A

hs-elt-7; elt-2::lacZ::GFP	**24-48 hours post HS**
Stage at HS	**% with ectopic *elt-2::lacZ::GFP***
L2	100% (n=18)
L3	100% (n=22)
L4-adult	100% (n=36)

B

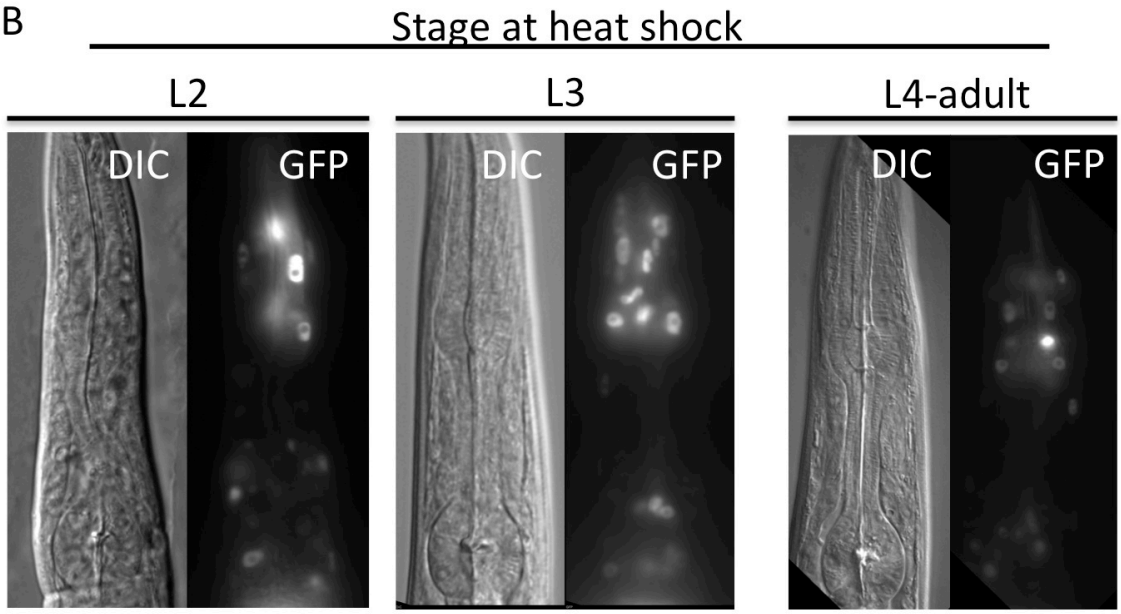


Fig. S1. Ectopic expression of the *elt-2* reporter in *hs-elt-7* induced larvae is not stage-dependent. (A) *hs-elt-7* larvae were grown as a synchronized population and heat-shocked at the L2, L3, or L4-adult stage, then viewed 24-48 hours after heat-shock. (B) Image showing the head region of larvae 24 hours after ectopic ELT-7 expression. All of the heat-shocked larvae expressed *elt-2::lacZ::GFP* in many non-intestinal cells while non-heatshocked worms (n=45) only expressed *elt-2::lacZ::GFP* in the intestine.

