Abstract for EDRC 2013
Section: Morphogenesis and Organogenesis

# EVIDENCE FOR THE COMMON ORIGIN OF TRACHEA AND ENDOCRINE ORGANS FROM A SEGMENTALLY REPEATED ECTODERMAL PRECURSOR

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The embryonic origin of the insect endocrine glands is not well known. Here we show that the corpora allata (ca), the prothoracic glands (pg) and the trachea have a homologous origin.
The trachea is a segmentally repeated organ developing from ten ectodermal placodes expressing Trachealess (Trh) and Ventral veinless (Vvl). These placodes invaginate and migrate to form an epithelial polarized tubular network. We show that homologous cells in the maxilla and labium expressing only Vvl, form the ca and the pg. The initial development of the trachea and the endocrine primordia is identical but it diverges when the endocrine organs activate Snail (Sna) and suffer an Epithelial to Mesenchymal Transition (EMT). We show that in the gland primordia Sna controls EMT, migration and viability.
The ca is specified by Deformed in the maxilla, and the pg by Sex combs reduced in the labium. These Hox genes specify the glands activating Vvl, Sna and either Seven-up or Spalt. We can follow in vivo how the two gland primordia coalesce and migrate dorsally to join the corpora cardiaca and form the ring gland. The endocrine organs and trachea are specified by similar upstream gene networks with STAT and Hox genes inducing their development. Hox genes can convert the endocrine primordia into trachea and viceversa. Our study uncovers the genetic and developmental mechanisms for ring gland morphogenesis and indicates that the respiratory tracheal organs and these two main endocrine glands arose through a process of divergent evolution from an ectodermal repeated structure.

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