

Exposing chicks to maternal stress leads to long-term reproductive success

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Male and female nestling starlings face different developmental costs as they compete for access to the limited resources provided by a low quality mother.

Credit: Oliver P. Love

Do mothers purposely expose their offspring to their own stress? If so, why?

The question arises because it is widely accepted that exposure to maternal stress during pre-natal development can have negative impacts on offspring following birth. To examine why a stressed mother would allow this to happen, evolutionary physiologists Oliver Love and Tony Williams examined how offspring exposure to the maternally-derived stress hormone corticosterone affect maternal fitness in free-living European starlings (*Sturnus vulgaris*).

They experimentally increased yolk levels of corticosterone to mimic the "signal" offspring receive indicating they have a low quality mother. They then paired corticosterone-exposed hatchlings with experimentally manipulated low quality mothers to examine how these mothers fared in raising stress-exposed young compared with "normal" young.

Finally, they followed mothers within and across years to determine the long-term effects of the original manipulation on future reproductive success and maternal survival.

Their results provide the first evidence that low quality mothers benefit in the long-term from exposing offspring to their own stress: corticosterone exposure better "matches" offspring demand to a mother's immediate offspring-rearing capability. Corticosterone-exposed sons were of lower quality at hatching and when paired with a low-quality mother these sons experienced increased mortality.

However, because these mothers now had fewer mouths to feed, and of the smaller, less-demanding sex (daughters), the offspring that survived were of better quality. More importantly, by reducing investment in their current reproductive attempt, these "matched" mothers began second broods in better condition, had increased future reproductive output, and increased survival compared to "mismatched" mothers (low-quality mothers that raised "normal" offspring).

In the long-term, natural selection therefore appears to favor low-quality mothers that expose offspring to quality-mediated stress.

Citation: "The adaptive value of stress-induced phenotypes: effects of maternally-derived corticosterone on sex-biased investment, cost of reproduction and maternal fitness" by Oliver P. Love and Tony D. Williams. *American Naturalist* (2008) 172:E135–E149 DOI: 10.1086/590959

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