Comparative Study on Dopamine and Seritonine Seretonin (5-HT) Levels in Brain Tissue of Rattus Norvegicus (Albino rat) and Uromastyx Acanthinura (Bell, 1825)

Ezaldin A. M. Mohammed, and Youssef K. A. Abd-Alhafid

***Abstract*—**This study examined the levels of dopamine and serotonin (5-HT) and comparative between albino rats and *Uromastyx acanthinura* (Bell, 1825) , The results revealed that, the levels of dopamine and serotonin in the brain tissue were almost stable in males and females of *Rattus norvegicus* (Albino rat) during all seasons (winter season and summer season), and there are variation between males and females during two seasons, whereby reached a high level in the brain tissue of *Uromastyx acanthinura*(Bell, 1825) during summer season , comparing with winter season (hibernation).

***Keywords*—** Dopamine, seritonine brain tissue , seasons.

I. Introduction

NEUROENDOCRINE system is an integral component of the neuronal apparatus of the brain, a major portion of which is concentrated in the hypothalamus. According to our present knowledge neuropeptides, a biogenic amines, are the most important agents synthesized and secreted by neuroendocrine cells. The role of Central Nervous System (CNS) neurotransmitters, which appear to be the mediator of many control mechanisms in mammals [1] .is little understood in other vertebrate groups . The hypothalamic dopamine and serotonin have profound effects on the release of mammalian pituitary hormone. Presumably in most cases by modulating release of the hypothalamic hormone [2]. The hypothalamus is of paramount importance as an “integration centre” for the various influences on pituitary function. The hypothalamus apparently responds to the exteroceptive and interoceptive stimuli by altering secretion of certain neurotransmitters and release hormones. The response of any given pituitary hormone is presumably the sum of all the stimulatory or inhibitory influences. Ideally a study of the control of pituitary function should not only show the effects of any particular influence on hormone secretion, but should also demonstrate the changes in metabolism of neurotransmitters and release of inhibiting hormones. Dopamine is reported to be synthesized largely in CNS .At the time of its discovered in brain, dopamine was proposed to act only as an intermediate in the biosynthesis of norepinephrine and epinephrine .[3], [4], [5], [6].

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II. Materials and methods

A. Experimental animals:

A total of forty male and female mature individual *of Rattus norvegicus* (Albino rat). forty male and female mature *Uromastyx acanthinura* (Bell, 1825) were collected from Libyan deserert (20 to each season 10 males and 10 female) during winter and summer between 2013 and 2014 and used in the present study. the animals were dissected and brain , were separated and subjected for the following determinations.

B. Determination of neurotransmitters content by HPLC:

Whole brain of the specimens during the different seasons were removed quickly, rinsed and used immediately to prepare 10% homogenates in ice-cold 2.5mM-tris buffer adjusted to pH 7.5 with 1 MHCI, containing 1.0 mM-EDTA by homogenizer. After the homogenates had been rapidly frozen and thawed at room temperature to ensure a thorough release of all soluble components from particulate matter they were centrifuged at 10000 rpm for 60min the clear supernatants were decanted and either analyzed at once or stored at 4oC. The tissue homogenate was centrifuged at 4°C for 5 min at 14000 x g and the supernatant separated. Following flurometric procedure procedure, ACh level was determined according to Gilberstadt and Russell (1984) using the following equation: Acetylcholine (μM) = Optical density of sampleoptical density of blank/Slope (μM) x n, where n is dilution factor. Catecholamines 5-HT and DA (ng/100mg) were determined fluorometrically as described by Ref. [7].

III. Results

The results revealed that, the levels of dopamine and serotonin (5-HT) in the brain tissue were almost stable in males and females of albino rats during all seasons (winter season and summer season), and there are variation between males and females during two seasons, whereby reached a high level in the brain tissue *Uromastyx acanthinura* (Bell, 1825) during summer season , comparing with winter season (hibernation).

