Neural circuits for pharyngeal pumping and pumping modulation

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This is a *C. elegans* worm –
See the pumping in the head?

Adult hermaphrodite
Video speed is real-time
C. elegans pumping – a closer, slower look

Video speed is ¼ real-time
The pharynx pumps food into the intestine
The individual steps of the pump

a

pumping

b

isthmus peristalsis

Avery & Horvitz 1989
Muscles of the pharynx

Derived from Albertson & Thomson 1976
All cell bodies in the pharynx

Left side nuclei

Neurons
Muscle
Epithelial cells
Marginal cells
Gland cells

Original data from Albertson & Thomson 1976, schematic from WormAtlas.org
wormweb islands
Electropharyngeogram (EPG)
MC causes pre-E spike and I-spike in EPG

E = excitation
R = relaxation
eat mutants have reduced pumping rate

eat-2(ad1113)  B  eat-18(ad820sd)

Raizen..Avery 1995
M3 is required for P-spikes

Raizen & Avery 1994