

Vinay Rawlani, Biochemistry

Year in School: Senior
Faculty Mentors: Dr. Vincent DeMarco and Dr. Jeffrey Skimming, Child Health
Funding Source: Life Sciences Undergraduate Research Opportunity Program

Can raising your body temperature guard against infection?

Each year approximately 30,000 premature babies are delivered in the United States. Ten percent of these babies will develop pulmonary hypertension in the first couple days of their lives due to incomplete development of their hearts. Some of them will live to a young age; others will die only weeks after their birth. Our laboratory is devoted to the study of pulmonary hypertension. To develop our study we looked to help our body enhance its own response to such a problem. What could that response be we asked? Well, what is the first thing you check when you think your sick? Your temperature of course. Most people do not realize that your body intentionally increases its temperature to help ward off sicknesses and injuries. Increasing an animal's body temperature above normal for a short period is known as heat shocking. Heat shocking causes cells in the body to produce heat shock proteins that act to protect cells from damage caused by various inflammatory agents. This kind of stress preconditioning with heat shock has been shown to increase survivorship during certain types of lethal forms of infection in animals. Endotoxin, an extract of bacterial cell coats, can cause infection-like symptoms in animals. Administration of this drug is an excellent model of pulmonary hypertension. Endotoxin causes cells in the lungs to overproduce the gas, nitric oxide, which causes lung injury and inflammation. These symptoms are, according to scientist today, the mediators of pulmonary hypertension pathology. Recently, studies from our laboratory and others have shown that nitric oxide itself formed within the lungs is a cause of lung injury. Furthermore, measurement of the amount of nitric oxide exhaled by the lungs is an easy and noninvasive method of evaluating the severity of this injury. In this experiment, our laboratory showed that stress preconditioning with heat shock twenty hours prior to infection with endotoxin can protect against lung injury. Also, results indicated that a level of nitric oxide produced in the lungs was raised to abnormally high in endotoxemic animals. However, in rats that were heat shock preconditioned showed only a low increase in nitric oxide due to endotoxin. With this data along with other results, we determined that heat shock preconditioning can protect against lung injury.