

fear

makes for
FASTER BABIES



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The level of predation risk is well known to affect breeding behaviour. Birds breeding in risky environments spend more effort on nest defence and encourage their chicks to fledge at an earlier age. Several studies also have shown that exposing ovulating female birds to predators results in them having smaller chicks. However, it wasn't clear whether this was simply a response to enhanced levels of corticosterone, a stress-related hormone, in their eggs. Corticosterone reduces the proportion of eggs that hatch and stunts chick growth. A recent experiment with Great Tits in Switzerland has demonstrated a possible functional advantage to this effect.

Michael Coslovsky and Heinz Richner exposed some female tits to sparrowhawk models and calls, while a control group was shown harmless thrushes. Shortly after the eggs hatched, the chicks were cross-fostered to parents outside the study area. The chicks whose mothers were exposed to sparrowhawks were smaller than the control group, confirming that the effect wasn't driven by differences in chick-provisioning behaviour.

Eggs of the predator group contained lower levels of testosterone, which might explain the chicks' lower growth rate. But

the researchers also found that the predator group of chicks grew their wings faster than the control chicks, and that those that survived to recruit to the breeding population a year later had slightly longer wings. Coslovsky and Richner argued that, coupled with the chicks' lower mass, their longer wings enhance the tits' flight performance, which could be crucial to avoid falling victim to a sparrowhawk after fledging. They also demonstrated that the chicks' growth rate suffered if their mothers made the wrong 'decision' about the level of predation risk in their environment.

A subsequent study explored the effects of different predators and ectoparasites on chick growth. A woodpecker model was added to simulate nest predation risk, as opposed to the post-fledging threat posed by sparrowhawks, and half of all nests were infested with fleas. This more involved experiment showed complex interactions between predation risk and parasite loads, obscuring the neat pattern from the initial experiments.

The differential growth of the tit chicks is just one example of a so-called epigenetic effect, which changes the phenotype of offspring independent of their genetic sequences. It has long been known that an organism's

A Eurasian Sparrowhawk with a Great Tit clutched in its talons. Maybe it was too heavy and short-winged to escape?

environment can modify gene expression, but recent experiments suggest that some of these modifications can persist for several generations and are potentially heritable. It will be interesting to know if the morphological effect induced by the fear of predators is passed on to subsequent generations of tits.

Meanwhile, epigenetic effects have been linked to the ability of some introduced species to thrive despite having very small founder populations. One study supporting this conclusion explored how House Sparrows managed to occupy a wide range of habitats in Kenya. These sparrow populations have very little genetic diversity, but they show considerable local variability in methylation of their DNA. Attaching methyl groups to DNA bases modifies gene expression, a key marker of epigenetic activity.

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Reference: Coslovsky, M. and Richner, H. 2011. 'Predation risk affects offspring growth via maternal effects'. *Functional Ecology* 25: 878–888.