DEDICATIONS

This Work is Dedicated To:

My parents, my grandparents, and my husband
whose encouragement and love is unending

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ABSTRACT

Methods for the Detection of *S*-Nitrosothiols and Nitric Oxide in Blood and Breath

by

Natalie R. Crist

Chair: Mark E. Meyerhoff

Nitric oxide (NO) and *S*-nitrosothiols (RSNO) are important biological molecules with multiple functions throughout the body, including acting as a vasodilator and preventing platelet aggregation. The detection of these molecules in blood and breath has previously been examined for disease diagnostics by various analytical techniques, each with its own limitations, revealing a wide range of values reported and thus the need for new detection methods. For RSNO detection, interference from nitrite remains one of the largest obstacles, while for NO detection in breath, the complexity and cost of the detection methods pose the most difficult challenge to overcome. In this thesis, work is presented that addresses these issues with new methods developed and demonstrated.

First, a new chemiluminescent assay system for RSNO detection is described using an organoselenium (RSe) catalyst. The system is capable of detecting RSNO concentrations as low as 20 nM, without any response to nitrite. The RSe-based method is used to detect *S*-nitrosohemoglobin in blood. Using the newly developed assay, exhaled breath condensate (EBC) is collected and analyzed for RSNOs. Despite previous literature reports, no detectable RSNOs are found in the EBC from 5 healthy volunteers. Finally, a simple and inexpensive method for determining the NO concentration in exhaled nasal air is presented. Utilizing the oxyhemoglobin reaction with NO to produce nitrate and methemoglobin, both potentiometric and optical detection of nasal NO is possible. Using asymmetric cellulose triacetate ion-selective membranes, calibration curves for the nitrate generated can be made. Collecting exhaled nasal air and bubbling the air through a solution of oxyHb allows for the NO to be trapped and quantitated with both detection methods. Overall, an average of 210 ppb NO is measured from the exhaled nasal air. With further improvements of the nitrate ion-selective membrane, this method of quantifying NO could be used in other applications, including monitoring the NO flux from new NO-releasing polymeric materials.