



ScienceWatch – Color Me Healthy

We have all heard the saying, “A boy chases a girl until she catches him”. Nowhere is that more true than in the avian world. During breeding season males will sing, strut, swoop and otherwise display their fitness to females who carefully scrutinize them. Then the females will choose their mates based upon certain factors such as song quality or plumage color intensity. Evidence exists to indicate that these qualities reflect a male’s intrinsic health – see *-ScienceWatch – If You’ve Got It, Flaunt It!* (June 2003). This seems reasonable in light of the fact that females, who produce only a few eggs at a time and must care for them, make a much larger investment in breeding than males, who produce millions of sperm, and can inseminate more than one female. However, many birds engage in biparental care whereby males also incubate eggs and feed nestlings. These activities are a large energy investment for males. So do males have a way of determining whether or not their investment is worth it before they begin, and if so, what do they look for?

A team of scientists headed by Judith Morales of the National Museum of Natural Sciences in Madrid, Spain has been working to provide evidence to support the idea that bright colors provide a signal to males not only of female fitness, but also tell males about fledgling success. Since females are not conspicuously colored in order to remain camouflaged during nesting, they apparently exhibit their fitness to males with brightly colored eggs.



The team has been studying the pied flycatcher (*Ficedula hypoleuca*), a widespread European passerine, which exhibits biparental care. A female produces one clutch per season of five or six intensely colored blue-green eggs that she incubates alone, but both parents divide nestling feeding approximately equally. Males visit several times during the egg-laying period. This allows ample opportunity for inspection by males who may, at times, mate with more than one female. The blue-green pigment that colors the eggshell is biliverdin, an antioxidant that may help prevent cancer and heart disease in humans. The idea is that if a female can use a lot of biliverdin to pigment her egg, she must have antioxidants to spare and should be very fit.

In a report published last year in *Behavioral Ecology* the team measured eggshell color intensity. They also tested female fitness by injecting them with substances that challenge the immune system and then measured the level of responding antibodies in the bloodstream. Darker egg color was linked with the ability of the female’s immune system to mount a greater antibody response, indicating these females were healthier.

The latest report by Morales *et al*, published in the March 2006 online version of *Biology Letters*, looked at the relationship between intensity of egg color and quality of the egg in

the pied flycatcher. The team examined the color intensity of eggs from 25 clutches. They also measured the levels of antibody secreted into the eggs by females as the eggs form in the oviduct. They found that more intensely colored eggs contain more maternal antibodies in the yolk. The antibodies are passed on to the chicks, providing them with passive immunity against disease. Thus, the intensity of egg color is an indicator of the chicks's chances of surviving to adulthood. Reading this signal is especially important for males that have mated with more than one female. Presumably, males make note of egg color intensity during their visits to the nests and decide how much energy to invest in each brood.

As for the brown vs. white eggs we can buy at the store? The only difference there is cost.

Saul Scheinbach

*Although many eggs appear white to us, that may not be true for birds. Due to their ability to see ultraviolet light, white eggs could appear pink or blue to them and could also vary in color intensity. Hopefully, we will see this work repeated with other birds.