

## Supplementary Materials

**Table S1.** The selection condition. The amount of aptamer library, counter SELEX, target SELEX, incubation temperature and incubation time, washing condition, and the amount of BSA/tRNA were indicated here.

SELEX rounds	Aptamer (pmol)	Counter SELEX (Incubation temperature and time)	Target SELEX (Incubation temperature and time)	Wash times	BSA/tRNA (pmol)
1	500	-	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	1	600
2	10	-	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	1	900
3	10	-	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	2	1200
4	10	-	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	2	1500
5	10	-	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	3	1800
6	10	250 $\mu$ L OD600=2 <i>R. microfus</i> Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	4	2100
7	10	50 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	6	2400
8	10	50 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	6	2700
9	10	50 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	6	3300
10	10	50 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	6	3600
11	10	50 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	6	3900
12	5	50 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 1 h	6	4200
13	5	50 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 0.5 h	6	4500
14	0.5	500 $\mu$ L OD600=2 per bacterium Incubation: 37 °C for 1 h	250 $\mu$ L OD600=1 Incubation: 37 °C for 0.5 h	6	4500

Note: 1. To avoid non-specific interaction between the aptamer and the cell surface, the BSA (100 mg/mL) and tRNA (10 mg/mL) as competitors were incubated with targeted cells. 2. Counter-selection: Aptamer library was incubated with *A. muciniphila*, *A. stercoricanis*, *R. intestinalis*, *B. producta*, and *R. microfus*. 3. Target SELEX: Aptamer library was incubated with *P. distasonis*.