

Regulation of Behavioral Arousal in *C. elegans*

ABSTRACT

Animals undergo periods of behavioral quiescence and arousal in response to environmental, circadian, or developmental cues. During larval molts, *C. elegans* undergoes a period of profound behavioral quiescence termed lethargus. Locomotion quiescence during lethargus was abolished in mutants lacking a neuropeptide receptor (NPR-1), and was reduced in mutants lacking NPR-1 ligands (FLP-18 and -21). Wild type strains are polymorphic for the *npr-1* gene, and their lethargus behavior varies correspondingly. Locomotion quiescence and arousal were mediated by decreased and increased secretion of an arousal neuropeptide (PDF-1) from central neurons. PDF receptors (PDFR-1) expressed in peripheral mechanosensory neurons enhanced touch-evoked calcium transients. Thus, a central circuit stimulates arousal from lethargus by enhancing the sensitivity of peripheral mechanosensory neurons in the body. These results define a circuit mechanism controlling a developmentally programmed form of quiescence.