Pregnancy is a critical period for maternal metabolic health and is accompanied by transient insulin resistance and adipose tissue accumulation (Musial et al., 2016; Pipe et al., 1979). Maternal diet (Schulz, 2010) and environmental stressors are known modulators of maternal and child health. Restriction of the eating window is a component of diet that is gaining more consideration as an approach for improving metabolic health. Recent studies have detailed the benefits of time-restricted feeding (TRF) in improving chronic disease-related outcomes like insulin resistance(Halberg et al., 2005; Hatori et al., 2012; Kahleova, Lloren, Mashchak, Hill, & Fraser, 2017; Liu et al., 2019; Ravussin, Beyl, Poggiogalle, Hsia, & Peterson, 2019; Sutton et al., 2018; Woodie et al., 2018), and high blood pressure (Gabel et al., 2018; Stote et al., 2007, Sutton et al, 2018). Only one study of TRF during pregnancy has been completed thus far in rodents(Upadhyay et al., 2019); however, maternal insulin resistance, energy conservation, and offspring health in the post-natal period were not evaluated.

It is likely that women experience time-restriction of food intake during pregnancy in many

contexts; including food insecurity, hyperemesis gravidarum, observing Ramadan (Ziaee et al., 2010), engaging in shift work and voluntary changes in food intake. I aim to investigate how insulin resistance and energy conservation in normal mouse pregnancy respond to time-restricted feeding. I will test the hypothesis that in the setting of early time-restricted feeding (eTRF), insulin resistance in pregnancy will be lessened, which will improve insulin sensitivity and confer resistance to high fat diet feeding in the offspring.

**Aim 1: Examine the effect of eTRF in the perinatal period on maternal metabolic health.** Dams exposed to eTRF during gestation will be compared to age-matched *ad libitum* fed controls. Food intake, body composition, energy expenditure, metabolic flexibility, gestation length, absorptive capacity, and mechanisms of insulin sensitivity will be evaluated. Based on ELISA results from maternal blood samples, candidate hormones (namely GDF15 and corticosterone) will be further evaluated for their mechanistic contribution to energy conservation and insulin resistance.

**Aim 2: Determine the effect of early time-restricted feeding in the perinatal period on offspring health.** Pups will be raised with *ad libitum* food access. Pups of dams exposed to eTRF will be compared to pups of *ad libitum* fed dams. Survival rates, litter size, birthweight, body composition, insulin sensitivity and response to a high fat diet will be measured.

**Translational Aim 3: Utilize the Michigan Medicine central biorepository obstetrics cohort to investigate relationships between eating window and human maternal and child health.** I will evaluate pregnancy-related glycemia and gestational weight gain in relation to hormone candidates determined in aim 2. I will also characterize the length of eating window in this sample and examine its associations with perinatal health outcomes; including: preterm birth, low birthweight/small for gestational age, intrauterine fetal demise, gestational diabetes, gestational weight gain, and pre-eclampsia.

Figure 1: the aims of this proposed thesis research

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