

# Hoopoes' eggs show their true colors

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Hoopoe females use cosmetics on their eggs - and the eggs gradually change color when they are incubated, from bluish-grey to a more saturated greenish-brown. This happens because secretion from the uropygial or preen gland – a substance birds use to preen and protect their feathers – is transferred from the female hoopoe's gland to her eggs directly with the bill and by means of belly feathers. This is one of the findings from a study led by Juan J. Soler of the Estación Experimental de Zonas Áridas, CSIC in Spain, published in Springer's journal *Naturwissenschaften - The Science of Nature*.

Previous work by Soler's team has shown that the preen gland secretion of incubating hoopoes is brown in color and holds antimicrobial properties. The color is thanks to a combination of symbiotic bacteria found in the uropygial gland that provides protection against [pathogenic bacteria](#). The [symbiotic bacteria](#) help to protect embryos from trans-shell infections, and in vitro are highly effective against *Bacillus licheniformis*, a well-known feather-degrading bacterium. The darker the color of the secretion, the more of the "good" bacteria are present – and the better protection there is against the "bad" bacteria to ensure that a bird's embryos or feathers stay healthy.

To find out if indeed it is the gland secretion that causes hoopoes' eggs to change color, Soler's team conducted field studies in southern Spain and experimental work at the University of Granada and in Finca Experimental la Hoya in Almeria. In some cases, the researchers blocked off female hoopoes' uropygial glands found over their tails, to make it impossible for them to spread any preen oil onto their feathers or eggs.

In other instances, the researchers smeared eggshells with this preen oil.

Their experimental tests showed that eggs that came into contact with the gland secretion changed color from their initial bluish-grey to greenish-brown. Eggs that were not covered with this so-called preen oil showed no color change.

"The eggshell coloration of hoopoe [eggs](#) is the consequence of the female birds' spreading uropygial secretion on the eggshells," says Soler.

The researchers speculate that the egg coloration might be a way through which a female hoopoe signals to the male that she is good breeding material, for future reference. It can inform a male of the presence, abundance, or even particularities of the antimicrobial bacterial community found in a female's glands – qualities that she will be able to carry over to their offspring should they mate in the future. Males can use this information to adjust their investment in the actual breeding attempt. Although further experimental work is needed to establish the validity of this signaling hypothesis, Soler hopes that the new results will encourage such research in hoopoes and in other birds.

**More information:** Soler, J. J. et al. (2014). Hoopoes color their eggs with antimicrobial uropygial secretions. *Naturwissenschaften - The Science of Nature*. [DOI: 10.1007/s00114-014-1201-3](https://doi.org/10.1007/s00114-014-1201-3)

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