

**Consequences of Trade-Offs During
Growth and Development in
Pheasants**
(Phasianus colchicus)

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Signed:

.....
Josephine Marie Orledge

Abstract

Oxidative stress may provide a proximate link mediating the trade-offs between the allocation of resources to growth and/or reproduction and investment in self-maintenance. Dietary antioxidants, such as carotenoids and vitamin E, provide potentially important roles in regulating these trade-offs. Recent work suggests that carotenoids may have important synergistic effects in combination with non-pigmentary antioxidants (e.g. vitamin E) on the expression of sexually-selected traits at adulthood. However, these studies involved the supplementation of antioxidants to adults and did not take into account early life-history effects. In this thesis, I test the independent and combined roles of supplementation of carotenoids and vitamin E during early growth in regulating the expression of traits at adulthood, in ring-necked pheasants, *Phasianus colchicus*. Individuals supplemented with a combination of carotenoids and vitamin E were larger at adulthood than individuals receiving other treatment diets (including vitamin E or carotenoids alone), but there were no differences in ornament expression, immune function or levels of oxidative damage. In addition, there were no effects of early antioxidant supplementation on primary sexual traits and I found no relationship between primary and secondary sexual traits to support the phenotype-linked fertility hypothesis. This suggests that the allocation of limited antioxidant resources is prioritised towards traits that increase competitive ability rather than sexual attractiveness or primary reproductive traits in this strongly sexually-selected species.

I also measure male ornament expression to test the 'parasite-mediated sexual signalling' hypothesis that predicts that ornamentation could provide a signal to females of a male's ability to resist parasites. Allocation of dietary-derived carotenoids to sexual ornaments may trade-off with allocation to immune and/or antioxidant functions mediated by the oxidative status of individuals. In this thesis I test whether supplementation with dietary antioxidants (vitamin E) can mitigate the effects of early exposure to parasites (the nematode, *Heterakis gallinarum*), via the alteration of the oxidative status of individuals, and positively affect the expression of sexual ornaments at adulthood. I find that vitamin E mediated the effect of early exposure to parasites on levels of oxidative damage at 8 weeks of age and reduced the parasite load of individuals at adulthood as predicted. However, the expression of sexual ornaments, immune function, and growth were unaffected by either early vitamin E supplementation or manipulation of parasite load. In contrast to predictions, the intensity of sexual ornament expression was not related to either the parasite load or oxidative status of individuals. Finally, I present the data from a novel experiment showing that feather odour changes in response to antioxidant status, but not intestinal parasite levels, at adulthood and in light of these results describe a potential role for feather odour in mate choice.

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