

The great tit bird is less attractive due to exposure to heavy metals

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The yellow colouring of the male is an indication to the female of its state of health and ability to find food. Credit: Wikipedia

Heavy metals, the result of contamination, may be toxic for animals to the extent of affecting their reproduction and physiology. This is the case with the great tit, a species of bird whose plumage colour is affected either negatively or positively depending on exposure to certain contaminating substances. Mercury, copper and chrome may cause the male great tit to be less attractive to the females.

Metals are naturally found in the environment, but their presence often increases as a result of [human activity](#). Concentrated in high quantities, they may be toxic for animals, thus affecting their physiology and reproduction.

A study published in *Science of the Total Environment* indicates, for the first time, the consequences that these materials, the principal agents of contamination, have on the plumage of the great tit (*Parus major*). The results show that these materials have either a positive or negative impact on the colours of the feathers of this species.

To reach these conclusions, the team of scientists analysed eight [heavy metals](#), typically found in pollution, and discovered that three of these substances significantly affect the bird.

One of these is mercury, a heavy metal which has a negative correlation with carotenoids which are responsible for the pigmentation of the brightest colours. This results in a loss in the brightness of the yellow hues found on the great tit's breast.

"The yellow colouring of the male is an indication to the female of its state of health and ability to find food. Therefore, a paler yellow great tit, as a result of exposure to mercury, will be less attractive to females," Joan Carles Senar, a researcher from the Museum of Natural Sciences in Barcelona (Spain) and one of the project researchers, explains to SINC.

On the other hand, copper increases the size of the bird's 'black tie'. This occurs due to the fact that this metal is used by the organism to synthesise melanin, the substance that gives the tie its black tone. However, chrome has the opposite effect and reduces the area covered by this plumage.

These changes also have consequences for the everyday life of the great tit, as, according to Senar, "the 'black tie' is a sign of dominance and aggression in defence against predators, as well as being linked to aspects relating to the bird's personality". The great tit's tie in these environments does not therefore reliably portray the bird's qualities.

Urban v. rural great tits

Although at the moment scientists are not going to compare the results obtained with other birds, the team plans to continue their research on the great tit in cities in order to gain a better understanding of the birds' adaptation processes to the urban environment.

"Whereas in the woods the specimens with the largest ties enjoy higher survival rates, in the city the opposite occurs; that is, the birds with smaller ties have better chances of survival. Therefore, we still do not know the effect of a smaller tie on urban [great tits](#)," says Senar.

For example, if in the woods females prefer males with bigger ties, "have great tit females realised that less is more in the city? It's an exciting subject that remains open," adds the expert.

The scientists highlight that this is the first study to show that, apart from copper, chrome also has a correlation (in this case, negative) with the synthesis of melanin.

Nevertheless, the study indicates that the physiological mechanisms

through which the great tit carries out this process remain unknown. Further research is therefore necessary to help in the understanding of how the concentration of metals affects the colouring of the plumage in other birds.

More information: M. Giraudeau et al. "Metal exposure influences the melanin and carotenoid-based colorations in great tits" *Science of the Total Environment* 532: 512-516 [DOI: 10.1016/j.scitotenv.2015.06.021](https://doi.org/10.1016/j.scitotenv.2015.06.021) november 2015.
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