MATERNAL HIGH-FAT DIET EFFECT ON THE OFFSPRINGS VOLATILOME COMPOUNDS

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One of the main global health concerns is the rising obesity rate. High-fat diet is known to induce physiological, metabolic, behavioral, and neurodevelopmental alterations [1]. During pregnancy and lactation, maternal diet-induced metabolic and inflammatory changes may be transmitted to offspring [2]. Previous animal studies have demonstrated that mothers fed a high-fat diet (HFD) exhibit impaired maternal care. As mice are highly olfactory animals, it is hypothesized that HFD disrupts the maternal olfactory system and may reduce the ability to recognize and distinguish their offspring. Altered olfactory cues may contribute to deficits in maternal behavior [3]. Offspring odor profiles are determined by metabolic activity and are reflected in the volatilome. Changes in the offspring volatilome may modify olfactory signals that are critical for maternal recognition and care [4]. However, the relationship between maternal diet, olfactory disruption, and offspring volatile profiles remains poorly understood. Investigating the offspring volatilome may provide novel insight into how maternal high-fat diet exposure influences maternal–offspring interactions and early-life programming of offspring metabolism and behavior.

Female C57BL/6J mice were fed either a control diet (CD, 10% fat) or a high-fat diet (HFD, 60% fat) from weaning through pairing, pregnancy, and lactation. Offspring were weaned onto a standard rodent diet. Postnatal day 6 (P6) pups were placed inside a glass container maintained on a temperature-controlled heating mat. Volatilome samples were collected using a sorbent tube and pump operating at a flow rate of 20 mL/min. Collected samples were analyzed at the National Public Health Surveillance Laboratory.

Volatilome samples from four litters of control diet (mCD) and high-fat diet (mHFD) offspring were analyzed. A total of 18 volatile compounds were identified and classified into eight functional groups. Some of these compounds, particularly nonanal, are inaturally occurring compounds commonly found on animal skin and in pheromone mixtures, where they play important roles in recognition, signaling, and communication between animals. Notably, offspring from mHFD did not emit specific compounds distinguished in mCD offspring. These findings suggest that maternal diet may alter offspring volatile profiles in ways that could affect olfactory-mediated maternal recognition and social interactions and require further investigation.

Keywords: Maternal obesity, high-fat diet, offspring, volatilome, neurodevelopment, olfaction, metabolic programming.

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