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INTRODUCTION TO MALE REPRODUCTION AND TOXICITY



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Effect of Cobalt and Molybdenum on Apoptosis of Ovarian Fragments in Rats

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[ABSTRACT: Cobalt (Co) and molybdenum (Mo) are essential in trace amounts for human life and play an important role in cellular processes. Cobalt is part of vitamin B-12, and plays a key role in the body's synthesis of this essential vitamin. It is widely dispersed in the environment and humans may be exposed to it by breathing air, drinking water and eating food that contains Co. Molybdenum also plays a vital part in everyday life, particularly in relation to many aspects of the protection of human health and the environment. The objective of this *in vitro* study was to examine the effects of Co and Mo on apoptosis of rat ovarian cells. It also aimed at investigating the apoptotic and the anti-apoptotic

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Conserving the Western Hoolock Gibbons in India and Bangladesh Through Joint Collaboration & Mutual Cooperation

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[ABSTRACT: The western hoolock gibbon (*Hoolock hoolock*) is an arboreal non-human primate with its distribution range extending over India, Bangladesh and Myanmar. In recent decades, western hoolock gibbons have become greatly endangered (WPA, 1972; IUCN Red List) has also designated western hoolock gibbons as Endangered. Western hoolock gibbon is an important pollinator and helps in forest regeneration and indicates the richness and well-being of tropical forests. Presently western hoolock gibbons face numerous threats mainly due to constant urbanization and habitat fragmentation which has led to a steep decline in its population all over its distribution ranges. The species is now highly dependent on human intervention for its survival therefore it is urgent to take up meticulous plans to protect this species. Moreover, due to comparable geographical location such as related feeding habitats,

Management of Petroleum and Oily Wastes in Barak Valley of Assam: Need for Biotechnological Approach

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[ABSTRACT: The conventional practices of pollution management caused by drill cuttings and fluids of fossil fuel exploration in north-east India is probing to be insufficient as well as expensive. The pollution caused by extraction of petroleum and natural gas has been linked to a number of detrimental consequences for the environment like loss of natural vegetation as well as loss of aquatic and soil biota. Studies reported that some of these pollutants can be readily degraded or removed by utilizing environmental bioremediation techniques leading to waste minimization. Reduction of pollution levels caused by petroleum exploration can be successfully achieved by use of biodegradative activities of natural as well as genetically modified microorganisms. Furthermore, environmental biomonitoring and biomaintenance can be useful tools for prevention of pollution caused by petroleum and natural gas exploration. Thus biotechnology may be regarded as a driving force for integrated environmental protection and pollution management caused by fossil fuel

Biology, Biotechnology *and* Sustainable Development



Dr. Hiranjit Choudhury

RIP

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Herbal Nanotechnology: An Emerging Tool in Cancer Therapy

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Abstract

Some natural anticancer compounds derived from natural product and their optimal potential are limited due to lack of solubility in aqueous solvent, degradation at alkaline pH and poor tissue absorption. In order to enhance their activity and improve their bioavailability, this chapter describes about designed bioactive loaded nanoparticles delivery system using nanotechnology. Nanotechnology is one of the modern developing approaches that raises new possibilities in the diagnosis and treatment of human cancerous cells. This is a new technique of analyzing the proteome of individual tumour. Most importantly nanoparticulate compounds are comparatively more effective than the pure compound against different cell lines under *in vivo* and *in vitro* condition with time due to enhanced cellular uptake resulting in reduction of cell viability by inducing apoptosis. Finally the use of bioactive loaded nanoparticles will allow simultaneous tumour targeting at a constant rate. This chapter provides an overview of advances and prospects in the application of nanotechnology for cancer therapy using bioactive loaded nanoparticles derived from natural anticancer herbs.

