as new methodologies for the identification of trace levels of proteins in various bodily fluids emerge. Comparative proteomics, which looks at different proteins in normal and diseased samples, is considered to be an important component in the detection and treatment of diseases since proteins heavily influence biological processes. Comparative proteome studies may help to identify biomarkers for the non-invasive diagnosis of female illnesses and to determine chances of success for assisted Reproductive Techniques (ART)

One or more electrons are lacking from the outer shell of the free radicals known as Reactive Oxygen Species (ROS). They interact often with nearby molecules to stabilise their structure and are very reactive. An essential endogenous source of ROS is the electron transport chain in mitochondria. The generation of ROS can be increased by a number of external stimuli, including alcohol, smoking, and environmental variables. Hydroxyl radicals, superoxide anion, and hydrogen peroxide are some of the free radicals that are frequently linked to oxidative stress. By extracting free radicals, enzymatic antioxidants like glutathione oxidase and superoxide dismutase as well as nonenzymatic antioxidants like vitamin A, vitamin E, zinc, and selenium are crucial for maintaining proper levels of ROS in the cell. The involvement of proteins and underlying oxidative stress in

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conditions affecting female infertility. The three most prevalent reasons of infertility among women worldwide at the moment are endometriosis, Poly Cystic Ovary Syndrome (PCOS), and unexplained infertility. Clinicians will have more insight into these disorders once they are aware of them, which will help

with early detection and treatment. Finding possible biomarkers for non-invasive disease diagnosis will be aided by the identification of proteins in various diseases and at various phases of disease progression.