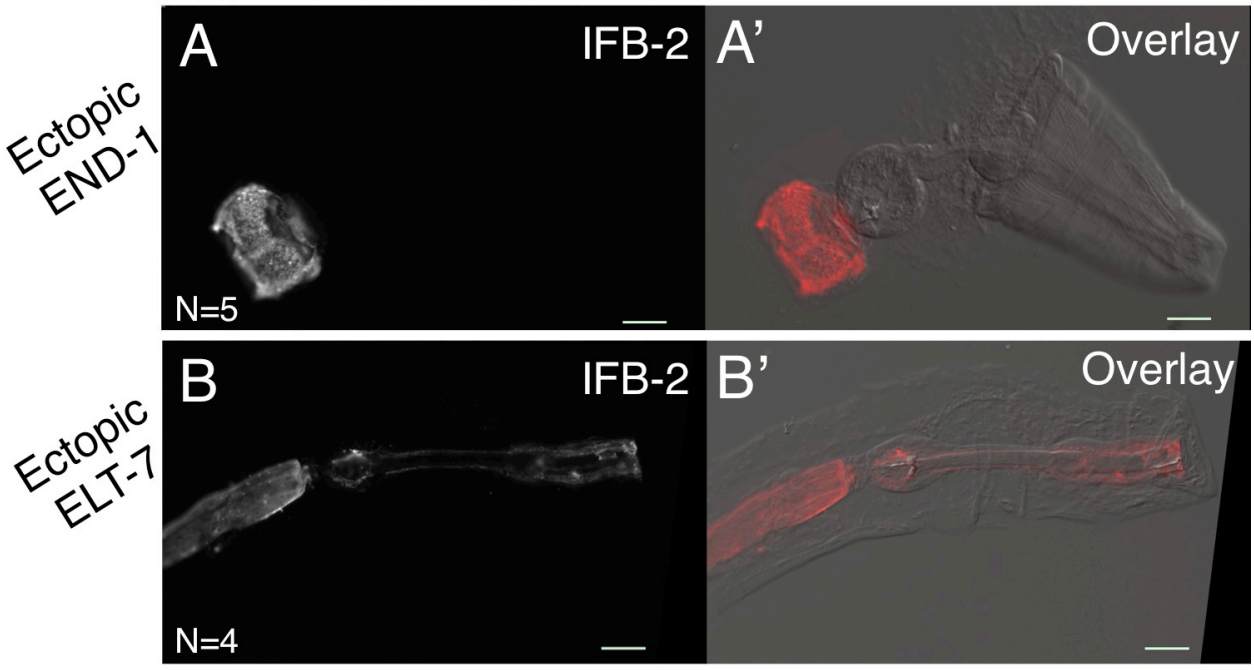


Fig. S2. IFB-2 expression in adult worms 96 hours after ectopic END-1 (A) or ELT-7 (B) expression as revealed by MH33 antibody. L4-adult worms were heat-shocked to activate ectopic expression of *end-1* or *elt-7,* then collected at 4 days after heat shock, dissected behind the pharynx, fixed, and stained with MH33 (anti-IFB-2) antibody. Worms in which *end-1* was expressed (A, A') had staining in only the endogenous intestine (shown by the overlay with DIC image in A', while all worms in which ELT-7 was expressed showed staining in both the intestine and the pharynx (B-B'). (N, number of worms, scale bars, 20μM).

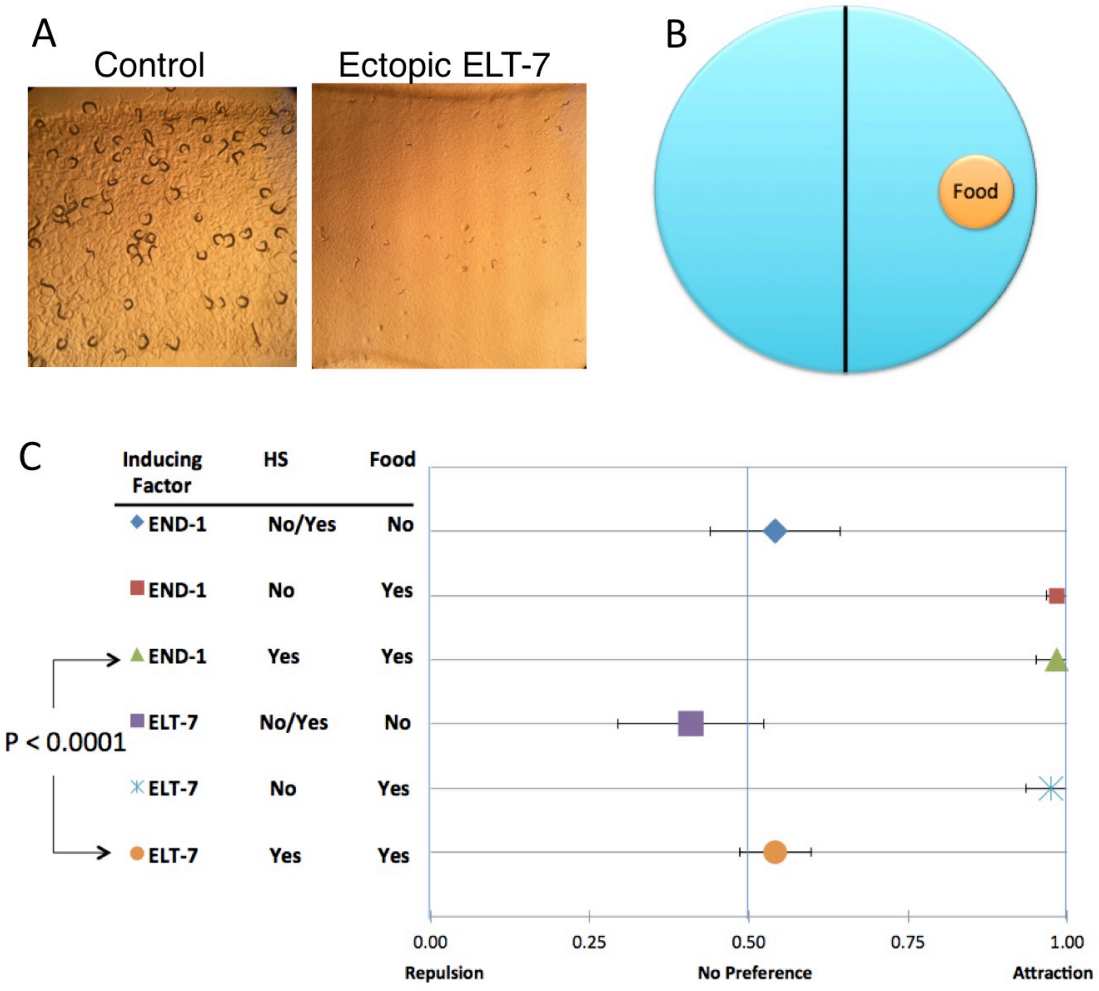


Fig. S3. Ectopic expression of *elt-7* leads to developmental arrest and defects in chemosensation. We extracted embryos from *hs-elt-7* gravid adults and allowed them to hatch in M9 buffer. Worms that were transferred to food without heat-shock progressed to the L4 stage of larval development 4 days after the beginning of feeding (A, control). None