Keywords: Herbal products, nanoparticles, polymers, anticancer activity

Chapter 6

Biotechnological Approaches to Evaluation of Toxicological Risks of Naturally Occurring Contaminants: A Case Study on the Impacts of Mycotoxins and Bee Pollen on Ovarian Cellular Mechanisms

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Abstract

It is important to highlight the impact of naturally occurring toxicants upon animals which extends beyond their clinical features. Despite the ever-increasing understanding of bee products and fungal toxins, they still have a continuous and severe economic impact worldwide. Pollen is a fine, powder-like material produced by flowering plants and gathered by bees and is considered as a valuable special food with varied enhancing effects on health. This beehive product also has several useful pharmacological properties, such as antibiotic, antineoplastic, antidiarrhoeatic and with nutritional composition, antioxidant and antiradical activity. However, bee pollen extracts may affect osteoblastic cells, bone calcification and resorption, hormonal release and human breast cancer cells. Although acute ingestion of high levels of mycotoxins can also be very harmful to the animals and humans, long term consumption of low concentrations of mycotoxins can also be damaging. There are several ways of reducing mycotoxin concentrations both pre and post-harvest, including the addition of feed additives such as, but not limited to, natural clays, yeasts, and enzymes. Since mycotoxins can be highly detrimental to veterinary industry, further determination of sustainable way to combat the global mycotoxin problem is important for maintaining animal health, as well as reducing

Chapter 2 Methods to Measure Reactive Oxygen Species (ROS) and Total Antioxidant Capacity (TAC) in the Reproductive System

Rakesh Sharma, Shubhadeep Roychoudhury, Nirvika Singh,
and Yash Sarda

2.1 Introduction

ROS production in the male reproductive tract has become a real concern because of their potential toxic effects on quality and function of sperm [1–3]. ROS is produced by abnormal, immature, morphologically abnormal spermatozoa and contaminated white blood cells especially the polymorphonuclear granulocytes in the seminal ejaculates [4–7]. Examples of ROS include the superoxide anion ($\bullet\text{O}_2^-$), hydrogen peroxide (H_2O_2), the extremely reactive hydroxyl radical ($\bullet\text{OH}$) and the peroxy radical (HO_2^-) [8]. Reactive nitrogen species are often considered to be a subclass of ROS. It includes nitric oxide (NO), nitrous oxide (N_2O), peroxyxynitrite (NO_3^-), nitroxyl anion (HNO), and peroxyxynitrous acid (HNO_3) [5–7, 9]. High levels of ROS have a detrimental effect on sperm concentration [10–16], motility [10, 12, 14, 16], abnormal sperm morphology [12, 17–21] as well as increase DNA damage [22–24], apoptosis [25] and result in sperm dysfunction [26–30]. Increased presence of ROS with progressive depletion of antioxidant reserves results in oxidative stress, which is strongly correlated, with the etiology of male infertility [28, 31–33].

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Chapter 4 Negative Effects of Oxidative Stress (OS) on Reproductive System at Cellular Level

Rakesh Sharma, Shubhadeep Roychoudhury, Rakan Alsaad,
and Fares Bamajbuor

4.1 Introduction

There are multiple physiological processes occurring at the cellular as well as at the molecular level in the reproductive system. They are important in maintaining the homeostatic balance between various ions; and such balance is essential for preserving the quality of both the sperm and oocyte. Disturbance in this may lead to infertility and oxidative stress (OS) is believed to be the major culprit [1].

Reactive oxygen species (ROS) are generated as byproducts of oxygen metabolism. They usually contain at least one unpaired electron and play important physiological roles. Antioxidants, on the other hand, help in combating ROS by converting these highly reactive metabolites into water and molecular oxygen. The state when there is an excess in ROS related to antioxidants results in OS [2].

