

NON-TECHNICAL ABSTRACT: *(State in layman's terms the application's broad, long-term objectives and specific aims, making reference to the potential public benefits of the project for California.)*

Many tissues, both in invertebrates and vertebrates regenerate after injury. This is even seen in the repair of digits in the early stage fetus in humans. The local responses to tissue injury and regeneration include inflammation at the site of injury, and reduced growth in neighboring cells, while broader responses include delays in development to compensate for the time needed to repair the tissues. Insect imaginal discs are precursor cells, which grow into adult structures such as wings. They show exceptional regenerative capacity, where when damaged, they secrete signals into the blood that delay development, putatively to allow sufficient time for tissue regeneration prior to the transition to the adult stage. Much is known of the responses at the cellular level, but there is a gap in information on how local signals produce these developmental delays. This project will (i) monitor the responses to tissue damage and subsequent repair in the imaginal discs and in the surrounding developing tissues, and will (ii) characterize the blood-borne signals secreted from the imaginal discs, including (iii) their actions on the endocrine systems regulating development. This research will be conducted on a large insect as a means of developing a complementary model organism to the small genetic model, the fruit fly. This pilot project will broaden the scope of the PI's expertise in endocrinology and development allowing her to understand how development is modulated in response to external stresses. This research complements our understanding of local responses to tissue repair, and should expand our knowledge in two important ways: First, through the identification of signals produced by local tissues when damaged that affect distant targets; second, by expanding our understanding of the limitations in regeneration placed on tissues during development. This research may provide new avenues for translational research into regeneration-based therapies for diseases such as Cystic Fibrosis and Crohn's Disease, which often show delays in puberty, and should complement stem cell research being conducted at the cellular level, and offers a model organism not restricted by animal protocols.