of the worms that were heat-shocked at 33°C for 15 minutes had grown into L4 larvae 4 days after transfer to food (A, Ectopic ELT-7). Images are of worms on OP50-seeded agar plates and were taken using a dissecting microscope and iPhone4S. B) Synchronized L1 worms were transferred to the center of 50mm agar plates that were unseeded or seeded with 200µL OP50 bacteria culture on one side (food). C) Attraction to food was calculated by dividing the number of worms on the food-containing sector by the total number of worms when viewed approximately 24 hours after transferring. The plot shows the average attraction value and standard deviation over several replicated experiments for each condition and strain. Plates that contained no food had an approximately even number of worms on each sector of the plate and these worms arrested as L1s (blue diamond, purple square). Worms that carried *hs-end-1* were located on the food-containing sector of the plate regardless of whether they were heat-shocked to induce ectopic *end-1* expression before transferring (red square, green triangle). In contrast, worms that carried *hs-elt-7* and were heat shocked before transfer were evenly distributed on the food and no-food sectors of the plate (orange circle). p-value comparing *hs-elt-7* and *hs-end-1* was determined using Fisher's exact test.

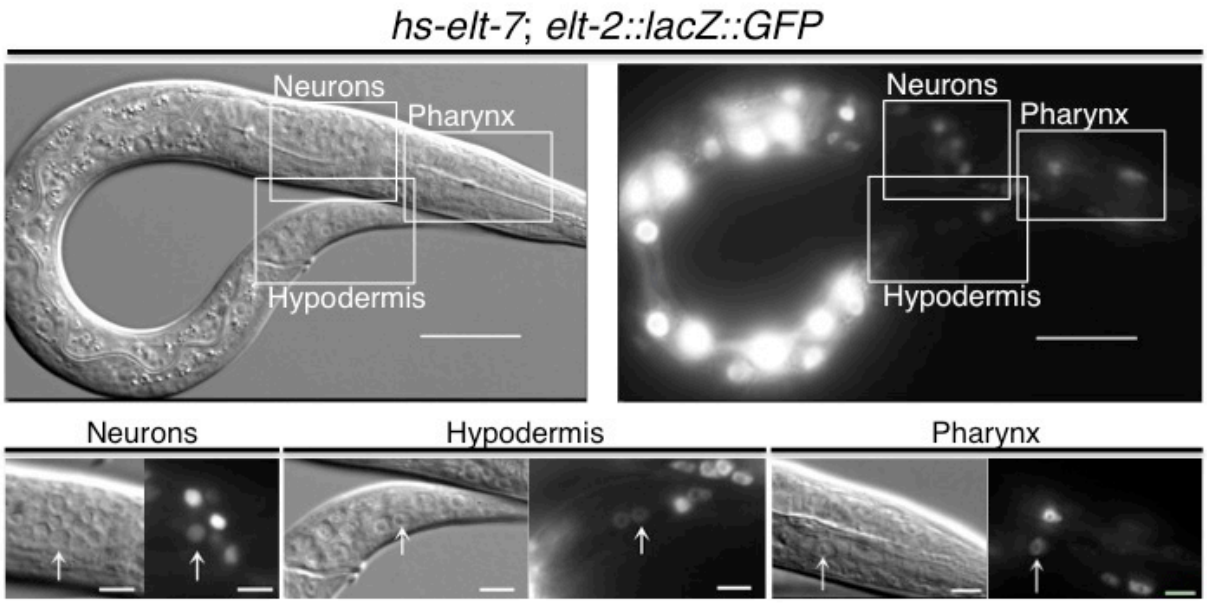


Fig. S4. The *elt-2::lacZ::GFP* reporter is expressed in hypodermal, neuronal, and pharyngeal cell nuclei 24 hours after ectopic *elt-7* expression. Bottom panels show higher magnification of boxed regions. (Top panel scale bars is 20μM, bottom panel scale bars is 5μM).

