"Novel Compound for Simultaneous Tissue Delivery and Enhanced Bioavailability of Oxygen and Nitric Oxide" VCU #12-092

Applications

- Enhanced oxygen delivery to tissues during stroke and myocardial ischemia
- Treatment of disorders related to low oxygen delivery to brain: Alzheimer's, depression and Schizophrenia
- Sensitization of tumors to treatment via inhibition of angiogenesis
- Increased physical performance in high altitude environments, aquatic environments and illnesses involving decreased lung capacity
- Preparation of blood substitutes and prolongation of stored blood shelf-life

Advantages

- Novel compound for NO delivery to tissues
- Simultaneously delivers exogenous NO and increases its bioavailability
- Stable over prolonged periods of time, unaffected by freezing/thawing
- Steady NO release over time
- Established crystal structure with hemoglobin allows for further development

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Market Need

Nitric oxide (NO) is an important signaling molecule involved in many physiological processes. It is most notably recognized for induction of vasodilation that increases blood flow and oxygen delivery to tissues. In addition, NO also exhibits anti-inflammatory and anti-oxidant properties. As a result of NO's beneficial properties, there has been a great interest in developing the means to exogenously deliver NO for therapeutic purposes or to enhance its endogenous production and bioavailability. The compounds that can simultaneously deliver NO and improve its bioavailability will find application in treatment of disease states characterized with decreased blood flow and oxygen delivery to the tissues.

Technology Summary

VCU researchers synthesized a novel compound with NO-releasing moiety incorporated into existing allosteric hemoglobin (Hb) modifier. This allosteric effector of Hb stabilizes the deoxygenated state of Hb (right-shifting), which results in decreased Hb affinity for oxygen, allowing for release of more oxygen to tissues. Because Hb is an aggressive scavenger of NO, the right-shifting property of the novel compound also reduces hemoglobin binding of NO, making more NO bioavailable to tissues. Thus, the synthesized novel compound combines two properties - it can be hydrolyzed *in vivo* to release NO, resulting in free NO and the parental allosteric modifier molecule, the former enhancing blood flow via vasodilatory effect on blood vessels walls, while the latter acting as a right-shifter increasing oxygen release from Hb to the tissues.

The novel compound, based on the beneficial pharmacologic properties of NO, has advantageous effects by reducing inflammation, increasing tissue perfusion, decreasing blood pressure, and acting as anti-oxidant. It also assists in vasodilating the microvasculature to enhance tissue blood flow and thus oxygen delivery, which will be useful for treating ischemic-related diseases, such as myocardial ischemia and stroke.

Technology Status

Patent: U.S. US20160326097 A1, European patent pending
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This technology is available for licensing to industry for further development and commercialization.