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### Trans-generational effects of prenatal stress on the neuroendocrine stress axis in rats

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immune response, general homeostasis, is a primary neuroendocrine marker for stress and hypothalamic-pituitary-adrenal axis function.

The purpose of this study was to examine diurnal patterns of cortisol in preterm and full term infants at young adulthood.

This prospective, longitudinal study of 215 preterm infants (healthy, medical, neurological, small for gestational age) and a full-term cohort were recruited at birth and followed to age 23. Five diurnal salivary samples were collected in timed intervals during a typical day. Enzyme immunoassay analyses were conducted in duplicate. Analysis of Variance and hierarchical linear regression analyses were used.

At 23 years, those born full-term displayed a normal diurnal cortisol pattern. In contrast, those born preterm with acute neonatal illness had the most distinct diurnal patterns. Birth weight affected the cortisol awakening response contingent upon preterm group status. Socioeconomic status further predicted diurnal cortisol patterns.

Dysregulation of this stress biomarker may be an early indicator of adult stress-related disease. The DOHaD framework offers a lifespan perspective on prematurity and adult outcomes, with potential for early identification of those at risk for later stress-related disease.

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#### PO23

##### Cumulative risk and protection on diurnal cortisol patterns in preterm infants at young adulthood



Mary Sullivan\*, Suzy Winchester

University of Rhode Island, Kingston, RI, USA

Annually, approximately 450,000 babies in the United States and 15 million worldwide are born prematurely. Complications of prematurity impact later health. Preterm follow-up studies are confined to homogeneous characteristics, (e.g., birth weight, gestational age). The Institute of Medicine challenged researchers to expand beyond singular indicators to fully appraise adult outcomes of prematurity.

This study examined the contribution of cumulative medical and socioeconomic risks, and cumulative protection on diurnal cortisol patterns.

This heterogeneous sample 215 preterm infants and full-term cohort recruited at birth were followed longitudinally to age 23. Cumulative medical risk comprised physical health at birth, 18 and 30 months, 4, 8, 12, and 17 years. Socioeconomic status (SES) captured distal risk. Cumulative protection comprised maternal and family characteristics at birth, 4, 8, and 12 years. Five salivary samples were collected during a typical weekday. Hierarchical linear modeling analyzed effects of medical risk, SES, and protection on diurnal cortisol.

Cumulative medical risk, SES, and protection significantly affected diurnal cortisol. A dysregulated diurnal pattern for participants with high medical risk, high SES, and low protection showed no cortisol awakening response, sharp decline 2-hours post-awakening and lowest bedtime levels. Conversely, participants with high medical risk, high SES, and high protection had a typical diurnal pattern.

Cumulative, multiple indicators of risk and protection contributed to the diurnal cortisol pattern of former preterm infants at age 23. High protection had buffering effects for those with high

medical risk and SES suggesting a mechanism to reduce the harmful neuroendocrine effects on adult stress-related disease.

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#### PO24

##### Trans-generational effects of prenatal stress on the neuroendocrine stress axis in rats



Natalia J. Grundwald, Paula J. Brunton\*

The Roslin Institute, University of Edinburgh, Midlothian, UK

Exposure to social stress during pregnancy results in hyperactive hypothalamo-pituitary-adrenal (HPA) axis responses to stress in the adult offspring. Here the aim was to test whether the effects of prenatal stress (PNS; exposure to repeated social stress for 5 days during late pregnancy) on HPA axis function are transmitted to the second filial generation (F2) via the maternal line. F1 control and F1 PNS female rats were mated with control males and housed under non-stress conditions throughout pregnancy. HPA axis responses to restraint and systemic interleukin-1 $\beta$  (IL-1 $\beta$ ) were assessed in the adult F2 offspring.

ACTH and corticosterone responses to acute stress were significantly greater/prolonged in the F2 PNS females, compared with F2 control females. This was associated with greater corticotropin releasing hormone (*Crh*) mRNA expression in the paraventricular nucleus. Moreover, glucocorticoid (*Gr*) and mineralocorticoid receptor (*Mr*) mRNA expression in the hippocampus was significantly reduced in the F2 PNS females, compared with controls. In the F2 males, HPA axis responses to IL-1 $\beta$  were not different between control and PNS rats, however ACTH and corticosterone secretion following restraint stress was markedly attenuated in the F2 PNS group, and hippocampal *Gr* and *Mr* mRNA expression was greater compared with controls. In conclusion, PNS affects HPA axis function in the F2 offspring in a sex-dependent manner. In F2 PNS females, greater HPA axis responses were associated with potentially impaired glucocorticoid negative feedback control; whereas in F2 PNS males enhanced glucocorticoid negative feedback control may explain attenuated HPA axis responses to stress.

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#### PO25

##### Relationship between prenatal cortisol exposure and behavioral development in macaque monkeys



Jerrold Meyer<sup>1,\*</sup>, Kimberly Grant<sup>2</sup>, Tom Burbacher<sup>2</sup>, Julie Worlein<sup>2</sup>, Caroline Kenney<sup>2</sup>, Amanda Dettmer<sup>3</sup>, Stephen Suomi<sup>3</sup>, Amanda Hamel<sup>1</sup>, Kendra Rosenberg<sup>1</sup>, Melinda Novak<sup>1</sup>

<sup>1</sup> University of Massachusetts Amherst, Amherst, MA, USA

<sup>2</sup> Washington National Primate Research Center, Seattle, WA, USA

<sup>3</sup> Laboratory of Comparative Ethology, NIH, Poolesville, MD, USA

Prenatal or early postnatal stress-induced increases in glucocorticoids exert adverse effects on offspring development. Much less