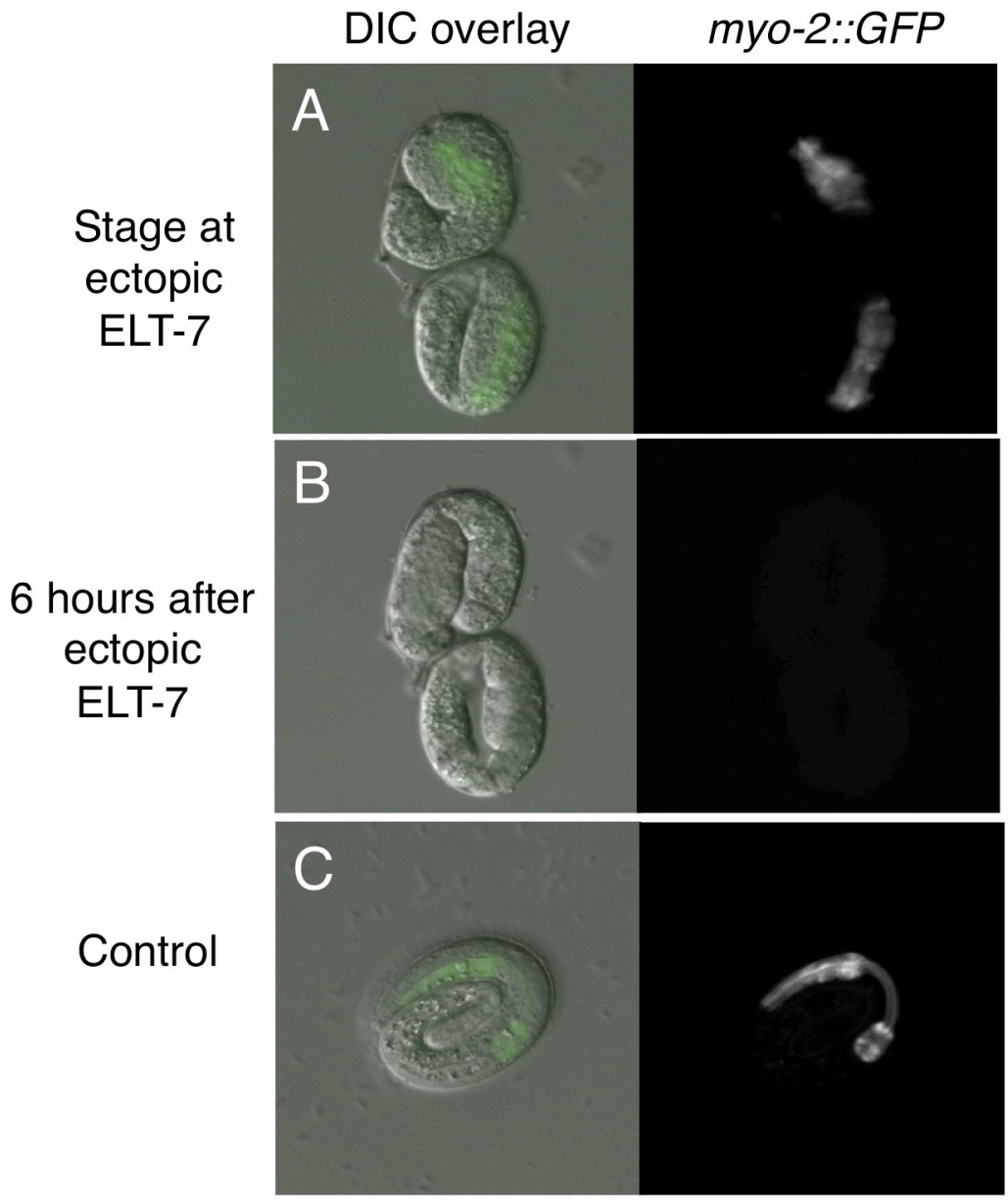


Fig. S5. Ectopic *elt-7* expression during embryogenesis rapidly represses *myo-2*::*GFP* expression. (A) Embryos carrying the *myo-2::GFP* reporter and *hs-elt-7* transgene before heat shock. (B) Same embryos as seen in panel (A) 6 hours after ectopic *elt-7* expression. (C) Non-heat shocked embryo at the three-fold stage with bright *myo-2::GFP* expression.

