THE UNIVERSITY OF UTAH
DEPARTMENT OF
PSYCHOLOGY

May 1st, 2019

Dear Reviewers:

Thank you for agreeing to review my tenure materials as part of the University of Utah's Retention, Promotion, and Tenure review process. I have attached my Curriculum Vitae, my research, teaching, and service statements, and four representative publications. These representative publications outline the breadth and depth of my research program, which leverages the developmental programming hypothesis to understand how early life stress may become biologically embedded to impact social and emotional outcomes. To advance the field and provide more clarity around how this embedding may occur, I incorporate both epigenetic and physiological methods. I describe how each of these publications fit into my research program below.

The field of behavioral epigenetics is in it's infancy and I was honored to have the opportunity to provide a synthesis of the field to a developmental audience in my *Child Development Perspectives* paper (Conradt, 2017). In this manuscript I reviewed evidence for epigenetic mediators and moderators in developmental science, and had the opportunity to include my own research. I also outlined controversies in the field and provided solutions to those controversies. This manuscript was important because it allowed me to demonstrate my growing independence in the field of behavioral epigenetics and it helped me to communicate this complicated science to an informed audience.

The next two publications were designed to address the gaps in the epigenetic literature outlined in the previous publication. First, I investigated whether the relation between maternal depression and newborn neurobehavior depended in part on epigenetic processes (Conradt, Lester, Appleton, Armstrong, & Marsit, 2013, *Epigenetics*). I found that newborns prenatally exposed to maternal depression had the poorest neurobehavioral outcomes but only if they exhibited greater methylation of the glucocorticoid receptor gene and *11β-HSD2* (indicating these infants may have been exposed to more cortisol *in utero*). This paper is consistent with my program of research investigating *for whom* early life stress may be particularly problematic. This paper has been cited 159 times since 2013, highlighting the importance of this work in the field of behavioral epigenetics.

In order to understand *how* exposure to maternal depression may impact these epigenetic processes, in the second publication I investigated the joint contributions of maternal depression and maternal sensitivity (Conradt, Lester, Hawes, Tronick, & Marsit, 2016, *Child Development*). Informed by Gunnar's social buffering hypothesis, I tested whether maternal sensitivity may buffer the infant to the effects of maternal depression exposure. I found no main effects of maternal sensitivity or depression on epigenetic outcomes (DNA methylation of the glucocorticoid receptor gene and *11β-HSD2*). Instead, the relation between maternal depression and DNA methylation depended on caregiver sensitivity. The highest levels of DNA methylation (suggestive of increased cortisol exposure in the child) were found among infants who had mothers who were both insensitive and reported high levels of depressive symptoms. Critically, mothers who had high depressive symptoms and who interacted sensitively with their infant had

Department of Psychology
380 S. 1530 E. Rm 502
Salt Lake City, Utah 84112
p: (801) 581-6124 | f: (801) 581-5841

infants with epigenetic outcomes indistinguishable from infants of mothers with low levels of depression. Although we cannot infer direction of effect with these data, these results suggest that epigenetic sensitivities or vulnerabilities may become biologically embedded via exposure to maternal depression *and* maternal insensitivity. We have since conducted two important follow-up studies providing additional support for the relations between maternal caregiving and epigenetic outcomes (Conradt et al., 2019, *Infant Mental Health Journal;* Lester, Conradt et al., 2018, *Pediatrics*).

Since arriving at Utah I have become convinced of the importance of moving beyond studying the effects of a single maternal psychological diagnosis on infant social and emotional outcomes. My close collaborator Sheila Crowell and I are investigating the impact of a transdiagnostic marker of psychopathology, emotion dysregulation, on the infant's ability to self-regulate (R01MH119070; Conradt Crowell MPIs). The fourth manuscript is the first from my lab to document the intergenerational transmission of emotion dysregulation. My graduate student, who was first author on the manuscript, found that mothers who were more dysregulated had newborns with less arousal and attention at birth (Ostlund et al., 2019, *Development and Psychopathology*). Mothers whose RSA decreased in response to a prenatal cry stressor also had newborns with less arousal. This initial work suggests that prenatal exposure to a transdiagnostic marker of psychopathology is related to newborn neurobehavioral outcomes identifiable already at birth using a well-validated measure of newborn neurobehavior. We are currently testing whether placental epigenetic mechanisms might explain these associations between prenatal emotion dysregulation exposure and possible impairments in newborn neurobehavior (as outlined in Conradt et al., 2018b, *Development and Psychopathology*).

These papers suggest that the impact of early life stress on biobehavioral outcomes depends in part on epigenetic and physiological characteristics of the young child, and that these characteristics may develop via parenting processes. I have argued in a series of publications that the concept of "biological embedding" lacks specificity and a clear understanding of the mechanism of effect, a limitation I address in my research (Conradt, 2017, *Child Development Perspectives*; Conradt et al., 2018a, *Development and Psychopathology*; Conradt et al., 2018b, *Development and Psychopathology*). Our NIMH-funded grants are also crafted to advance the prenatal programming field by developing new tools to test specific stress-sensitive biological pathways implicated in the development of stress disorders. Our goal is to identify a network of genes implicated in HPA axis functioning that scientists can incorporate in their own research to test the mechanisms by which early life stress may affect risk for the development of psychopathology (Conradt et al., 2018b, *Development and Psychopathology*).

Thank you for taking the time to review my research and for your consideration of my tenure application.

Sincerely,

Elisabeth Conradt

Elisabeth Conradt
Assistant professor, developmental psychology
University of Utah

Department of Psychology
380 S. 1530 E. Rm 502
Salt Lake City, Utah 84112
p: (801) 581-6124 | f: (801) 581-5841