Not All Chicks Created Equal

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Hatchling canaries defy the truism that all baby animals are cute. Born just 14 hours earlier and each weighing hardly more than an aspirin tablet, the three little birds now balled together in a nest are extravagantly repellent, squirming grubs of flesh and fuzz that look less avian than larval. They seem too feeble to be taken seriously, yet simulate the arrival of a parent canary with a puff of air and they start behaving as young birds should: lifting their heads, opening their microbeaks and begging for dinner.

"If they don't do this, if they fail to open their mouths, they will not get fed," said Dr. Hubert Schwabl, a behavioral ecologist at the Rockefeller University Field Research Center here. "If they don't beg, their parents will ignore them and they will die."

Each of these birds, however, has been given an extra advantage, tailored to its particular needs. It turns out that its mother has supplied it with a substance that body builders and football players know well as a source of strength, stamina and surliness. Dr. Schwabl has made the unexpected discovery that while the eggs are growing inside her, a mother canary adds to the standard accretion of protein, fat and nutrients a lacing of testosterone, the male hormone. She does this without regard to whether the recipient will be a he-chick or she-chick, but rather to lend the young birds a head start on their development. Testosterone can add mass to a growing body, and it may play a role in the maturation of the spinal cord, allowing the chicks to coordinate their movements, lift their heads and demand their dinner.

Most interesting, Dr. Schwabl has learned that the mother bestows varying amounts of the steroid hormone on her chicks, with the first-laid egg receiving the smallest dose of testosterone, and donations of the potent compound increasing with each successive egg. As a result, the last chick born in a clutch of, say, five eggs, gets a dose of testosterone that may be 20 times that given to the first chick. The discrepancy has a dramatic effect. As Dr. Schwabl reported in a recent issue of The Proceedings of the National Academy of Sciences, the last-born bird, whatever its gender, always proves to be the most aggressive. It is no bigger than its siblings, but it is the most pugnacious, able to monopolize food and to chase the rest away from its perch.

"This work opens up a new avenue of research for understanding how parents can influence the development of their offspring," Dr. David Winkler, a field researcher at Cornell University in Ithaca, N.Y., said in a telephone interview. Dr. Winkler wrote a commentary accompanying Dr. Schwabl's paper.

Dr. Schwabl's studies, carried out in a research setting removed both physically and philosophically from Rockefeller's main Manhattan campus, are part of a small but growing effort by biologists to understand the subtle and often surprising influence of hormones on every phase of an animal's development and behavior. In an era when genetics and the glories of DNA reign supreme, and most molecular biologists are fixated on discovering the genes for everything from senility to shyness, researchers of a more naturalist bent are suggesting a different tack.

Genes are only part of the story of any animal's profile, they say, and other influences, like hormones, can contribute to, complicate and in some cases override the innate program inscribed in a creature's genes. And although researchers have long appreciated that a fetus's own steroid hormones, produced by its growing sex organs -- testes in a male, ovaries in a female -- will in turn help shape the growing animal's body and brain, only recently have they paid significant attention to hormonal contributions from the mother or, in the case of litters, the other siblings in the uterus.

The hormone research exemplifies the scientific philosophy of Dr. Fernando Nottebohm, a prominent behavioral ecologist and neurobiologist who heads the center. Defying the drift toward increasing specialization in science, Dr. Nottebohm seeks to foster a broad perspective in his colleagues, encouraging them to expand their vision of how nature works rather than focus too narrowly on a discrete molecule operating in isolation from the animal that makes it.