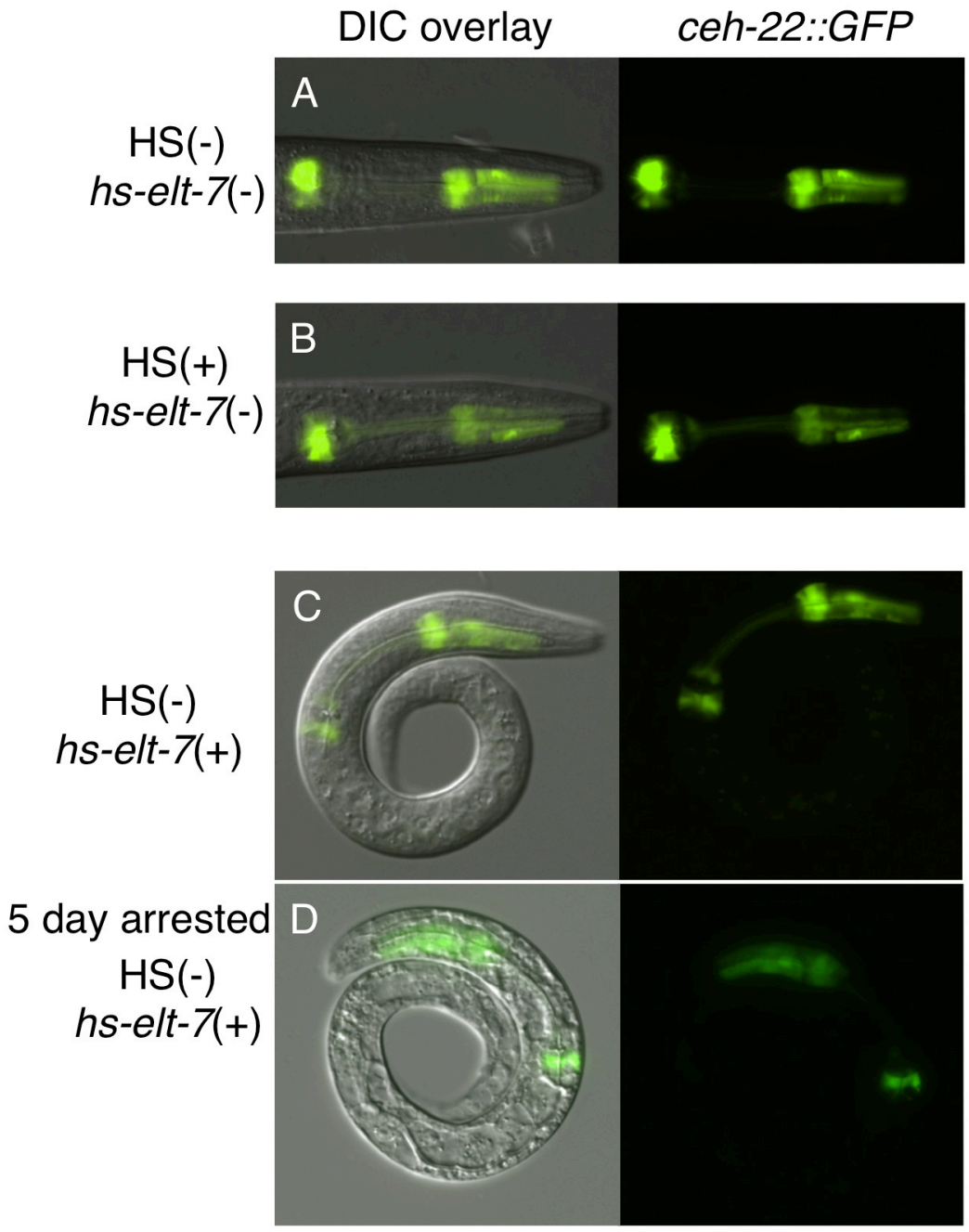


Fig. S6. Neither heat-shock nor developmental arrest leads to loss of *ceh-22::GFP* expression. (A) The *ceh-22::GFP* reporter is expressed in pharyngeal muscle cells (which we found was variable in the pm5 muscle cells). (B) Worm carrying the *ceh-22::GFP*

reporter 96 hours after heat shock. (C) Non-heat shocked L1 larva carrying both the *ceh-22* reporter and *hs-elt-7* transgene. (D) Larva expressing *ceh-22::GFP* after 5 days in M9 buffer.

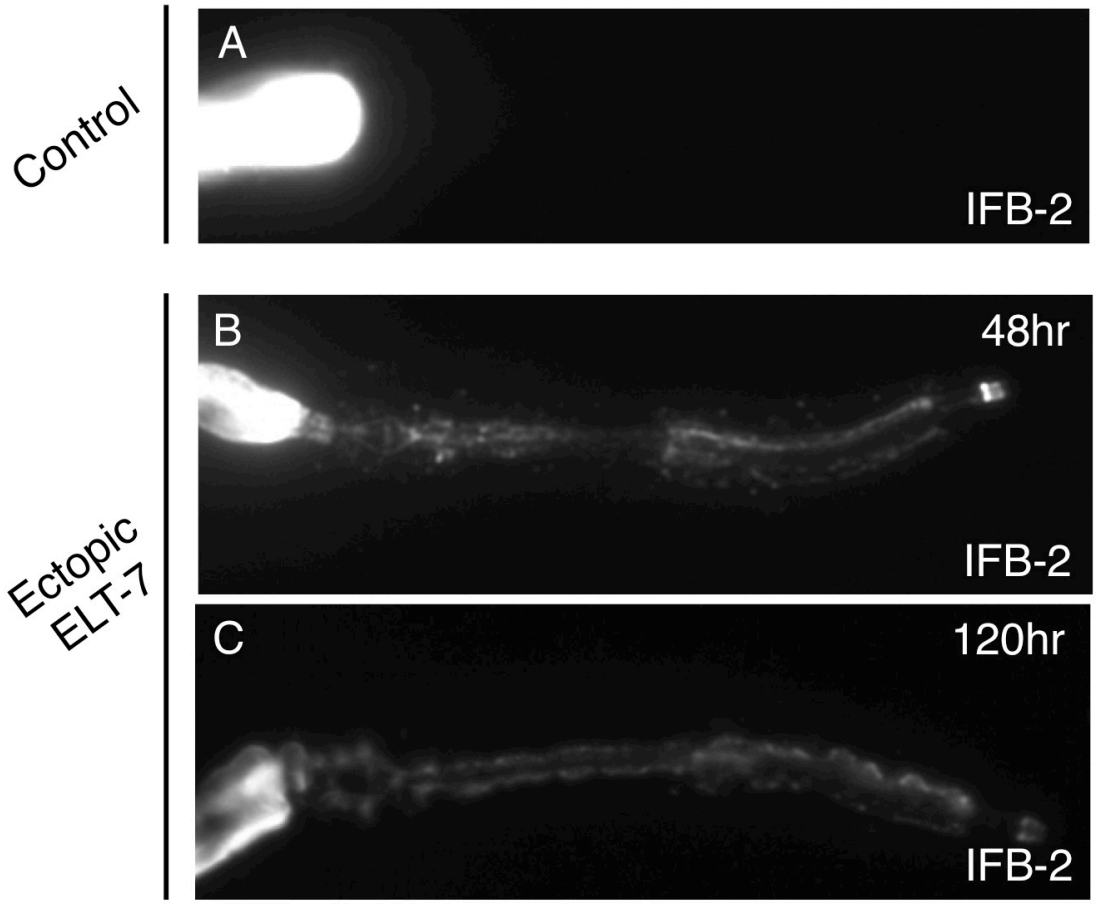


Fig. S7. Intestine-specific intermediate filament protein IFB-2 progressively localizes to the apical surface of pharyngeal cells. (A) IFB-2 in control L1 larva as revealed by MH33 antibody. The anterior most region of endogenous intestine is on the left (brightly stained) and pharynx is to the right. IFB-2 localization in worms 48hrs (B) and 120hrs (C) after ectopic ELT-7 expression. Lower panels show the same region as in the control image.