OS has a negative impact on several male physiological parameters and processes such as motility, morphology and concentration at the cellular level [1, 3]. It can cause cellular damage [4], DNA damage, and other deleterious effects [2] on both male and female reproductive systems. Similarly, high ROS levels in the various biological windows such as follicular fluid, peritoneal fluid and hydrosalpingeal fluid have all been reported to have adverse impacts on fertility. These microenvironments are essential in creating an ideal environment for nurturing oocytes and the resultant development of competent and mature oocytes that are necessary for suc-

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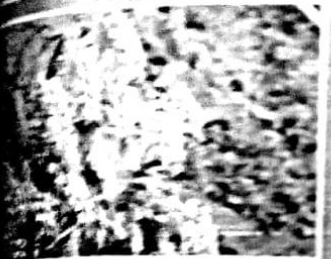
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Role of Stress in Diseases and Its Remedial Approach by Herbal and Natural Products in Stress-Related Disease Management: Experimental Studies and Clinical Reports

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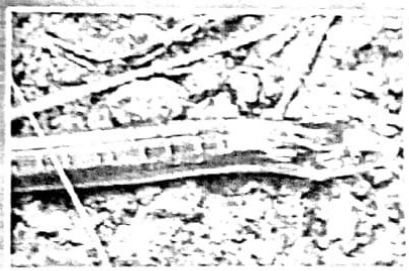
In today's 21st century there is a huge generational shift in terms of socio-economic, work, and cultural pressures that can lead to a stressful life. Also there has been a subsequent rise in the range of disorders affecting major populations regarding health and monetary consequences [1]. Stress affects practically everybody on the planet from schoolchildren to the elderly population. The role of modern medical science is constantly updating its parameters to understand the causes of psychological stress-induced disease and its treatment. However, in many cases of chronic lifestyle diseases, one significant point regarding the prognosis of patients is that treatment is focused only on the apparent pathophysiological aspect of the disease, not upon the grassroots level or the underline hidden cause, such as "psychological stress," which remains often unaddressed. As a precursor to many diseases, psychological stress may also worsen in patients suffering from several chronic diseases [2]. According to the World Health Organization and the Global Burden of Disease Survey, it has been estimated that mental disease, including stress-related disorders, will be the second leading cause of disabilities by the year 2020 [3]. Moreover, the United Nations in 1992 affirmed that stress was a 20th



BIODIVERSITY CONSERVATION

Strategy and Application

Prof. G.S. Solanki



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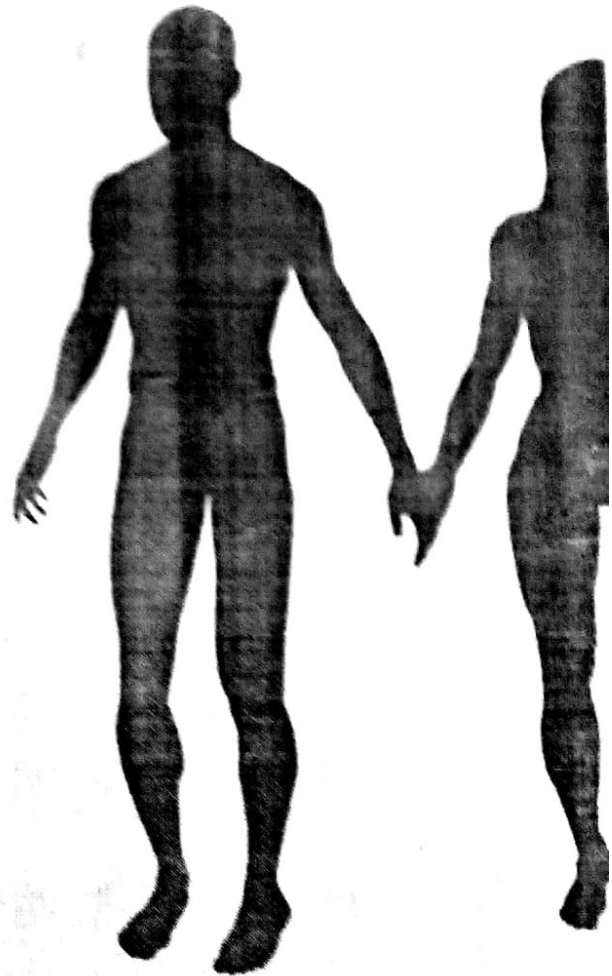
Analyzing farmers' adaptation to climate change in Southern Assam