Tables (1) And Figures (1 And 2) Illustrates The Levels Of Seretonin (5-HT) And Dopamine (Ng/100mg) In Braine Tissue *Of Uromastyx Acanthinura*(Bell, 1825) During Winter And Summer .

TABLE I

		Seretonin (5-HT) (ng/100mg)		Dopamine (ng/100mg)	
Uromastyx acanthinura(Bell, 1825)		Male	Female	Male	Female
Winter	Mean± SE	6.29±0.635	7.156±0.035	5.113±0.032	5.160±0.034
Summer	Mean± SE	11.03±0.406	11.903±0.206	12.837±0.354	12.883±0.367
	F-test	1.23	1.34	1.02	1.08
	$p \leq 0.05$	S.	S.	S.	S.

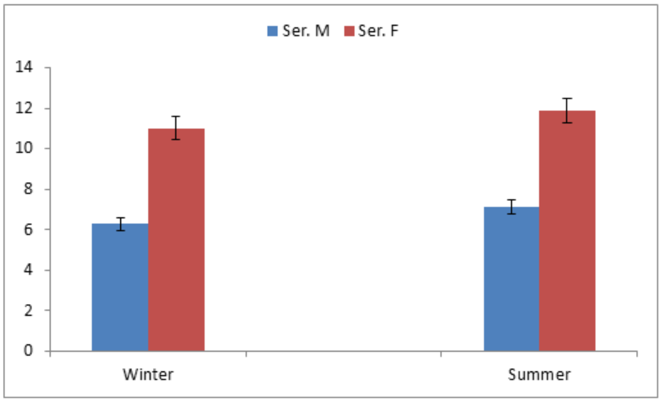

Fig 1. Representing the levels of Seretonin (5-HT) (ng/100mg) in brain tissue *of Uromastyx acanthinura*(Bell, 1825) during winter and summer

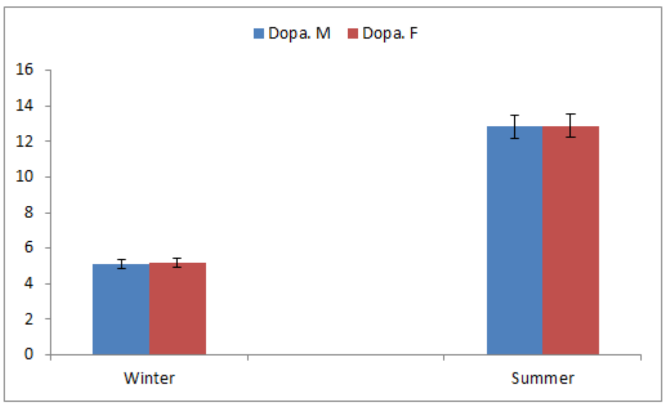

Fig 2. Representing the levels of Dopamine (ng/100mg) in brain tissue *of Uromastyx acanthinura*(Bell, 1825) during winter and summer

Tables (2) and figures (3 and 4) illustrates the levels of Seretonin (5-HT) (ng/100mg) and **Dopamine in** braine tissue *Rattus norvegicus* (Albino rat) during winter and summer .

TABLE II

		Seretonin (5-HT) (ng/100mg)		Dopamine (ng/100mg)	
Albino rats		Male	Female	Male	Female
Winter	Mean± SE	11.9±0.762	11.96±0.12	12.43±0.42	12.87±0.64
Summer	Mean± SE	11.91±0.406	11.97±0.43	12.87±0.354	12.98±0.12
	F-test	0.32	0.54	1.01	0.65
	$p \leq 0.05$	IS.	IS.	IS.	IS.

