Mechanosensitive Piezo Channel, PEZO-1, regulates food deglutition in *C. elegans*

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The PIEZO ion channels are evolutionarily conserved mechanosensitive channels (Coste et al., 2010). Mammalian genomes encode two PIEZO genes, Piezo1 and Piezo2, of which functions have been shown to be involved in mechanosensation (Woo et al., 2014, Nonomura et al., 2017, Li et al., 2014, Rode et al., 2017). *C. elegans* genome has a single PIEZO gene, *pezo-1*, which encodes 14 isoforms (Bai et al., 2020). The molecular function of PEZO-1 in *C. elegans* has yet to be fully determined. To examine *pezo-1* function, we grouped 14 isoforms depending on the mRNA length and observed their expression patterns. The promoter region of long isoforms is specifically expressed in the pharyngeal-intestinal valve, which is predicted to mediate food swallowing (Avery and Thomas, 1997). Next, to examine whether *pezo-1* has a role in food swallowing, we fed animals with OP50-sized GFP-microsphere and found that pezo-1 mutant animals show excess accumulation of GFP-microsphere in the anterior part of the intestine lumen. Expression of long isoform PEZO-1 or mouse PIEZO1 under the control of valve cell-specific promoter restores the food swallowing defect of *pezo-1* mutant animals. We also observed that when GFP-microspheres are fully accumulated at the anterior part of the intestine, the pharynx is pulled posteriorly to push GFP-microspheres down into the posterior intestine. We named this a pharyngeal plunge. We next found that the pharyngeal-intestinal valve exhibits calcium transient during pharyngeal plunge and the optogenetic activation of valve cells induces the pharyngeal plunge. Moreover, elevated pressure in the anterior part of the intestinal lumen by microinjecting buffer solution causes pharyngeal plunge, not in *pezo-1* mutant but wild-type animals. Currently, we are investigating whether PEZO-1 is activated upon pressure by performing electrophysiology in a heterologous system. These results demonstrate that the *C. elegans* PIEZO channel regulates pharyngeal plunge and provides insights to understand the function of the mammalian PIEZO channel shown to be expressed in the esophagus.