Two Distinct Classes of Potassium Channels Inhibit *C. elegans* Egg Laying

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We have identified two genes predicted to encode potassium channels that negatively regulate *C. elegans* egg-laying behavior.

In one study we found that the mutation *n575*, which defined the gene *egl-7* and confers a dominant egg-laying defect, is an allele of *unc-103*. *unc-103* is predicted to encode the *C. elegans* ortholog of mammalian HERG and Drosophila seizure, cyclic nucleotide-gated voltage-sensitive potassium channels. The *n575* mutation affects the splice-acceptor site for exon 8 of *unc-103*, resulting in the use of a cryptic splice acceptor 90 basepairs downstream. The predicted protein product of *unc-103(n575)* lacks a highly conserved 30 amino acid sequence adjacent to the cyclic nucleotide binding domain in the cytoplasmic COOH terminus of the channel. We isolated *n4328* as a dominant suppressor of the *n575* Egl phenotype and found that *n4328 n575* mutants harbor a missense mutation in the *unc-103* coding sequence in addition to the *n575* mutation. Gene-dosage studies indicate that *n575* is a gain-of-function allele of *unc-103*. Loss-of-function alleles of *unc-103*, including *unc-103(n4328 n575)*, confer an Egg-laying constitutive (Egl-c) phenotype, suggesting that the wild-type function of *unc-103* is to inhibit egg-laying behavior.

In another study we isolated deletion alleles of *irk-1* and *irk-2*, which are predicted to encode the *C. elegans* potassium channels most similar to G protein-gated potassium channels found in vertebrate nervous systems. We are interested in testing the possibility that G protein-gated potassium channels are effectors of G protein signaling pathways that control *C. elegans* egg-laying behavior. Mutants carrying a deletion allele of *irk-2* have normal egg-laying behavior, but mutants carrying an *irk-1* deletion allele are Egl-c. We will present our characterization of genetic interactions between *irk* deletion alleles and mutations that affect G protein signaling in the *C. elegans* egg-laying neuromusculature.

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