

***Decoding the role of vascular lipid droplets  
in endotoxemia-induced vascular inflammation***

**What if tiny fat droplets in your blood vessels could influence how your body handles a life-threatening infection?** It may sound surprising, but these microscopic structures – called **lipid droplets (LDs)** – could play a far more dynamic role in our health than previously imagined. Traditionally viewed as passive fat storage units, LDs are now emerging as active regulators of immune and metabolic processes. The goal of our project is to investigate whether LDs found in the aorta – the body's main artery – contribute to proper vascular function during the progression of vascular diseases such as sepsis, where inflammation and vessel dysfunction can lead to organ failure and even death.

During severe bacterial infections, the immune system launches a powerful response to neutralize invading pathogens. But this defense can backfire. In **endotoxemia** – a model of sepsis caused by bacterial toxins like lipopolysaccharides – massive inflammation damages the vascular system. The aorta, under such stress, may fail to function properly, losing its ability to contract and dilate, which is crucial for maintaining body homeostasis. Our project focuses on understanding the role of LDs in endotoxemia-induced vascular inflammation: **do they protect vascular cells from damage, or do they contribute to dysfunction?**

We aim to uncover how LDs are formed and degraded in the aorta during endotoxemia-induced inflammation, and how this process is regulated. A central goal is to determine whether LDs accumulation disrupts vascular tone and whether inflammation interferes with **enzymes** that normally control lipid balance. Importantly, we will study how **endothelial cells** and **smooth muscle cells** – the two main cell types of the aorta – interact and coordinate their lipid metabolism during immune stress. This intercellular interplay could hold the key to understanding how metabolic disturbances contribute to vascular failure in sepsis.

To address these questions, we will use a multidisciplinary approach, combining **fluorescence and Raman microscopy, lipidomics, and functional vascular assays** in a murine model of endotoxemia.