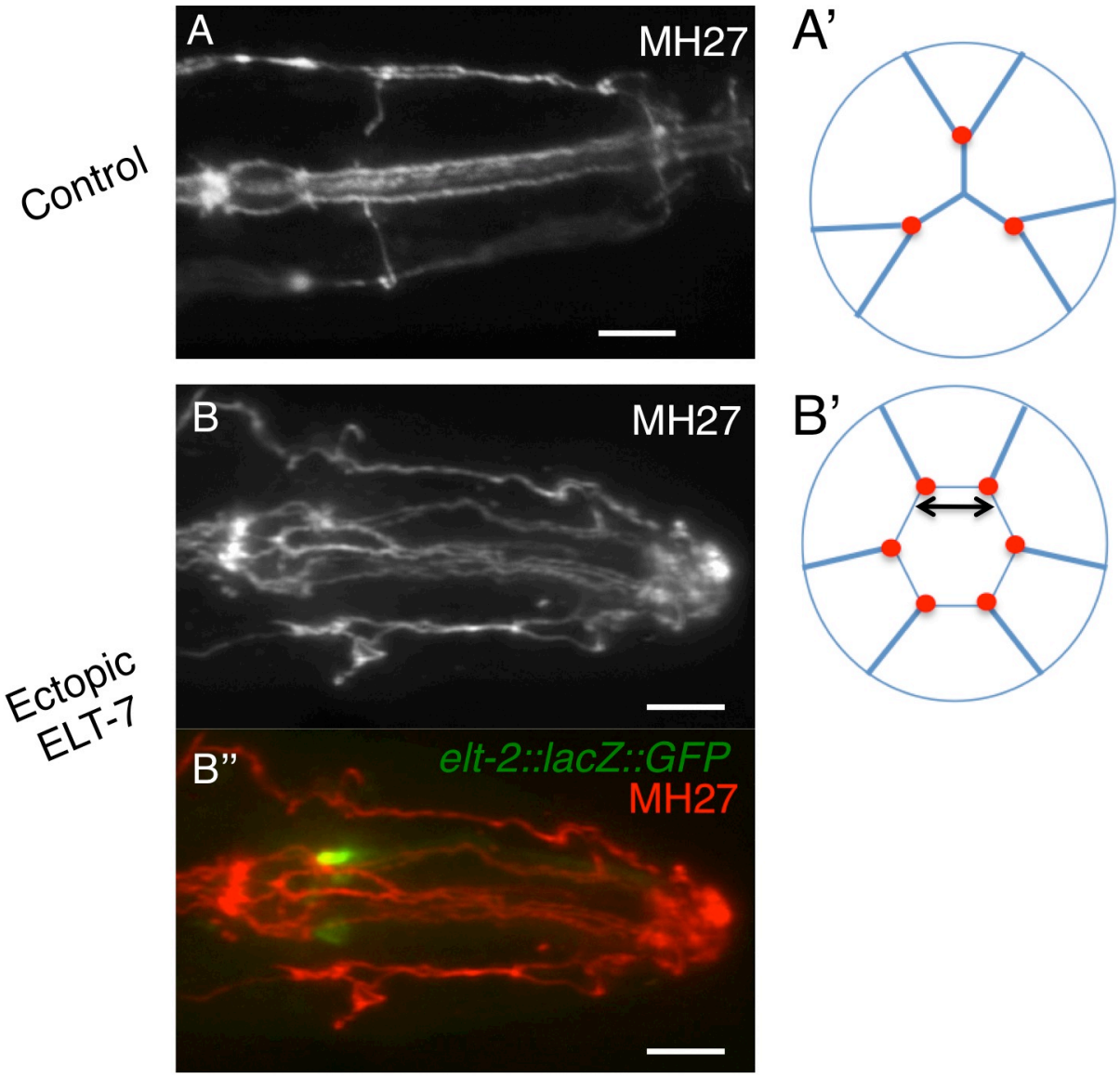


Fig. S8. Reorganization of the marginal cell apical surface as revealed by MH27 (anti-AJM-1) antibody. Monoclonal antibody MH27 recognizes a protein at the apical borders of epithelial cells. (A) Diapause arrested L1 worm stained with MH27 antibody. Image shows the head region containing the anterior pharynx. (A') Drawing of a cross section of the anterior pharynx. The apical surface of the marginal cells (smaller triangular sections) is

highly organized such that the junction between marginal and muscle cells appears as three lines (red dots) in the pharynx of MH27-stained worms. (B) *hs-elt-7* worm stained with MH27 5 days after ectopic ELT-7 expression. (B') In the *hs-elt-7* worms, 6 lines (red dots) can be seen at the apical border of the pharynx, suggesting reorganization of the marginal cell apical surface. (B'') MH27 staining overlay with *elt-2::lacZ::GFP* expression (EDF focused images with Nikon Elements software, scale bars= 5μm)

