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A Review on Role of Prolactin in Birds

Violet BJ* and Kannan TA

Department of Veterinary Anatomy, Tamil Nadu Veterinary and Animal Sciences University, India

***Corresponding author:** Violet Beulah J, Department of Veterinary Anatomy, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai-600 00, India, Tel: 9962045809; Email: violet.beaulahvet@gmail.com

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Abstract

In this article, we review the role of Prolactin, the parental hormone secreted by the adenohypophysis of the pituitary gland in birds. Release of prolactin is regulated by the Ca+ dependent mechanism in birds. In lactating mammals, prolactin is associated with regulation of milk production, whereas, in birds, this hormone is associated with incubation behaviour and broodiness. In pigeons, is associated with the secretion of crop milk. Plasma concentration of prolactin and Luteinizing hormone varies with the breeding cycle which determines the success of incubation in birds.

Keywords: Prolactin; Role; Birds

Introduction

Prolactin is an ancient hormone that promotes mammalian evolution and present in all vertebrates [1]. Prolactin, serves as a molecular correlate of seasonal timing in most species. Prolactin is highly pleiotropic with a wide variety of physiological effects in regulating yearly changes in pelage and molt. The short-term homeostatic variation of prolactin secretion is under the control of the hypothalamus, long-term seasonal rhythms of prolactin are controlled by pituitary gland [2]. Prolactin exhibits reproductive transitions in species that has parental care during breeding. Prolactin induces parental behaviours and related physiological changes in many vertebrates, especially birds and mammals [3]. The level of prolactin was highest in the pituitary than any other tissue [4]. The structure of prolactin is different from other peptide and glycoprotein pituitary hormones [5]. Prolactin level increases In birds after egg laying and also at the time of egg laying to initiate incubation behaviour [6]. In birds and mammals, change in the level of prolactin hormone in circulation and in the behavioural centres of brain will reinforce reproductive behaviours and correlates with parental experience [7]. In pigeons, prolactin was found to stimulate crop-milk production [2,8]. Prolactin was produced by the neuroendocrine signalling of the hypothalamus and in vertebrates it is an adenohypophyseal hormone. Prolactin is popularly known as "Parental Hormone" or "The Hormone of Maternity because of its important role in different vertebrate species [9]. Prolactin shows a wide range of incubation behaviour and defence behaviour in the same birds during broodiness phase [10]. Growth hormone and prolactin secreted from the anterior pituitary gland have a significant impact on maintaining physiological functions in birds. Prolactin is a fascinating subject in avian studies due to its wide-ranging effects from osmoregulation to reproduction. In mammals, prolactin plays a crucial role in milk production, while in birds, it is well-known for maintaining birds during incubation and broodiness phases [11]. Prolactin levels are typically higher during the broodiness phase compared to the laying phase, peaking during nest building and reaching their maximum during broodiness. In females, prolactin levels increase notably during the period of feeding their offspring, decreasing significantly at the end of the broodiness phase [11]. Increased prolactin concentration during the broodiness period suppresses LH secretion, resulting in gonadal regression. Prolactin level increases at the time of parental care in birds [12]. Prolactin rapidly increases the firing rate [13,14].

In birds, prolactin plays a crucial role from breeding to

brooding behaviour. An increase in circulating prolactin facilitates the initiation of incubation during broodiness in birds. However, the extent of prolactin rise varies between species and throughout the course of broodiness. In contrast, in the ring dove and zebra finch (*Taeniopygia guttata*), this increase in serum prolactin is not reported until late incubation [15]. Nonetheless, there is a consistent rise in serum prolactin levels in all bird species during late incubation. Altered levels of reproductive endocrine hormones, including gonadotrophin, growth hormone, prolactin, luteinizing hormone, progesterone, and oestradiol, were major factors inducing the occurrence of broodiness [16]. The authors Liu L, et al. [17] reported that in domestic hens during the ovulation-oviposition cycle, circulating levels of prolactin were high ten hours before and low six hours before ovulation. It was found that in broody hens, low gonadotropin-releasing hormone and high vasoactive intestinal polypeptide released from the hypothalamus influenced the production of prolactin [18]. In Muscovy ducks, reproductive endocrine hormones and pituitary transcriptome profiles were studied during egg-laying phases and broodiness phases.

Neutralization of prolactin leads to longer ovulatory sequences and increased egg production [19]. Changes in plasma prolactin and LH concentrations in hens interact with broodiness behaviour; prolactin secretion in broody birds is initiated by the presence of chicks, and increased plasma prolactin concentrations maintain incubation behaviour. In incubating hens, the secretion of LH and prolactin may be partly regulated independently. This crop milk production system is exclusive to this group of birds and is essential for feeding newly hatched squabs. High levels of prolactin assist columbids in secreting crop milk and also promote parenting behaviour. Increase in appetite in adult birds is mainly by the proliferation of crop sac gland that promotes the storage of lipid and protein to feed the young ones. Prolactin secretion is induced by the presence of eggs or chicks [20]. Parental motivation and caring behaviours of adult birds of both males and females of many vertebrates was due to prolactin [21,22]. Release or inhibition of prolactin hormone in migratory birds will result in hypertrophy, body weight gain and gonadal development [9].

Conclusion

This review article has focused on providing fundamental information about prolactin in birds.

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