Honey bee (Apis mellifera) colonies in the United States have suffered annual losses of up to 30% of total managed colonies over the past 10 years. Many factors likely contribute to these massive colony losses, including habitat destruction, pesticide exposure, migratory stress in long-distance pollination operations, Varroa destructor mite levels, and pathogen load. Colony collapse disorder (CCD) is the name given to the pattern of sudden colony loss and honey bee disappearance from colonies, and likely involves viral pathogens as a strong contributing factor. Honey bee viruses have generally not been culturable in laboratory conditions, making experimentation with these viruses difficult. Our laboratory has developed a model system to study viral infections in honey bees using cricket paralysis virus (CrPV). This virus can be cultured and quantified in the laboratory, alters honey bee physiology and behavior and increases the death rate of worker bees. We measured multiple physiological and behavioral parameters in honey bees following viral infection, including fat content, vitellogenin expression, phenoloxidase levels, and radio frequency identification (RFID)-tracked behavior. Physiological measurements (fat content, vitellogenin expression, and phenoloxidase activities) exhibited age-dependent changes and were significantly different in bees infected with CrPV compared to uninfected bees. Additionally, the behavior of CrPV-infected honey bees was measured using micro RFID tags, and the behavior of CrPV-infected honey bees was determined to be significantly different from uninfected bees. This work provides a new model virus system to study honey bee infections and provides a direct, mechanistic understanding for how viruses cause physiological and behavioral changes in honey bees.

If you would like to visit with Dr. Carol Fassbinder-Orth, please contact Rollie Clem at rclem@ksu.edu.