ECRONICON OPEN ACCESS

EC VETERINARY SCIENCE
Editorial

Trials on Advancing Age of Puberty in Cockerels of Domestic Birds

Hisham MS Shoukry*

Faculty of Agriculture, Al-Azhar University, Cairo, Egypt

***Corresponding Author:** Hisham MS Shoukry, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt.

Received: October 25, 2021; **Published:** October 29, 2021

Modern poultry industry depends on breeding plans to develop synthetic meat- and egg-type strains. Many attempts have done to decrease the generation life span by inducing precocious sexual maturity of cockerels.

Kuenzel WJ [6] reviewed the role of central nervous system in regulating gonadal development in male birds. He stated that there are two theories explained the onset of puberty. Firstly, single hypothesis called the "Gonadostat" or "Central Restraint Theory" originally proposed by Harris in 1955 as cited by Kuenzel WJ [6]. Kuenzel continued "the hypothesis centered upon the hypothalamo-pituitary-gonadal (HPG) axis". In HPG the gonadotropin-releasing hormone (GnRH), luteinizing hormone (LH) and Follicle-stimulating hormone (FSH) act to convey signals originated from hypothalamus to the final destination, the gonads. According to this theory tonic inhibitory inputs to the HPG prevented activation of this axis until a defined age, characteristic for a given species. Secondly, an alternative theory proposed in the late 1970s and mid-1980s. This theory called "Excitatory Inputs" or "Central stimulatory theory". The theory proposed that prepubertal excitatory inputs to HPG axis is developed near the point of sexual maturation to induce puberty. Data to date, from birds, appear to favor the latter " the Excitatory Inputs or Central Stimulatory Theory".

It is proposed that there appear to be at least three basic components for a neural system regulating onset of puberty in birds: 1) receptors that can receive and respond appropriately to external light and photoperiod, 2) a GnRH pulse generator and a primary neural system comprising the HPG axis, and 3) neural loci having elements that activate the HPG axis [6].

Invasive technics either knife cuts of neural connections to hypothalamus [4,8] or electrolytic lesions of some brain regions [10] have been used for better understanding of brain influence on puberty in domestic birds. In broiler cockerels as well as turkey growing male received parasagittal knife cuts throughout the anterior-posterior extent of the hypothalamus and thalamus showed prematurely developed wattles, large testes, advanced stages of spermatozoan development, significant increased plasma levels of LH and androgens; and mating behavior [4,8]. They concluded that lateral hypothalamic deafferentation removes an extrahypothalamic areas of the brain inhibitory effect on LH release.

Again, with the same knife cuts to isolate hypothalamus from extra hypothalamic areas of brain, [2] induced significant increase in testes weight in male broiler chicks. The advanced sexual maturation had reduced norepinephrine (NE), epinephrine (E), and homovanilic acid (HVA) in anterior hypothalamus and elevated levels of dopamine (DA) and serotonin in median eminence compared with controls. They stated that the increased DA in the median eminence suggests an excitatory role for this neurotransmitter in gonadotrophin release at puberty. Gonadal development in photoperiodic birds such as chicken, Japanese quail, and turkey is depending on photoreceptors, these receptors are not found in eye retina or pineal gland, which are not involved in effecting gonadal development, rather deep encephalic photoreceptors as medial basal hypothalamus (infundibular tubular complex) as reviewed by Kuenzel WJ [5,6].

Chemical manipulation of precocious puberty had started by van Tienhoven A., *et al* [14]. Ongoing researches of manipulating brain receptors or neurotransmitters by chemical agents were done on median eminence and infundibulum region in hypothalamus as application to what was found by invasive techniques to control timing of puberty in domestic birds was found to be successful. Tamoxifen (TAM) and Sulfamethazine (SMZ) are two chemical agents usually used for such type of researches [1,3,7,9,11-13,15].

Shoukry HMS., *et al*. [12] used dietary administration of TAM to cockerels of Fayoumi x LSL. The treatment started at one or 3 weeks of age where, cockerels were fed 50 mg TAM/Kg diet until 5 weeks of age then the dose of tamoxifen was reduced to 15 mg/Kg diet until 16 weeks of age. They found that the spermatogenesis started at 10th weeks of age for treated cockerels, however, control showed the same level of spermatogenesis after two weeks later.

Precocious puberty in domestic cockerels still need more research to get more commercial way for reducing the time needed to attain successful fertile mating capability.

Bibliography

1. Coco CM., *et al*. "Effect of in ovo 17- β - estradiol or tamoxifen administration on sexual differentiation of the external genitalia". *Poultry Science* 71 (1992): 1947- 1951.

2. Davison BA and WJ Kuenzel. "Hypothalamic biogenic amine levels in broiler chicks showing advanced sexual maturation". *Poultry Science* 70 (1991): 1610-1618.

3. Kirby JD., *et al*. "Effects of transient PrePubertal-6-N-propyl-2-thiouracil treatment on testis Development and function in the Domestic fowl". *Biology of Reproduction* 55 (1996): 910-916.

4. Kuenzel WJ. "Advanced gonadal development in male turkeys following knife cuts directed to the hypothalamus". *Poultry Science* 63 (1984): 568-572.

5. Kuenzel WJ. "The search for deep encephalic photoreceptors within the avian brain, using gonadal development as a primary indicator". *Poultry Science* 72 (1993): 959-967.

6. Kuenzel WJ. "Central nervous System regulation of gonadal development in the Avian male". *Poultry Science* 79 (2000): 1679-1688.

7. Kuenzel WJ. "A landmark contribution to poultry science –A possible mode of action of snlfamethazine on the reproductive system of Leghorn cockerels". *Poultry Science* 88 (2009): 824-831.

8. Kuenzel., *et al*. "Parasagittal hypothalamic knife cuts in male chicks: Advancement of reproductive function and changes in plasma concentrations of luteinising hormone and androgen". *British Poultry Science* 26 (1985): 199-205.

9. Pinilla l., *et al*. "Comparative effects of testosterone propionate, estradiol benzoate, 1C1 182,780, tamoxifen and raloxifene on hypothalamic differentiation in the female rat". *Journal of Endocrinology* 172 (2002): 441-448.

10. Rathinam T and WJ Kuenzel. "Attenuation of gonadal response to photostimulaion following ablation of neurons in the lateral septal organ of chicks". *Brain Research Bulletin* 64 (2005): 455-461.

11. Rozenboim I., *et al*. "The effect of tamoxifen on the reproductive traits in White Leghorn cockerels –pharmacology". *Biochemistry and Behavior* 32 (1989): 377-381.

12. Shoukry HMS., *et al*. "Induction of sexual maturation of cockerels fed dietary tamoxifen at different ages". *The Journal of Agricultural Science, Mansoura University* 20.11 (1995): 4559-4568.

13. Simunek J., *et al*. "Interaction between sulphamethazine and sulphaphenazole and some coccidiostats in chicken of different Ages". *Acta Veterinaria Brno* 56 (1987): 87-98.

14. Van Tienhoven A., *et al*. "The effect of sulfamethazine feeding on the thyroids, combs and testes of single comb White Leghorn cockerels". *Poultry Science* 35 (1956): 179-191.

15. Wilson SC., *et al*. "Differential responses of hypothalamic LHRH-I and – II to castration and gonadal steroid or tamoxifen treatment in cockerels". *Journal of Endocrinology* 125 (1990): 139-146.

Volume 6 Issue 11 November 2021
©All rights reserved by Hisham MS Shoukry.