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**Sensing Oxygen Tension in tissues with Ultrabright “Clickable” Molecular Sensors**

**Awardee:** Conor L. Evans

**Award:** New Innovator Award

**Awardee Institution:** Massachusetts General Hospital

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Hypoxia plays a major role in diverse pathologies, ranging from diabetic and pressure ulcers to cancer metastasis and resistance. Hypoxia following complications in wounds, burns, grafts can lead to poor cosmetic and functional outcomes, with long-term hypoxia linked to chronic wounds in patients with abnormal perfusion, such as those with diabetes. In cancer, low oxygen levels have the unwanted effect of triggering pro-survival mechanisms that including cellular quiescence, upregulation of anti-apoptotic factors, and increased expression of DNA repair enzymes that allow cancer cells to survive therapies. Despite the importance of tissue oxygen concentration and the need to understand this complex oxygenation landscape *in vivo*, there are few tools that enable quantitative, dynamic mapping of oxygen tension. Our research has been focused on developing a platform for real-time, cellular to whole tissue imaging of oxygen. First, we have developed a set of bright and highly sensitive planar porphyrin molecular oxygen sensors based on near-infrared phosphorescence quenching. These *meso*-unsubstituted molecules have considerably higher phosphorescence quantum yield than existing commercial probes, enabling rapid oxygen tension sensing and image acquisition. Second, we have developed a simple, but extensible, click-chemistry based scheme that allows for the rapid growth of custom dendrimer layers surrounding these new porphyrin sensors that not only provide an extended oxygen sensing dynamic range, but are also designed to enable cellular uptake. Third, we have incorporated these sensors into liquid bandages that can be applied to the surface of tissue for real-time oxygen tension mapping. These oxygen-imaging bandages can be used to visualize the oxygen dynamics in real-time, as well as provide an assessment of equilibrium tissue oxygenation in burns and grafts.