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**Cell-fie Time: Capturing Cells in Action with 19F MRI**

Understanding the dynamic functions of the placenta and diaphragm is crucial for both fetal development and respiratory health. Conventional preclinical 3D-MRI techniques often face limitations in capturing these physiological movements due to long acquisition times and the need for external respiratory gating. This presentation investigates the application of MRI self-gating and acquisition acceleration techniques to overcome these challenges, enabling detailed, motion-resolved imaging of both the placenta and diaphragm. Self-gating eliminates the need for external sensors by using the MRI signal itself to track motion, while advanced acquisition strategies, such as compressed sensing, significantly reduce scan times. Together, these methods provide high-resolution, temporally accurate images that can offer new insights into placental blood flow and diaphragm mechanics. This approach holds promise for improving the preclinical studies of conditions such as fetal growth restriction and diaphragmatic dysfunction.