Adaptations to environmental stressors require a collective integration of many responses across organ systems in the body to maintain homeostasis. The central nervous system includes several respiratory networks that help maintain oxygen supply to the body and it helps coordinate immediate and specific responses when oxygen supply is intermittent. Chemoreflexes are initiated by changes in carbon dioxide, hydrogen ion, and oxygen concentrations in the blood. The goal of this research project was to investigate the role of several brain regions in the response to acute exposure to hypoxia, or decreased oxygen levels in the blood. In this project, we assessed cardiovascular, respiratory, and neural changes that occur when an animal is exposed to different levels of hypoxia using conscious rats. This work provided valuable information about areas in the brain that controls sympathetic nerve outflow and ventilation and how they could be involved in controlling reflex changes in breathing and blood pressure. Novel to this research was the finding that neurons projecting from the brainstem to the forebrain were activated in response to hypoxia, and the majority of these neurons were catecholaminergic. Given the recent evidence that reflex responses contribute to acclimatization to high altitude, exercise, and also to autonomic imbalances in various diseases, it is becoming increasingly important to fully understand the central nervous system pathways and mechanisms involved during hypoxia. The present study elucidates one important pathway that may contribute to all facets of the chemoreflex: cardiorespiratory, sympathetic nerve activity, and neuroendocrine responses to acute hypoxia. Collectively, the results are an addition not only to basic biomedical research but more specifically to, altitude, cardiovascular, and respiratory research.