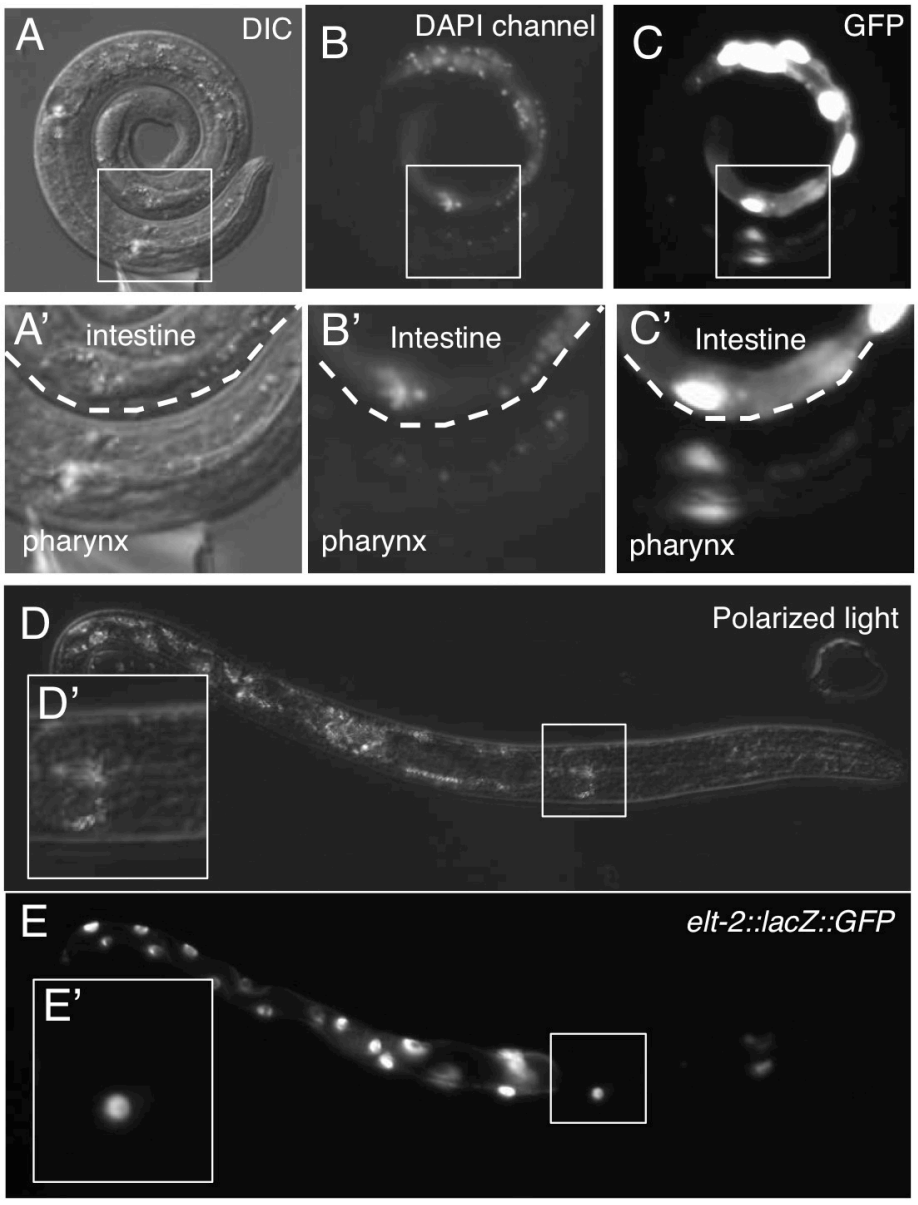


Fig. S9. Ectopic gut-like granules have autofluorescent and birefringent properties. Granules in the anterior pharynx observed after ectopic ELT-7 expression fluoresce when viewed using the DAPI filter set and appear similar to granules in the endogenous intestine

(A, A', B, B'). Autofluorescent granules appear in *elt-2::lacZ::GFP*-expressing cells (C, C') (bottom panel is larger version of boxed region in the upper panel). D and E show an example of granules in the posterior pharynx (D') that appear similar to granules in the intestine when viewed using polarized light (D). These granules also overlap with *elt-2::lacZ::GFP* expression (E, E').

L1 larvae		24-48hrs	120hrs	192hrs
Strain	**HS**	**% with IFB-2 in intestine and pharynx**		
elt-2::lacZ::GFP	(+)	0% (n=33)	nd	nd
hs-end-1; elt-2::lacZ::GFP	(-)	0% (n=62)	0% (n=42)	nd
hs-end-1; elt-2::lacZ::GFP	(+)	0% (n=21)	nd	nd
hs-elt-7; elt-2::lacZ::GFP	(-)	0% (n=25)	nd	0% (n=110)
hs-elt-7; elt-2::lacZ::GFP	(+)	98% (n=98)	100% (n=14)	100% (N=26)

Table S1. Ectopic expression of *elt-7* and not *end-1* leads to IFB-2 in the pharynx.

