Study shows urban birds with darker feathers may be better at removing metal toxins

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Feral Pigeon (Columba livia domestica) in flight. Credit: Alan D. Wilson/Wikipedia.

(Phys.org) —A team of researchers in France has found a possible connection between the darkness of bird feathers and the removal of metal toxins from birds' bloodstreams. In their paper published in the journal *Biology Letters*, the team describes how they captured 97 pigeons in Paris and made measurements of toxic metals in their feathers at initial capture and then one year later and how it showed a difference based on feather color.

The darkness of bird feathers is controlled by the amount of eumelanin present. Also, birds in urban areas tend to have darker feathers than

those that live in the wild, which means they have more eumelanin in their feathers. Why this is case has remained a mystery. In this new effort, the researches wondered if has something to do with the fact that toxic metals tend to bind to eumelanin —if so, birds with more eumelanin in their feathers that eat food with toxic metals in them, would have more of those metals pulled from their blood, leading to less adverse effects (such as laying fewer eggs)—that would give them a competitive advantage and explain why there are more birds with dark feathers, than light, in urban areas.

To learn more, the researchers captured 97 pigeons from around Paris and put them in cages in an outdoor environment. They then plucked major feathers from their wings and measured the amount of toxic metals found in them. The birds lived in the cages for a year (eating a diet free of toxic metals) upon which time the researchers plucked the new feathers that had grown in where the old had been removed and measured them for toxic metal concentrations. In so doing, they found first that the level of toxic metals in the feathers of all the birds had dropped significantly (from 328 to 89ppm). They noted also that initially all of the birds had roughly the same amounts of metals in their wing feathers—after a year though, the birds with darker feathers had more metals in them, suggesting that the eumelanin in their feathers helped pull metals from their bloodstreams.

Inexplicably, the researchers did not also take blood samples, which meant they were not able to report conclusively that higher levels of eumelanin in feathers truly reduced toxic metal levels in their bloodstreams, giving the birds an advantage. Still, the results of the study suggest that the reason there are more dark feathered birds in cities is because they are less susceptible to the health problems associated with toxic metals.

More information: The adaptive function of melanin-based plumage

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Abstract

Trace metals produced by anthropogenic activities are of major importance in urban areas and might constitute a new evolutionary force selecting for the ability to cope with their deleterious effects. Interestingly, melanin pigments are known to bind metal ions, thereby potentially sequestering them in inert body parts such as coat and feathers, and facilitating body detoxification. Thus, a more melanic plumage or coat coloration could bring a selective advantage for animals living in polluted areas. We tested this hypothesis by investigating the link between melanin-based coloration and zinc and lead concentrations in feathers of urban feral pigeons, both at capture time and after one year of captivity in standardized conditions. Results show that differently coloured pigeons had similar metal concentrations at capture time. Metal concentrations strongly decreased after one year in standardized conditions, and more melanic pigeons had higher concentrations of zinc (but not lead) in their feathers. This suggests that more melanic pigeons have a higher ability to store some metals in their feathers compared with their paler counterparts, which could explain their higher success in urbanized areas. Overall, this work suggests that trace metal pollution may exert new selective forces favouring more melanic phenotypes in polluted environments.