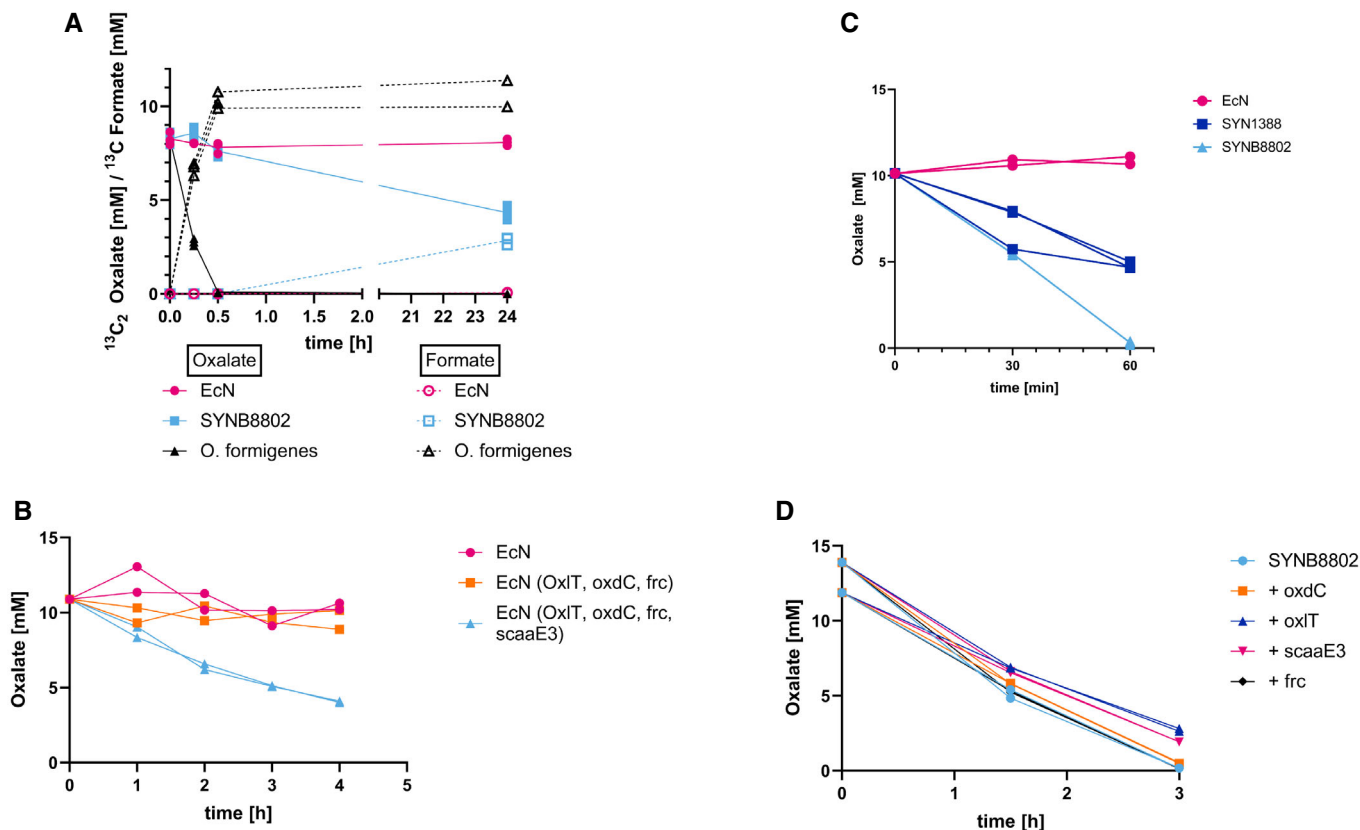
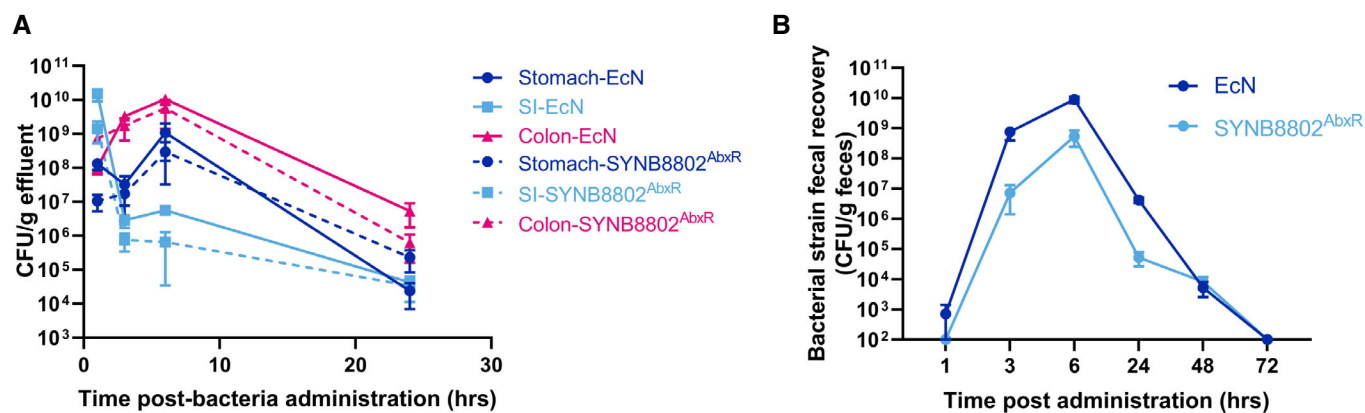