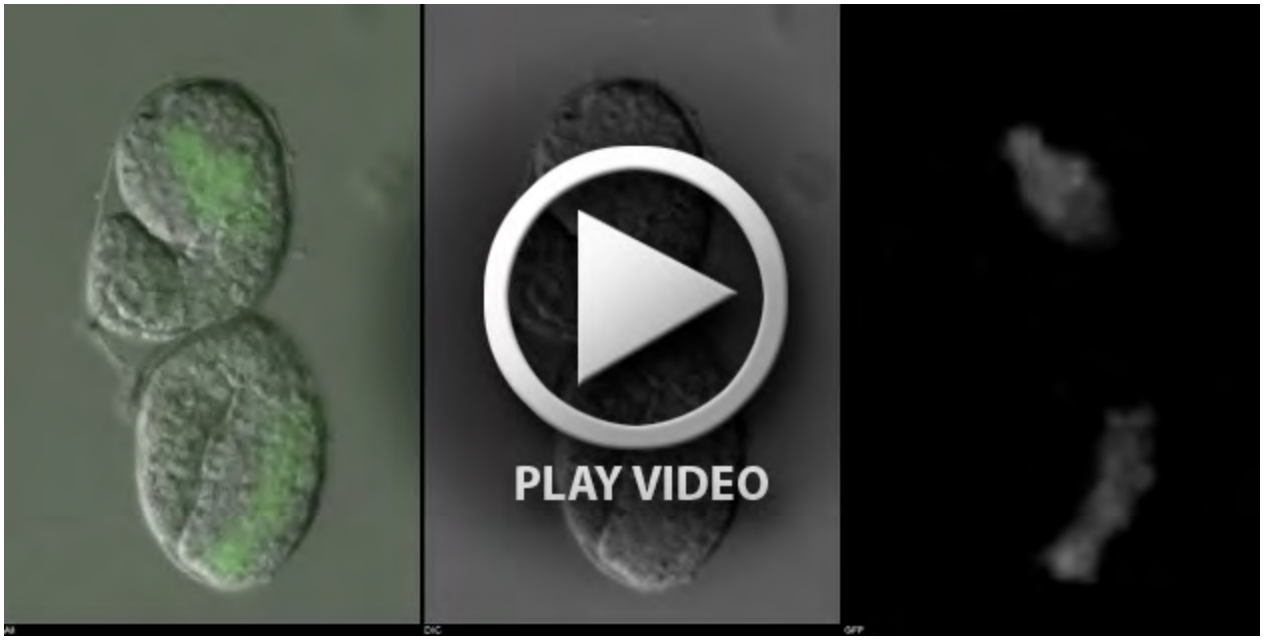
(controls, nd=not determined, n is number of larvae)

L1 larvae		4-5 days post HS	
Strain	**HS**	**% gravid adults**	**% with *elt-2::lacZ::GFP* outside intestine**
elt-2::lacZ::GFP	(+)	95.3% (n=150)	0% (n=56)
hs-end-1; elt-2::lacZ::GFP	(+)	100% (n=151)	0% (n=36)
hs-elt-7; elt-2::lacZ::GFP	(-)	95.3% (n=150)	0% (n=27)
hs-elt-7; elt-2::lacZ::GFP	(+)	0% (n=100)	100% (n=22)

Table S2. Ectopic expression of ELT-7 and not END-1 results in developmental arrest and maintained *elt-2::lacZ::GFP* expression outside the intestine. Embryos were collected from gravid adults using a bleach solution and allowed to arrest as L1s in M9 buffer. Heat-shock of L1s carrying only the *elt-2* reporter or worms carrying *hs-end-1* did not result in developmental arrest or expression of *elt-2::lacZ::GFP* outside the endogenous intestine when viewed 4-5 days after heat-shock. Worms carrying *hs-elt-7* only showed defects in growth and ectopic *elt-2* reporter expression when heat shocked. n, number of larvae.

L1 larvae		3-5 days post HS
Strain	**HS**	**% with rhabditin granules in pharynx**
elt-2::lacZ::GFP	(+)	0% (n=16)
hs-end-1; elt-2::lacZ::GFP	(+)	0% (n=36)
hs-elt-7; elt-2::lacZ::GFP	(-)	0% (n=27)
hs-elt-7; elt-2::lacZ::GFP	(+)	11% (n=129)

Table S3. Ectopic expression of ELT-7 and not END-1 leads to gut-like granules in the pharynx (controls). Shown is the percentage of worms with autofluorescent granules in the pharynx. Over six experiments, between 5-17% of larvae contained prominent ectopic gut-like granules in the pharynx.



Movie 1: Expression of the pharynx marker *myo-2::GFP* decreases after a brief pulse of ectopic ELT-7 expression. The time-lapse video shows images taken every 20 minutes starting approximately 30 minutes after ectopic ELT-7 expression and ending after 4 hours and 40 minutes. DIC/GFP overlay on left, DIC only in center, and GFP only in right.