Why are there redheads? Birds might hold the clues

January 28 2013

Red coloration—historically seen as costly in vertebrates—historically seen as costly in vertebrates—might represent some physiological benefit after all, according to research published in the journal *Physiological and Biochemical Zoology*.

Pheomelanin, which is responsible for red hair and freckles in humans and orange and chestnut coloration in other animals, is known to increase the damage to skin cells and melanoma risk when present in large amounts. Furthermore, its creation involves the consumption of glutathione, a beneficial antioxidant.

In an attempt to unearth the factors favoring the evolution of pheomelanin in spite of its costs, Ismael Galván and Anders P. Møller of the University of Paris-Sud examined the survival from one breeding season to the next of a wild European population of barn swallows, as well as the annual survival rates of 58 species of American birds.

A recent hypothesis claims that the consumption of cysteine (a component of glutathione) that occurs when pheomelanin is produced can be beneficial under conditions of low stress. Cysteine, which is mainly acquired through diet, can be toxic at high levels, so the production of pheomelanin may help to sequester excess quantities of this amino acid.

Galván and Møller measured birds' blood levels of uric acid and analyzed the coloration of their chestnut throat feathers (an indication of

pheomelanin content). When they compared birds that had similar uric acid levels (and therefore similar capacities to excrete excess amino acids), they found that both the European barn swallows and the American birds with larger amounts of pheomelanin in their feathers survived better.

This study is the first to propose that the costs/benefits of pheomelanin may depend on prevailing environmental conditions, and its results suggest that the production of this pigment may even be beneficial in some circumstances. Given that all higher vertebrates, including humans, present pheomelanin in skin, pelage, and plumage, Galván and Møller's findings increase the scant current knowledge on the physiological consequences of pheomelanin and open new avenues for research that will help us understand the evolution of pigmentation.

More information: Ismael Galván and Anders P. Møller, "Pheomelanin-Based Plumage Coloration Predicts Survival Rates in Birds." *Physiological and Biochemical Zoology* 86:2 (March/April 2013). Available ahead of print at www.jstor.org/stable/10.1086/668871

Provided by University of Chicago