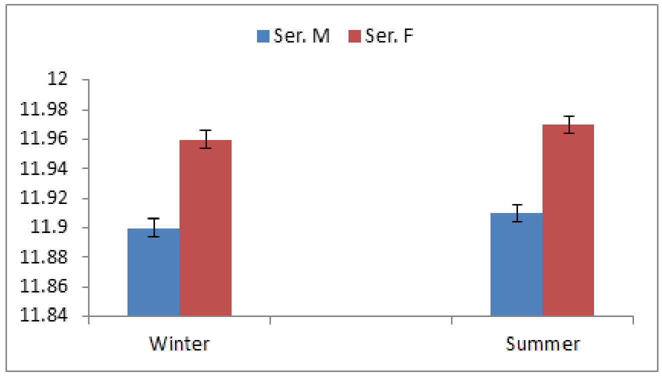

Fig. 3 Representing the levels of Dopamine (ng/100mg) in brain tissue *of Rattus norvegicus* (Albino rat) during winter and summer

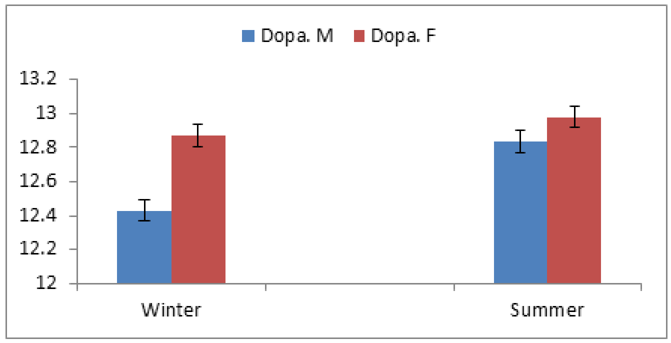

Fig. 4 Representing the levels of Dopamine (ng/100mg) in brain tissue *of Rattus norvegicus* (Albino rat) during winter and summer

IV. DISCUSSION

The data of the present work revealed the occurrence of highly significant declines in serotonin (5-HT) and dopamine levels in brain of *Uromastyx acanthinura*(Bell, 1825) during winter season , and almost stable in brain of albino rats . The brain is an important part of the nervous system , and many brain neurotransmitter substances, dopamine and seritonine, have been identified as brain neurotransmitters, or neuromodulators [8].

Uromastyx acanthinura(Bell, 1825) , often known as the North African Spiny-tailed Lizard, is a medium–sized lizard occurring in desert habitats of north-western Africa, and the northern part of western Libyan desert . The ecology and physiology of *Uromastyx acanthinura*(Bell, 1825) in Libya is still little studied, although the amount of information on the subject has increased considerably within the last ten years. This lack of knowledge hampers understanding of how ecological and physiological differences may arise as a result of the environmental changes in terms of seasonal variation.

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Several authors were interested in studying effects the seasonal variation on the Seritonine and dopamine and few scientists studied the comparative effects between reptiles and mammals. Many outers were studied the levels of neurotransmitters in albino rats and some reptiles . the levels of Neurotransmitters were decreased in brine and retina of *Uromastyx aegyptius* Falco tinnunculus and *Rattus norvegicus* (Albino rat) with aging [9].

Dopamine has an important role in sensory processing and increase in brain and retinal vessel diameter , serotonin (5-HT) and 5-hydroxyindoleacetic acid (5-HIAA) levels in the visual Wulst, optic lobes, retina, cerebellum and brainstem of the pigeon during embryonic and posthatching periods and reported that the serotonin5-HT content increased during development in almost all regions[10]. thermogenesis was an important source of heat for arousal from hibernation that resulted from dopamine secreted by the adrenal medulla as well as the sympathetic nervous system[11]., the increasing catecholamine level in the brain and its decline in the serum during hibernation suggested that the release of catecholamine from the brain stores was associated with the lowered activity of the nonadrenergic neurons during cold acclimation

V. Conclusion

Finally, we can concluded that , the annual cycle and climate changes leading to biological changes of body temperature during two seasons, then influence in the biological Neurotransmitters in Reptiles like Uromastyx acanthinura(Bell, 1825) , on the other hand there are no effects in mammals like *Rattus norvegicus* (Albino rat).

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