

Title: Depression and Heart Disease: Studies of Negative Social Experiences in an Animal Model

Introduction: The present proposal is focused on the influence of negative social experiences in mediating the relationship between depression and heart disease. The experiments described here are part of a large ongoing research program in my laboratory in the Department of Psychology, and will lead directly to the development of grant proposals, including those relevant to both the National Institutes of Health (NIH) and the National Science Foundation (NSF). The success of this project and future grant funding depends heavily on involvement from graduate students, as it includes integrative, translational methods conducted in an animal model. The following sections will: (a) provide evidence for the importance of studying social experiences, emotion, and heart disease, (b) discuss the benefits of this project in the context of applying for external funding, and (c) describe the involvement of a graduate assistant.

Description of the Project: Research indicates that there is a bi-directional association between depression and heart disease, and this link is an important public health concern. The current behavioral and neurobiological mechanisms underlying this link are not well understood. One potential mechanism is alterations in the social environment. For instance, negative social experiences increase the vulnerability to both depression and heart disease. Furthermore, disruptions of the social environment negatively influence the autonomic nervous system, producing dysfunction of blood pressure, heart rate, and heart rhythms, increasing the risk of heart disease.

Therefore, negative social experiences may contribute to depression and heart disease through disrupting autonomic nervous system functions. To better understand these relationships, the present project will use a valid and reliable animal model, the prairie vole, to more directly study interactions of the social environment and the autonomic nervous system. This unique rodent species displays social behaviors similar to those of humans, including an active engagement in the social environment and forming enduring social bonds. The prairie vole is a valuable animal model for studying the interactions of social experiences, stress, and neurobiological functions. The specific goal of this project is to use the prairie vole model to experimentally investigate the effects of social isolation and social support on depressive behaviors, blood pressure, and heart rate. This project will focus on two related hypotheses:

Hypothesis 1: Prairie voles exposed to social isolation for 4 weeks will display an increase in resting and stress-induced blood pressure and heart rate; animals that are allowed to remain paired with a sibling (social support condition) will be protected against autonomic dysfunction.

Hypothesis 2: Prairie voles exposed to social isolation for 4 weeks will display depression-relevant behaviors in validated behavioral tests; animals that are allowed to remain paired with a sibling (social support condition) will be protected against depressive behaviors.

In the context of previous findings suggesting that negative social experiences may affect several biological and psychological functions, social isolation (versus pairing) in prairie voles is predicted to lead to increased blood pressure and heart rate. Furthermore, long-term social isolation is expected to produce depression-like behaviors during validated behavioral tests, as well as increased blood pressure and heart rate responses during these tests. The results will indicate that negative social experiences lead to both depressive behaviors and cardiovascular problems via dysfunction of the autonomic nervous system. The present findings will increase our understanding of how the social context influences autonomic function. This research program will provide a foundation for developing improved treatments for individuals with depression and heart disease. Given the importance of mood disorders and heart disease – not only in the United States but also worldwide – the results from this project will have a significant impact on society.