



**Application number/Title:** 25057 - SIM-BIO-CIS (pronounced Symbiosis)  
Signalling, Imaging and Metabolic Biobank Composition at Iowa State

**Applicant PI:** Assistant Professor Auriel Willette

**Application Institution:** Iowa State University, Food Science and Human Nutrition, 220 Mackay Hall, 2302 Osborn Drive, Ames IA 50011, United States

**Keywords provided by the Applicant PI to describe the research project:**

Metabolic Dysfunction, Brain, Emotion, Body Composition

**Application Lay Summary:**

1a: Determine how lean vs obese participants enriched for metabolic dysfunction, compare on:

1) memory and cognitive tests; 2) behavior, general health, well-being, and personality; 3) brain structure; and 4) brain function

Specific Aims:

- 1) Determine if biological markers predict cognitive, behavioral, or brain outcomes
- 2) Elucidate how body composition measures predict cognitive, behavioral, or brain outcomes.
- 3) Discern if biological factors including genes, free fatty acids, immune system signaling proteins, or metabolic/stress hormones predict brain outcomes.

Health conditions: obesity and type 2 diabetes

1b: The outcomes from SIM-Bio-SIS will signal to the lay community that obesity is important for one's current cognitive function and brain health, not just for chronic diseases that take years or decades to manifest. These results will indirectly improve the prevention of metabolic related disorders by demonstrating the impact of dysmetabolism on brain structure and function to encourage healthy lifestyles throughout society. Additionally, these results will provide preliminary evidence that will lay the foundation for subsequent intervention protocols focused on lowering body weight and/or improving metabolic function to see if behavioral and brain outcomes improve.

1c: It is unknown which aspects of brain structure/function are affected by obesity or Type 2 diabetes. To assess these relationships, we will be the first researchers to systematically assess:

- 1) if individuals with obesity or metabolic dysfunction show worse cognition and memory, as well as increased feelings of anxiety, sadness, and difficulty in regulating "negative" emotion in thousands of subjects;
- 2) If obesity or metabolic dysfunction affect brain structure and brain function during different tests; and
- 3) if fat, muscle, bone composition, or markers in the blood explain why obesity results in altered behavior, brain structure and brain function.

1d: The subset of subjects with imaging variables will be used for all analyses where  $N = 11,000$  subjects