

Figure S1 Survival curve of worms cultivated at different temperature

Survival curves of worms cultivated at indicated temperature from eggs. Worms were fed *E. coli* on NGM plates. n=4 experiments with 25 worms/experiment. Statistics: Log-rank test, p***<0.001.

$T_{\text{cult}} = 23 \text{ }^{\circ}\text{C}$, $20 \text{ }^{\circ}\text{C}$ center

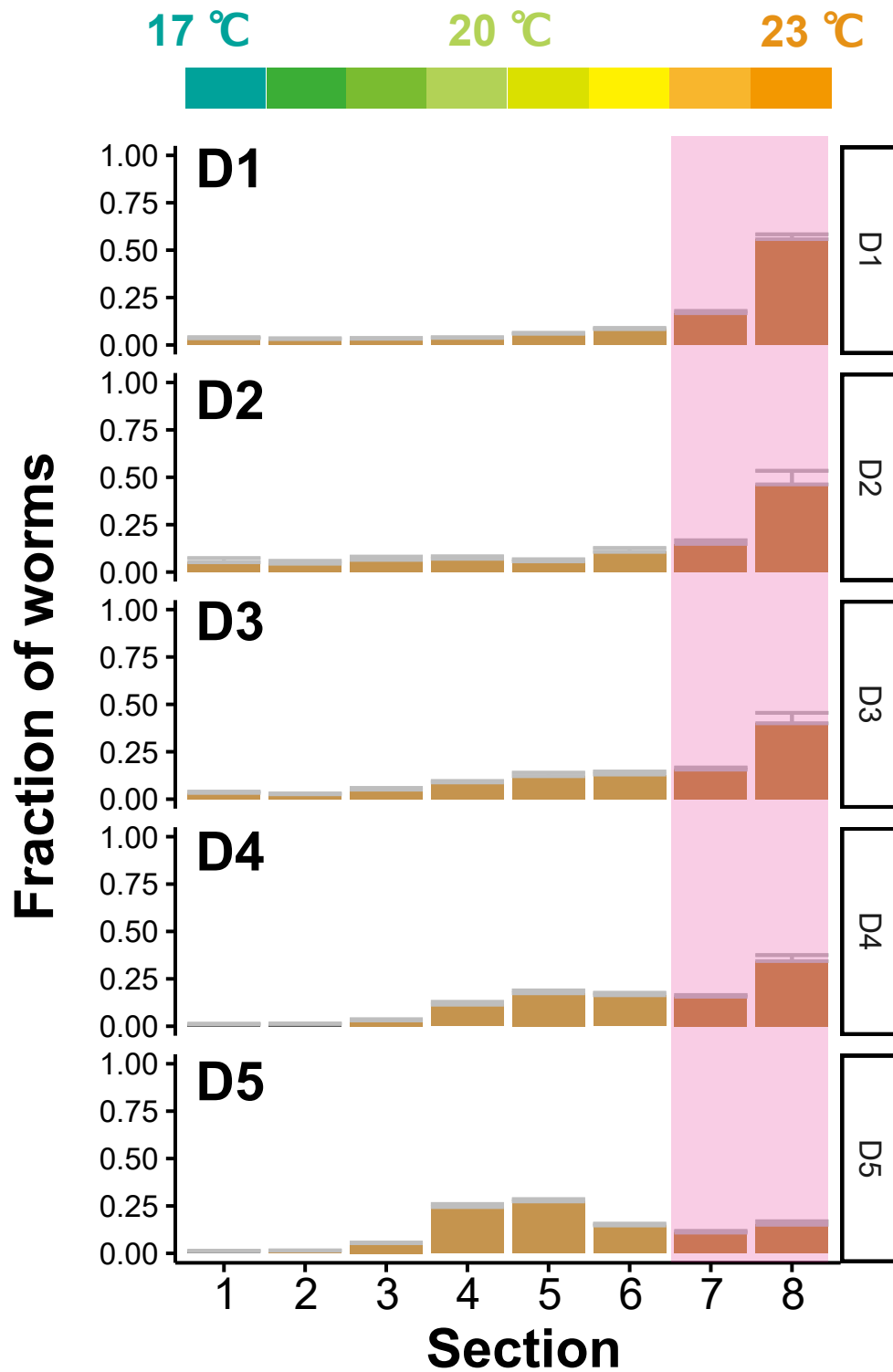
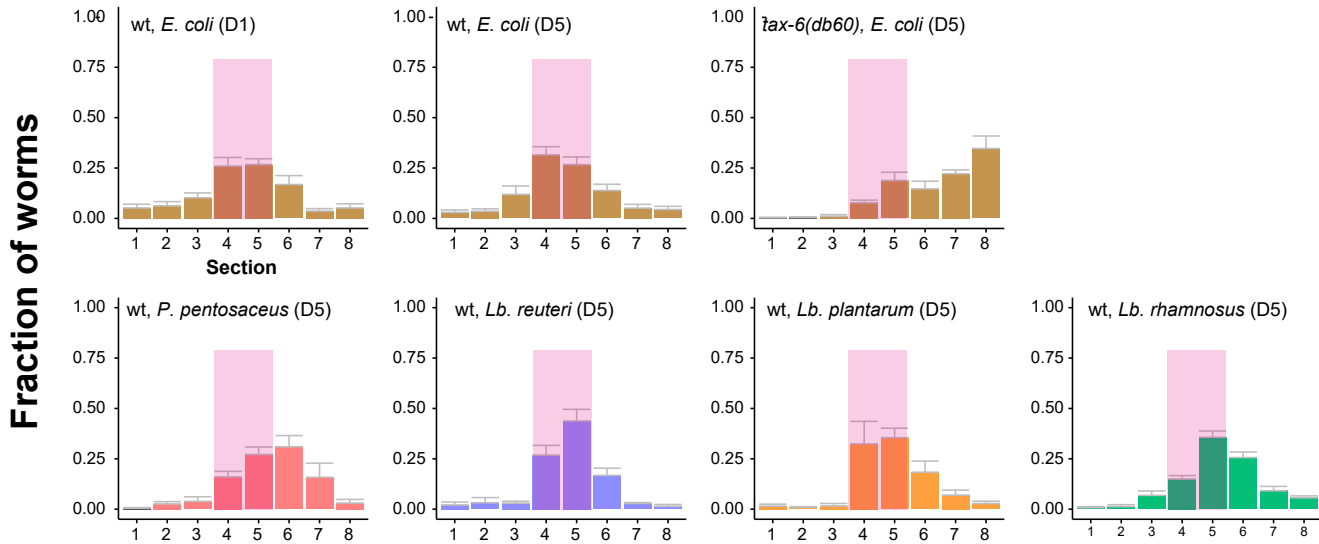


