Maternal Effects of Aseptic and Septic Injury on Embryonic Larval Gene Expression in the Tobacco Hornworm, Manduca Sexta

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Cross-generational effects of physical and pathogenic stress have been demonstrated in several insect groups, including our model insect Manduca sexta. Prior studies in our laboratory have shown that maternal exposure to the soil-dwelling gram-negative bacteria, Serratia marcescens, just prior to adult eclosion alters egg morphology and larval immunity. Our goal is to identify mechanisms underlaying pathogen-associated parental effects on offspring. The current study advances this goal through measurement of embryonic size, embryonic histone modification, and both embryonic and larval gene expression. Two days prior to eclosion, parents were injected with saline, heat killed S. marcescens, or live S. marcescens. Embryos were collected at 24 (+/- 2) h or permitted to hatch for clearance assays (first instar) or measurement of fat body gene expression (fourth instar). We find that maternal, but not paternal, pathogen exposure significantly increases egg volume variability, and that maternal pathogen exposure may delay hatching. Furthermore, maternal injection with bacteria conferred on their offspring an enhanced ability to clear infection when compared to their saline injected peers. Histone analysis revealed that maternal treatment does not globally alter embryonic histones, however, several immune-related genes demonstrated altered expression in both embryos and fourth instar larvae.