

Prenatal auditory learning

(Knowledge Transfer)

Project leads

Univ.-Prof. Sonia Kleindorfer
(sonia.kleindorfer@univie.ac.at)

Abstract

Female vocalisation behaviour is largely unstudied, though in songbirds, 71% of extant females produce complex learned vocalisations. My team pioneered the discovery of prenatal vocal tutoring by incubating females and showed that embryos derive fitness benefits from early life auditory exposure to their mother's calls including enhanced gene activity and in ovo and post-hatch vocal learning. These findings have implications for fundamental research, gender-balance in science, and potential application to improve survival and performance in neonates exposed to sound rather than silence.

Keywords

Female song, prenatal auditory learning, developmental biology, communication, vocal learning

Aims of the Third Mission activity

This research measures the role of prenatal auditory experience for brain development, gene expression and phenotypic change using birds as model systems.

Cooperation partners outside the university sector

public service providers including Cleland Wildlife Park and Department for Environment and Water

Cooperation partners from the scientific/research field

External partner: Prof. Dr. Mark Hauber, University of Illinois at Urbana-Champaign, Dr. Diane Colombelli-Negrel, Flinders University

Faculty

Faculty of Life Sciences, core facility Konrad Lorenz Research Center for Behavior and Cognition, Grunau im Almtal

Timeframe

2018 - ongoing

Funding

Australian Research Council

Research basis

My team was the first to discover and publish on prenatal female vocal tutoring (Colombelli-Negrel et al. 2012, Current Biology). This research into incubation calls inspired research into prenatal in-nest calls more broadly and led to the discovery of prenatal heat calls that alter offspring metabolic trajectories.

Social/economic relevance

The discovery that mothers contribute costly in-nest calls to embryos that enhance their developmental trajectory carries social and economic consequences. The findings have implications for fundamental research, gender-balance in science, and potential application to improve survival and performance in neonates exposed to sound rather than silence.

Integration into academic teaching/the curriculum

I use this research as case studies in my lectures including 300013 VO Einführung in die Verhaltensbiologie and 300039 VO Einführung in die Ethologie.

Impact

I have been invited to give numerous keynote and plenary talks since discovery of this phenomenon, and a documentary film on the subject that I produced called "Superb Fairywren" has won two awards in 2020 (Best Short Documentary at the Royal Wolf Film Awards and Award for Excellence from the Nature Without Borders International Film Festival).

Transfer aspect of the activity

I am repeatedly told in comments during talks and in response to my outreach activities, including preparing and sharing film and video documentary, that my research inspires women to be more active in science. My research literally gives women a voice.

Future orientation & sustainability

Future-oriented effects include more research into the role of females to shape variance in behaviour and survival. The long-term gender balance perspective is not only about female representation as scientists but also female representation in biological theory. The skew in health research into men rather than women, for example, has had measurable negative effects on understanding specific risk factors for women. We urgently need more research into female biology in natural systems.

Achievement of objectives

The outcomes of the research undergo peer-review. The project aims and objectives are reviewed annually.

Measures to sustain this activity over the long term/expand it

Recent successful FWF funding 2021-2025.

Visibility

Publications and awards

Links/Publications

e.g. Colombelli-Négrel D, Hauber ME, Evans C, Katsis AC, Brouwer L, Adreani NM, Kleindorfer S (accepted). Prenatal auditory learning in avian vocal learners and non-learners. Philosophical Transactions of the Royal Society. <https://rdcu.be/cdyxZ>