Figure S2 Distribution of worms on temperature gradient at different age

Worms were cultivated at $23 \text{ }^{\circ}\text{C}$ and placed at the center of $17\text{-}23 \text{ }^{\circ}\text{C}$ gradient. Distribution of worms were shown. Pink rectangles indicate the sections around the T_{cult} .

A $T_{cult} = 23\text{ }^{\circ}\text{C}$, $23\text{ }^{\circ}\text{C}$ center



B

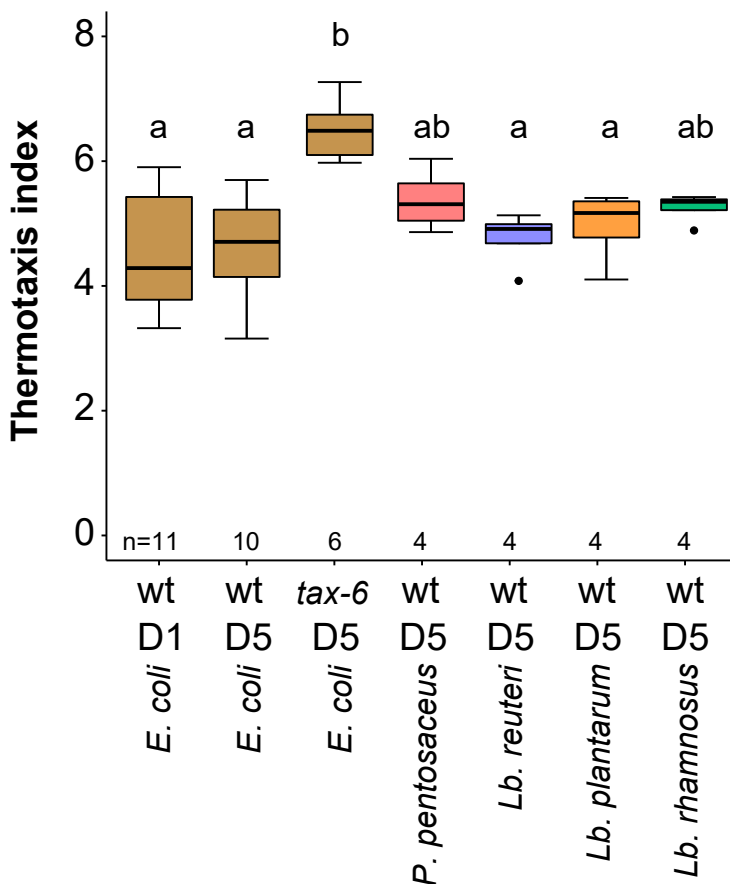


Figure S3 Worms fed select LAB were not thermophilic

Worms were cultivated at $23\text{ }^{\circ}\text{C}$ and placed at the center of $20\text{-}26\text{ }^{\circ}\text{C}$ gradient. (A) Distribution of worms fed indicated bacteria. Pink rectangles indicate the sections around the T_{cult} . (B) Box plots summarizing thermotaxis indices of aged worms fed indicated conditions. Numbers of experiments are shown. Statistics: The mean indices marked with distinct alphabets are significantly different ($p < 0.05$) according to One-way ANOVA followed by Tukey–Kramer test.

