Peaks and valleys of prolatin-related gene expression during pigeon parental care stages

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Abstract

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Author summary

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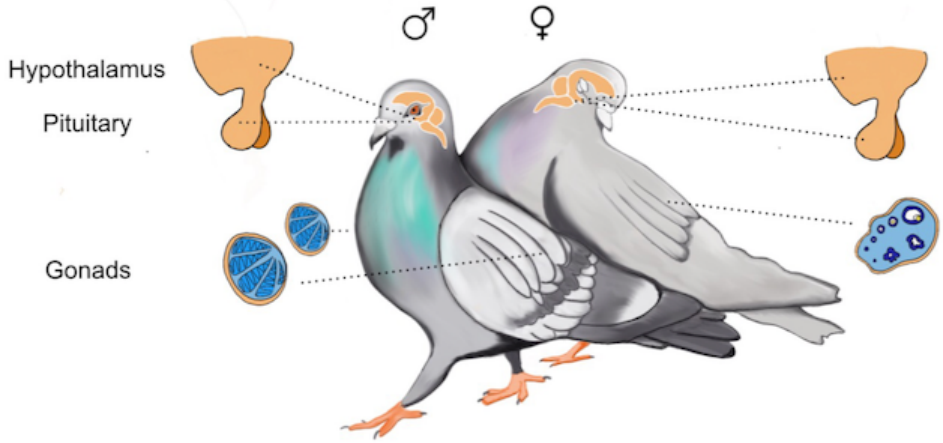
Introduction

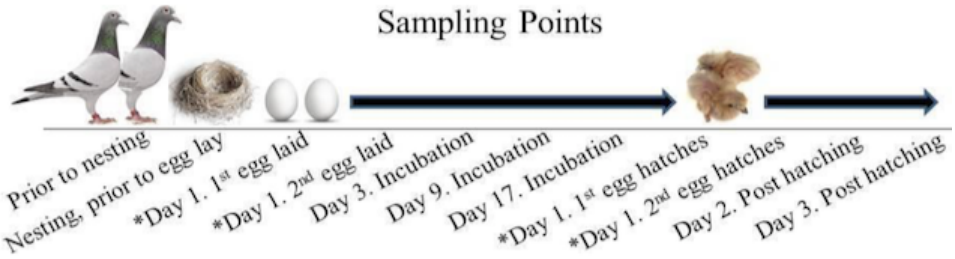
Understanding the mechanisms underlying parental care are critical to circumventing issues with parent-newborn bonding as well, where ultimate explanations are obvious, but specific mechanisms remain elusive. The rock dove (*Columba livia*) is an ideal system to characterize changes in genetic expression during parental care transitions because: 1) ample genomic resources are available (Gillespie et al. 2013), including a complete annotated genome assembly [1] and methodology concerning reproductive physiology and behavior (Dong et al. 2012); and 2) rock doves are prolific, year-round breeders that thrive in captivity, making observation, manipulation, and sampling highly feasible year-round.



Rock doves are socially monogamous and offer bi-parental care, making inter- and intra-sexual comparisons possible. Birds offer two important behavioral transition

points into parental care: the incubation of eggs and the caring for chicks. This produces two unique opportunities to study how the brain transitions into two different suites of parental care behaviors. Additionally, rock doves exhibit a parental care strategy analogous to mammals in that they, too, 'lactate' to feed their young (Gillespie et al. 2011, 2012). This lactation, unlike simple regurgitation of food, consists of the production and sloughing off of skin cells inside the crop sac of females and males, creating a protein-rich milk-like substance on which they rear their chicks. Many functional similarities between rock dove and mammalian lactation exist concerning the mediation of this event by the hormone prolactin (Dumont 1965). Additionally, like mammalian milk, rock dove milk delivers essential immunoglobulins and nutritional benefits to young, aiding in their immune function and development of microbiota [2]. Thus, because rock doves incubate eggs and exhibit mammalian-like mediation and function of lactation for young, they have the potential to serve as a powerful theoretical bridge to understand the neurobiology of both avian and mammalian transitions into parental care.

Materials and Methods and Results



Characterize changes in neural-gene expression during parental care transitions

Our working hypothesis is that distinct changes in transcription occur in the brain at the anticipation of, during, and in response to two different types of parental care: incubation behavior and hatchling care.

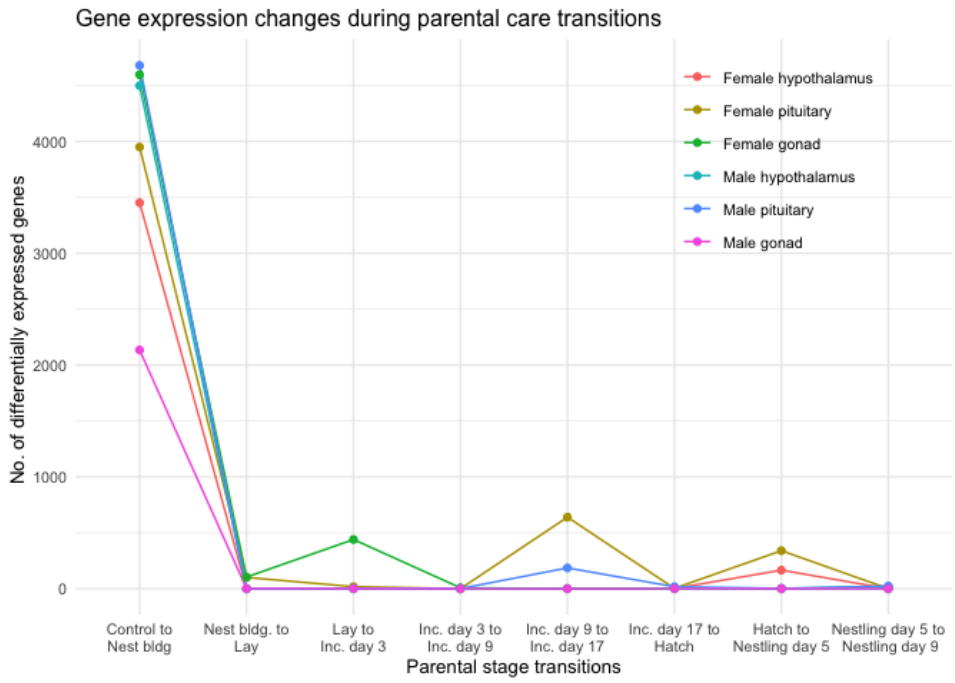


Fig 2. The magnitude of gene expression changes between each parental transition. 4-5K genes are differentially expressed beteen control birds and their nest buliding conspecifics in all tissues except the male gonad. 500 - 1000 genes are differentially expressed in the female pituitary from mid-late incubation as well as in the female hypothalamus and pituitary from hatch to nestingly care day 5.

Acknowledgments

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References

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