Brain serotonergic activation in growth-stunted farmed salmon: adaption versus pathology

Signalling systems activated under stress are highly conserved, suggesting adaptive effects of their function. Pathologies arising from continued activation of such systems may represent a mismatch between evolutionary programming and current environments. Here, we use Atlantic salmon (Salmo salar) in aquaculture as a model to explore this stance of evolutionary-based medicine, for which empirical evidence has been lacking. Growth-stunted (GS) farmed fish were characterized by elevated brain serotonergic activation, increased cortisol production and behavioural inhibition. We make the novel observation that the serotonergic system in GS fish is unresponsive to additional stressors, yet a cortisol response is maintained. The inability of the serotonergic system to respond to additional stress, while a cortisol response is present, probably leads to both imbalance in energy metabolism and attenuated neural plasticity. Hence, we propose that serotonin-mediated behavioural inhibition may have evolved in vertebrates to minimize stress exposure in vulnerable individuals.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, University of Oslo, Uni Research AS, Institute of Marine Research, Radboud University Nijmegen, Norwegian University of Life Sciences
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Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Royal Society Open Science
Volume: 3
Issue number: 5
Article number: 160030
ISSN (Print): 2054-5703
Ratings:
Web of Science (2018): Indexed yes
Scopus rating (2017): CiteScore 2.69 SJR 1.237 SNIP 1.064
Web of Science (2017): Impact factor 2.504
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 2.27 SJR 1.003 SNIP 1
Web of Science (2016): Impact factor 2.243
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 1.92 SJR 0.646 SNIP 0.951
Original language: English
Keywords: Biology (whole organism)
Electronic versions:
Publishers version
DOIs:
10.1098/rsos.160030
URLs:
http://rsos.royalsocietypublishing.org/content/3/5/160030
Source: FindIt
Source-ID: 277650889
Research output: Research - peer-review › Journal article – Annual report year: 2016