Society for Endocrinology - Media Release

Embargoed until 00.01am GMT, Wednesday 18 March 2009

A new model to investigate post-natal stress responses in birds

Researchers have discovered the first direct evidence that exposure to stress in young birds affects the way they react to stress when adult. This research, presented at the Society for Endocrinology BES meeting in Harrogate, greatly improves our understanding of how the environment during development influences birds' subsequent physiology, health and survival.

Exposure to stressful events soon after birth has significant effects on a range of physiological and behavioural responses later in life. Previous work in mammals has been unable to work out whether this is due to raised stress hormone levels produced by the young or raised stress hormone levels in the mother, transmitted to her offspring through lactation. To overcome this problem, a team led by Dr Karen Spencer at the University of Glasgow used a bird species, the zebra finch, as a model to study the effects of stress in early life. In birds, there is no possibility of hormone transfer between the mother and offspring after egg laying.

The researchers took 34 12-day old sibling pairs of zebra finch chicks. They simulated a stressful situation by giving one chick from each pair the hormone corticosterone (dissolved in peanut oil) for 16 days. Corticosterone is the main hormone produced by birds in response to stress. It causes many changes in behaviour and physiology, helping the bird to cope with stressful stimuli. The other chick (the control) was just given peanut oil. When adult (60 days old), all birds were exposed to a stressful situation and researchers measured the amount of corticosterone they produced naturally in response.

Birds exposed to higher corticosterone levels as chicks showed different physiological responses to stress when adult. When presented with a stressful situation, they showed a larger ($p=0.008$) and more prolonged ($p=0.03$) corticosterone response than control birds. There was no difference in the corticosterone levels of the two groups when resting.

This study shows for the first time that direct post-natal exposure to raised stress hormone levels can have long term consequences for birds' physiological stress responses. In the wild, conditions that cause stress during early life include inclement weather conditions, lack of food and exposure to parasites. This research suggests a potential mechanism for why this early stress can alter animals' behaviour and physiology when adult. Further research is now needed to examine how these changes are related to birds' long-term health and survival.

Researcher Dr Karen Spencer said:

"Early exposure to stress hormones is known to affect later responses to stressful situations in the adult. Using the zebra finch as a model provides us with an important tool with which to investigate the role of stress hormones on adult characteristics. Our results show an individual's stress response can be re-programmed as a result of post-natal exposure to elevated corticosterone levels. This indicates that if a bird is exposed to stress early in life, for example through bad weather conditions or lack of food, this has implications for the way it will react to situations throughout its life. We now want to study how the observed changes in stress hormone response relate to any behavioural changes observed, and in turn to birds' long term health and survival."

----------Ends----------

Notes for editors

The paper will be presented as a poster (207) at the Society for Endocrinology BES meeting. The poster will be attended at 12:15-13:15, Tuesday 17 March and 13:00-14:00 Wednesday 18 March 2009. The abstract for this work is reproduced at: http://www.endocrine-abstracts.org/ea/0019/ea0019P207.htm

The Society for Endocrinology BES 2009 is Britain's biggest scientific meeting on hormones, and is taking place at the Harrogate International Centre, Harrogate, from 16-19 March 2009. For the full programme, please see http://www.endocrinology.org/meetings/2009/sfebes2009/prog/prog.aspx

Please mention the Society for Endocrinology BES meeting in any story

The Society for Endocrinology is Britain's national organisation promoting endocrinology and hormone awareness. For general information, please visit our website: http://www.endocrinology.org

For more information: please contact the Society for Endocrinology press office

Rebecca Ramsden
Public & Media Relations Assistant
Mobile: +44 (0)7531 945 676
Tel: +44 (0)1454 642 252
Email: rebecca.ramsden@endocrinology.org

Jennie Evans
Public & Media Relations Officer
Mobile: +44 (0)7773 797 501
Tel: +44 (0)1454 642 230
Email: jennie.evans@endocrinology.org

ABSTRACT

Post-natal stress in birds: a novel experimental model to understand glucocorticoid programming of the HPA axis

K Spencer[1], P Monaghan[1], N Evans[1],
[1]*University of Glasgow, United Kingdom*

Exposure to stressful events during development is known to have significant effects on a range of phenotypic traits in later life. Several mammalian studies have linked early post-natal stress to later changes in the Hypothalamic Pituitary Adrenal (HPA) axis, underlying the physiological response to stress. However, the physiological link (lactational hormonal transfer) between mother and offspring during post-natal development limits our ability to determine the direct effects of glucocorticoid exposure

in post-natal life on subsequent stress responses, as the dosage experienced by the offspring may vary with time and feeding regime. Here we present a novel model using an avian species, the zebra finch (*Taeniopygia guttata*), in which maternal hormonal transfer during post-natal development is absent. Post-natal exposure of chicks to the glucocorticoid hormone corticosterone (CORT) was manipulated for a 16-day period up until nutritional independence (28 days) and the long term effects on the physiological response to stress determined. CORT doses were scaled to mimic the physiological response of juvenile birds to a capture-handling-restraint protocol. There were no effects of developmental CORT treatment on baseline CORT concentrations at 60 days ($F_{1,26}$ = 0.51, p 0.48). However, CORT fed birds showed exaggerated ($F_{1,26}$ = 8.1, p = 0.008) and prolonged responses ($F_{1,20}$ = 5.67, p = 0.03) to acute stress at 60 days of age. There were no effects of growth rates or sex on stress responses in later life. Our results clearly demonstrate that post-natal stress has significant long-term effects on the physiological stress response in birds and provides a potential mechanism underlying long-term behavioural responses to developmental conditions. This study represents the first direct evidence for post-natal glucocorticoid programming of the hormonal phenotype using this novel model for post-natal stress. This model therefore provides an important tool with which to investigate the role of glucocorticoids in shaping adult phenotypes.