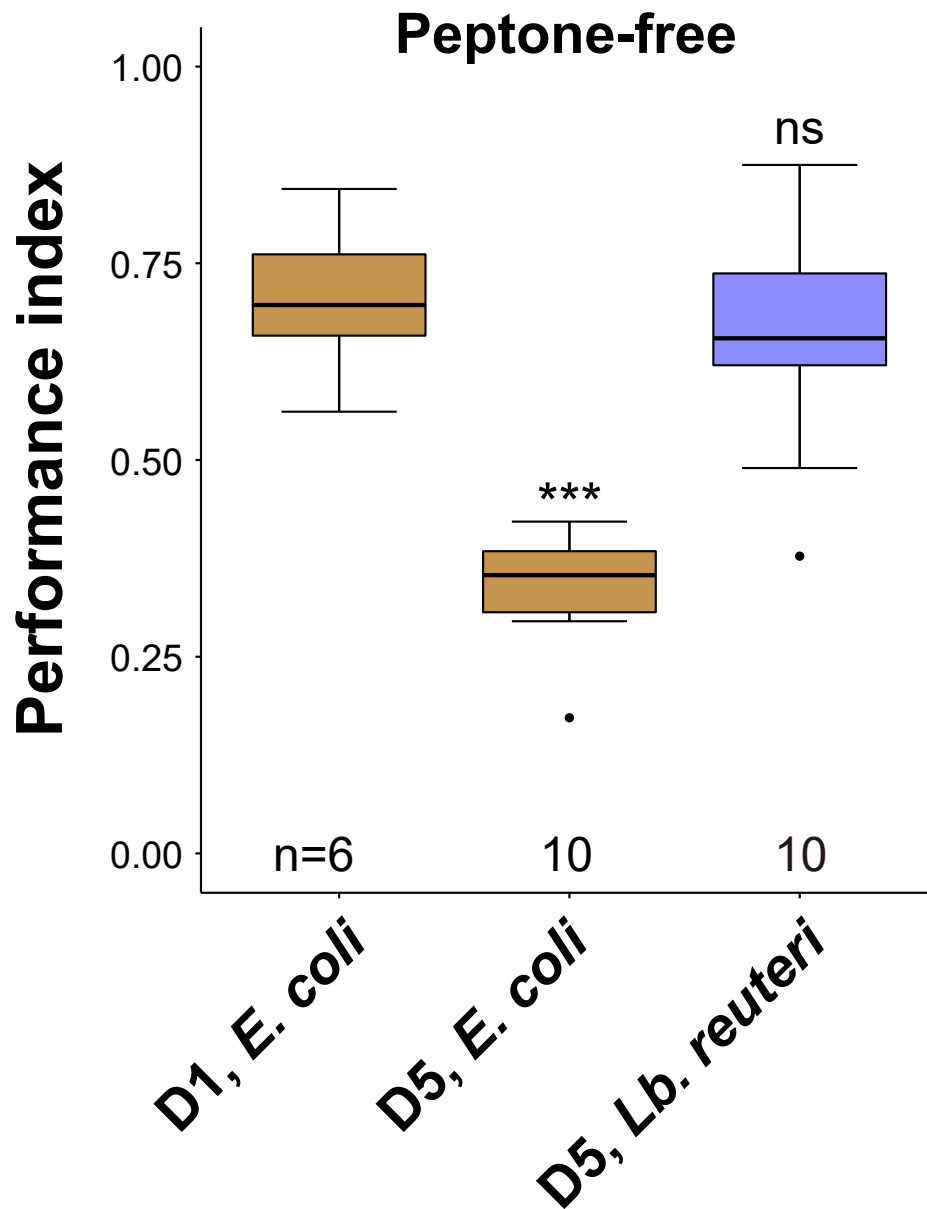
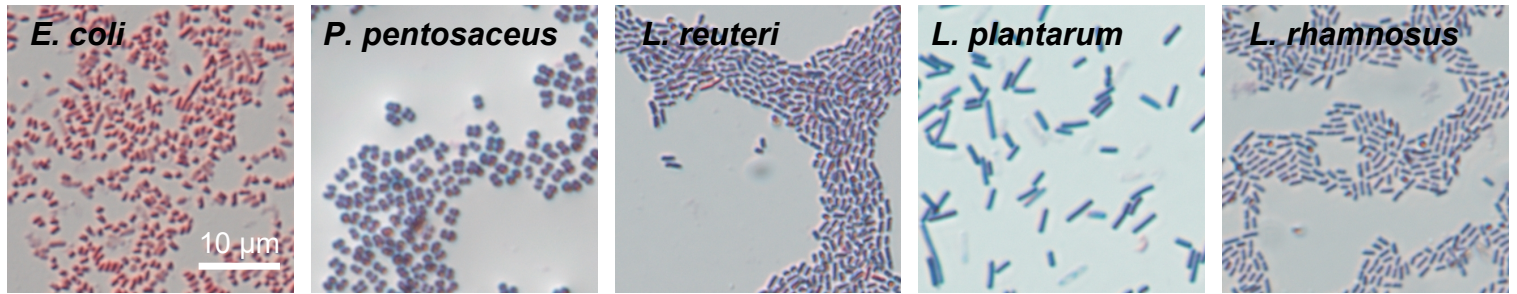


Figure S4 Peptone-free plates do not affect the beneficial effect of *Lb. reuteri*

Box plots comparing performance indices between worms cultivated on NGM plates without peptone.

Worms were cultivated at 23 °C with *E. coli* or *Lb. reuteri*. Numbers of experiments are shown. Statistics: One-way ANOVA followed by Dunnett's multiple comparison test compared to the D1 control for each condition, $p^{***}<0.001$; ns, $p>0.05$.

**Figure S5 Images of Gram-stained bacteria**

Representative images of Gram-stained *E. coli* and select LAB. *E. coli* and LAB are Gram negative and positive, respectively. Scale bar: 10 µm.