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FOLLICLE STIMULATION HORMONE (FSH) AFFECTED BY ORAL ADMINISTRATION OF THE ENVIRONMENTAL CONTAMINANT ATRAZINE HERBICIDE BY USING *WISTAR RATS* AS EXPERIMENTAL ANIMALS, AND ITS CONFLICTS ON HUMAN HEALTH

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Abstract— Twenty *Wistar rats* were divided into four groups; three groups served as test groups which were orally administered by different doses of the herbicide: (27.3, 38.5, and 42.0 mg/kg b.w), while the remaining group was put as control. Animals were freely accessed to water tap, and basal diet. Metal cages were interval cleaned. Cages were kept in 15 C degree. Decreased concentrations ($p \leq 0.05$) of FSH compared to control were observed through the course of the experiment, more precisely at the 30th day. This information could affect the endocrine disruptor-screening program that is focused on hormone mimetic compounds and regulatory systems in order to better protect the reproductive health of women from ATR exposure [5]. Some sexually selected traits concerning many vertebrate species, especially in males, in which sex hormones interpresion was established [6].

Keywords— Atrazine, Endocrine, infertile, environmental pollution, expression, steroidogenesis

I. INTRODUCTION

It has been estimated that 72.4 million women are currently infertile [2]. An ongoing and rapid increase in reproductive diseases and a decline in reproductive functions have been observed in recent years, almost due to environmental pollution by chemicals [17]. Endocrine-disrupting chemicals impacts on cellular and molecular events in the ovary and their role in ovarian pathophysiology could provide important insights into the potential reproductive harm in humans. Atrazine, is the most heavily applied agricultural pesticide for crop production worldwide. Atrazine is banned in European Union countries, while the maximal contaminant level of 0.003 mg/L in drinking water is currently under review [18]. An increased concern that agricultural runoff of this chemical can affect non-target animal species. The actual ATR levels in the environment can exceed maximal permissible concentrations MPCs, sometimes reaching more than 0.02 mg/L [15]. ATR exposure in humans is primarily related to ingestion of contaminated drinking water and from dermal contact or ingestion following agricultural and lawn



applications. Atrazine is toxicologically important, primarily because it acts as an endocrine disruptor and has a potential to interfere with steroidogenesis. Among the steroid-disrupting outcomes, the effect of ATR on aromatase (CYP19A1), an enzyme involved in estradiol synthesis [16]. Premature luteinization is a possible cause of infertility in women. It is currently unknown whether environmental chemicals can induce changes associated with premature luteinization. Using rat granulosa cells (GC) in vitro, it was demonstrated that exposure to atrazine (ATR), a widely used herbicide, causes GC phenotype that resembles that of human premature luteinization. At the end of the 48-h stimulation with FSH, ATR-exposed GC showed, higher levels of progesterone, overexpression of luteal markers, and an increase in progesterone: bestradiol ratio above 1[11]. It was concluded that disorders in reproductive functions in many mammals was due to atrazine exposure. Treatment of human cumulus granulosa cells with 20 μ M ATR for 48 h resulted in lower FSH-stimulated estradiol and progesterone production. ATR reduced mRNA levels of aromatase (CYP19A1), steroidogenic acute regulatory protein (STAR) and luteinizing hormone/choriogonadotropin receptor (LHCGR). It is suggested that ATR alters steroidogenesis and ovulatory process in human cumulus granulosa cells jeopardizing female reproduction. Women who are exposed to this pesticide are more likely to experience side effects of the FSH action during regular menstrual cycling or in vitro fertilization. The concept of endocrine disruptors as hormone sensitizers has been recognized and represents a new mode of action different from the hormone mimetics. This information could affect the endocrine disruptor-screening program that is focused on hormone mimetic compounds and regulatory systems in order to better protect the reproductive health of women from ATR exposure [5]. Some sexually selected traits concerning many vertebrate species, especially in males, in which sex hormones interpresion was established [6]. Disruption of the expression or perception of such traits can influence mate choice and evolutionary patterns [14]. Increased pollution is becoming an important factor in such disruptions [13], and is hence instrumental in shaping evolutionary trajectories. Endocrine disrupting compounds (EDCs) are concerned as pollutants, which interfere with proper hormonal functioning. Many of them have anthropogenic sources such as pesticides, industrial effluents, pulp mill effluents, plastics and sewage. Significant routes of exposure include direct exposures from living in contaminated soil or water, as well as indirect exposures through eating contaminated prey [9]. All aspects of the reproductive system can be affected by EDCs, including gonadal formation, production of hormones and gametes, sex determination [1].

II. EXPERIMENT AND RESULT

Atrazine with different concentrations was prepared in a suitable carrier. Blood samples were collected interval every

ten days for forty days, then centrifuged and kept at 5 C degree, till analysis according to the method described by [4].

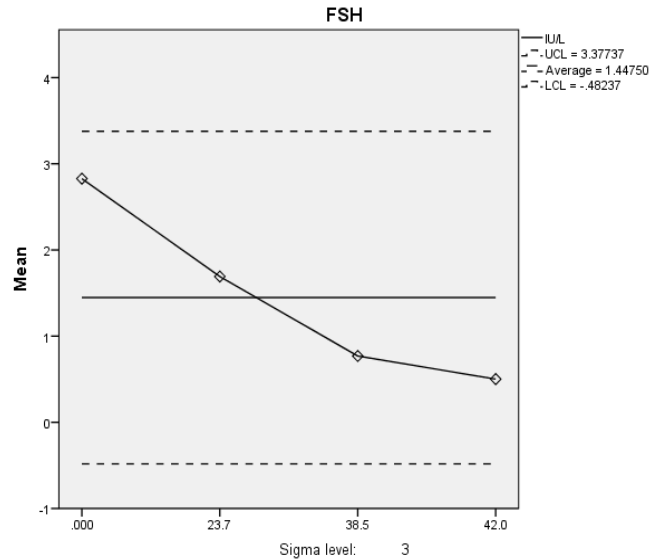


Fig.1. Mean values of FSH in IU/L vs Dosage mg/kg bw

Table 1. Mean difference of FSH concentration IU/L, Weight in mg/kg bw, and Time in days

	Test Value = 0					
	t	Df	Sig (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
FSH IU/L	3.663	15	.002	1.447500	.60530	2.28970
mg/kg bw	6.102	15	.000	26.05000	16.95056	35.14944
Days	8.660	15	.000	25.000	18.85	31.15

This study resulted in decreased FSH concentrations in accordance to time intervals (10th, 20th, 30th, and 40th day of the experiment), as shown in Figure No.1 and Table No.1. Study results agree with [7] who demonstrated that ATR decreases the FSH-stimulated aromatase expression and consequently diminishes estradiol production. Study results are also confirmed by [10] who has shown that ATR decreases estradiol production and Cyp19a1 and Lhr expression in the FSH-stimulated GC. Study results are confirmed by [3], who stated that, in the luteal-follicle phase transition period the serum levels of progesterone and estrogen (primarily estradiol) decrease and no longer suppress the release of FSH.



III. CONCLUSION

Authors highly recommend restricting chemical weed control, and prefer usage of integrated pest management, which can be defined as an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

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