Pradosh Kiran Nath, Shubhadeep Roychoudhury

INTRODUCTION

There are growing scientific evidences that global warming due to greenhouse gas emission is causing climate change at an alarming rate (Karl et al., 2009) thereby posing serious challenge to social, economic and ecological system across the globe. Existing and increasing concentrations of greenhouse gases seem likely to increase the mean and extreme air and ocean temperatures, rise in sea levels, changes in precipitation patterns, and increase in intensity of extreme events (Karl et al., 2009). These changes are in turn are likely to drive changes in the ecosystems upon which billions of people depend for their livelihoods and wellbeing. It is also often perceived that the poorest people in developing countries are going to be the worst affected as they are heavily dependent on climate sensitive sectors (Nanda, 2009). Agricultural activities being inherently climate sensitive are amongst the most vulnerable sectors to risks and impacts of global climate change (Reilly, 1995; Kurukulasuriya & Rosenthal, 2003). Research has also shown that specifically in tropical regions, with many of the poorest countries, impacts on agricultural productivity are particularly going to be harmful (Rosenzweig et al, 2002; Kurukulasuriya & Rosenthal, 2003; Adger et al, 2003; Cline, 2008). Thus, the rapidly changing climatic condition poses a real threat to the developing nations as agriculture is the main source of their economic growth. In last few years a number of scientific reports have also observed climate change as one of the greatest threats in ensuring welfare in both developed and developing nations. For example, The Stern Report (Stern, 2006) on The Economics of Climate Change predicts that by 2100, in South Asia and Sub Saharan Africa, up to 145 - 220 million additional people could fall below the \$2-a-day poverty line, and every year

BIOENVIRONMENTAL ISSUES
AFFECTING MEN'S
REPRODUCTIVE AND
SEXUAL HEALTH



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Environmental Issues Resulting in Andropause and Hypogonadism

CHAPTER

16

Shubhadeep Roychoudhury, Rudrarup Bhattacharjee
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INTRODUCTION

The testes are the male gonads and form the male reproductive system in association with other anatomical entities. The endocrine role of testes is to release the steroid hormone testosterone for the development of male secondary sexual characters. It also produces the spermatozoa (sperm cells). The androgens, i.e., the testosterone and its more active and potent form dihydrotestosterone, are involved in pituitary hormone regulation (luteinizing hormone (LH) and follicle-stimulating hormone, (FSH)), and these are also involved in sperm production and maturation. Insufficient physiological concentration of testosterone leads to hypogonadism. With increment in age, there is a characteristic decrease in androgen generation and this may elicit hypogonadism particularly in the elderly men. The condition is particularly common; however, the exact cause is still a matter of investigation [1]. However, the natural age-related factor is not the only cause of this clinical condition. There are certainly other factors, such as genetic, life style-related, drug use, exposure to chemicals, radiation, and so on, which take active part in development of hypogonadism in men [1–6]. This chapter focuses mainly on the environmental issues that correlate with the development of hypogonadism and/or andropause either directly or by indirect influence. Conventional clinical diagnosis and analytic characterization of hypogonadism has so far not incorporated the ecological and/or environmental issues component in the workup algorithm to the treatment of such patients. This has escaped the attention of many clinicians primarily because of the lack of availability of large number of scientific literature studies. We emphasized intense conceivable environmental issues that may assume a noteworthy role behind the development of hypogonadism, and the clinicians may consider it valuable to incorporate these in their treatment workup algorithm. This chapter aims to elucidate the possible environmental issue(s) that may be associated with the phenomenon of andropause and hypogonadism, and also it tries to describe the associations among these issues that produce such conditions.

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