**Table S1. Bacterial strains and plasmids used in this study.**

| Strains or plasmids | Characteristics | Source |
|---|---|---|
| Strains | | |
| *E. coli* DH5α | $F^-$ φ80*lacZ*ΔM15 Δ(*lacZYA-argF*) *U169 recA1 endA1 hsdR17* ($rK^-$, $mK^+$) *phoA supE44* $\lambda^-$ *thi-1 gyrA96 relA1* | Invitrogen |
| *L. paracasei* BL23 | Previously known as *L. zeae* ATCC 393 $pLZ15^-$ | [13] |
| *L. paracasei* BL23-pIAV7 | *L. paracasei* BL23 harboring pAF900 | [19] |
| *L. paracasei* BL23-1E4 | *L. paracasei* BL23 harboring pAF900-1E4 | This study |
| Plasmids | | |
| pIAV7 | Broad-range vector, Erm, *lacZ*, pWV01 replication origin | [17] |
| pAF900 | Surface-anchored (anchor domain 243-aa PrtP of *L. paracasei* BL23) scFv anti-SAI/II in pIAV7 | [19] |
| pAF900-1E4 | pAF900 inserted with 1E4 expression cassette | This study |

**Table S2. *Lactobacillus paracasei* BL23-pIAV7 (negative control) or BL23-1E4 collected from the feces of germ-free mice after oral administration**

| | BL23-pIAV7 | BL23-1E4 |
|---|---|---|
| 8 h | $5.14 \times 10^6$ cfu/ml $\pm 2.08 \times 10^5$ | $5.53 \times 10^5$ cfu/ml $\pm 1.38 \times 10^5$ |
| 72 h | $9.94 \times 10^6$ cfu/ml $\pm 4.38 \times 10^5$ | $3.14 \times 10^6$ cfu/ml $\pm 4.98 \times 10^5$ |
| 240 h | $3.13 \times 10^5$ cfu/ml $\pm 1.31 \times 10^5$ | $1.87 \times 10^5$ cfu/ml $\pm 1.08 \times 10^5$ |

Samples of feces (0.1 g) collected from germ-free mice at the indicated times after their oral administration *with L. paracasei* BL23-pIAV7 or BL-23-1E4 were suspended in 1 ml PBS and then further diluted 2000-fold in PBS; 100 µl of this final dilution was spread on a MRS agar plate containing 5 µg/ml erythromycin agar plate and grown anaerobically for about 48 h at 37°C. Each data are shown colony forming unit (cfu) per ml of sample. The experiment was performed three times, and results are shown as mean ±1 SD. No *L. paracasei* BL23-pIAV7 and BL-23-1E4 were found at 336 h after oral administration.