EGF, WNT & HOX INTERACTIONS DURING PATTERNING OF *Caenorhabditis elegans* EQUIVALENCE GROUPS

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ABSTRACT

During development, as a single-cell zygote divides multiple times to generate a complete organism, previously undifferentiated cells somehow acquire the correct fates. A group of cells that shares the same developmental potential is called an equivalence group. In *Caenorhabditis elegans*, the most well-characterized equivalence group is the hermaphroditic Vulval Precursor Cell (VPC) group. Epidermal Growth Factor (EGF) signaling specifies VPC fate partly by upregulation of *lin-39/SexcombsReduced/Hox5*, while Wnt signaling plays a minor role in vulval induction. EGF and Wnt signaling also act together to pattern the P11/12 equivalence group, present in both *C. elegans* hermaphrodites and males, by upregulating a different Hox gene, *egl-5/Antennapedia/UltrabithoraxHox6/8*, to specify P12 fate. Previous observations suggest that EGF or Wnt signaling may act through Hox genes to specify fate in two other *C. elegans* equivalence groups: the hook competence group (HCG) and γ/δ pair. I characterized the roles of EGF and Wnt signaling in the HCG and γ/δ pair, and found that upregulation of Hox genes is controlled by either pathway in each group.

I showed that the major hook inductive pathway involves the Wnt ligands and LIN-17/Fz, which specify the 1° and 2° HCG fates. Also, I identified a role for EGF signaling in specifying the 1° fate, although its role is only revealed when Wnt activity is compromised. I provided a link between *mab-5/Hox6/8* and Wnt signaling during normal hook development by determining that LIN-17 is required for *mab-5/Hox6/8* expression in P11.p.

In the γ/δ pair, I demonstrated that EGF signaling (through the LIN-31/Forkhead and LIN-1/ETS transcription factors) controls *ceh-13/Hox1* expression in γ. I did not find any evidence that Wnt signaling specifies the γ fate. Instead, I observed that *lin-44/Wnt, mom-2/Wnt* and *lin-17/Fz* are required to orient the γ mitotic spindle. In addition, TGF-β signaling (by *dbl-1/Dpp*) was previously reported to control γ expression of *ceh-13/Hox1*. I showed that *dbl-1* acts either downstream or in parallel to EGF signaling to specify the γ fate. I also found that *dbl-1/Dpp* does not appear to specify fates in the VPC and P11/12 equivalence groups, in which EGF signaling plays an important role, suggesting that TGF-β signaling contributes to the specificity of the γ fate.

TABLE OF CONTENTS