

**Supplemental Figure 1:** Human mRNAs did not show a dose response at the concentrations used. Phenotype penetrance is shown for the ten candidate genes at concentrations from 10-200 pg/embryo.

**Supplemental Figure 2:** SOD1 and RRP1 were examined for penetrance of the phenotype at very low RNA doses but did not show significant penetrance. Uninjected embryos for controls. \*  $p < 0.01$

**Supplemental Figure 3:** Pairwise injections of Shh related genes using *SOD1* as the reference gene. *SOD1* was coinjected with 6 other genes to look for synthetic effects. *SOD1* was injected individually at 50pg RNA, the other gene was injected individually at 100pg RNA and then the two were injected together, 50pg each, for a total of 100pg RNA.