## Expanded View Figures



**Figure EV1. SYN8802 in vitro evaluation.**

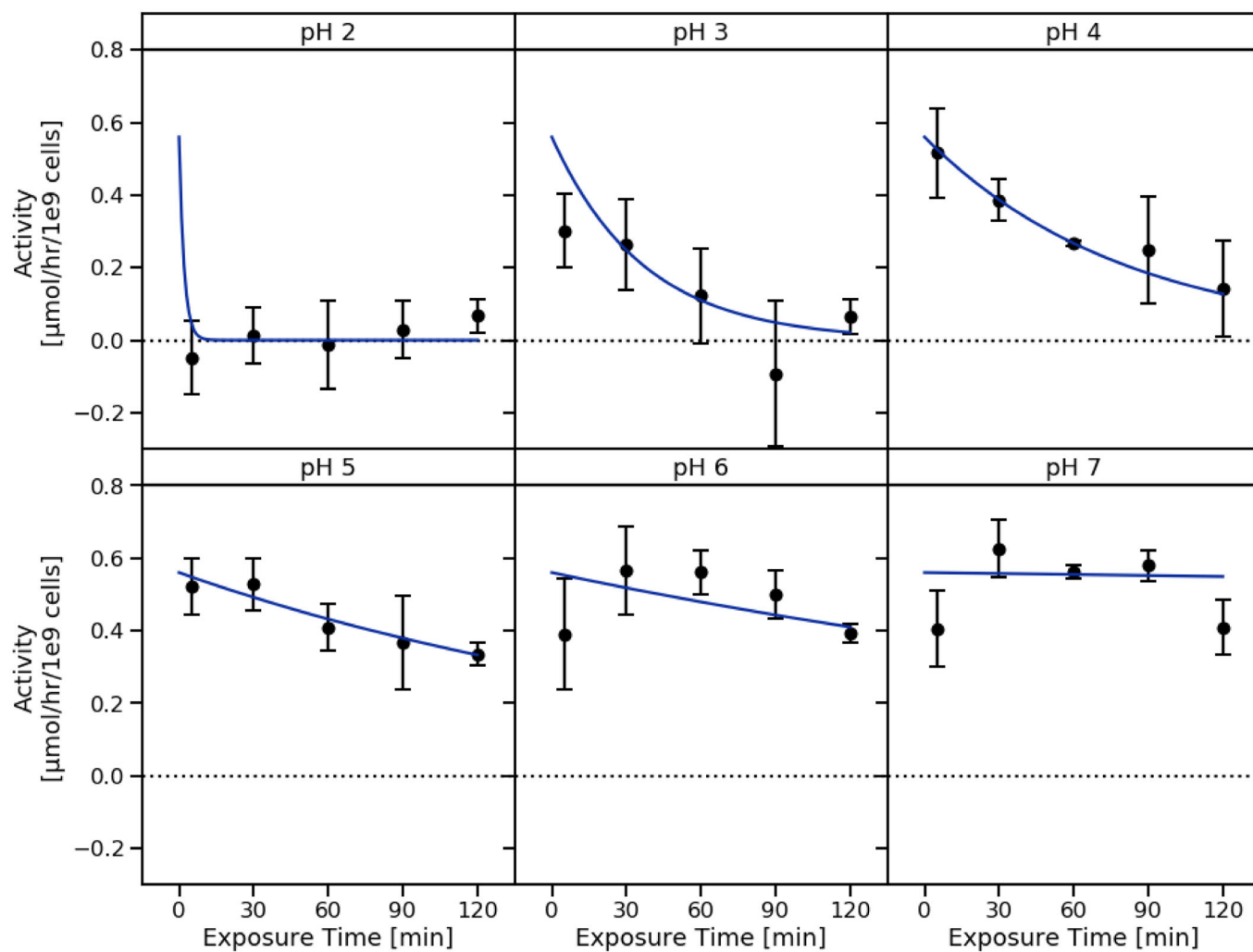
- A SYN8802 vs. *Oxalobacter formigenes*. Left y-axis:  $^{13}\text{C}_2$ -oxalate in mM,  $^{13}\text{C}$ -formate in mM, x-axis: time in hours. *Oxalobacter formigenes* (black, triangle, solid line: oxalate, dotted line: formate). SYN8802 (light blue, square, solid line: oxalate, dotted line: formate). The control EcN (pink, circle, solid line: oxalate, dotted line: formate). Biological triplicates were run and plotted separately.
- B ScaaE3 is needed for oxalate degradation in EcN. Y-axis shows oxalate in mM. X-axis: time in hours. Wild type EcN (pink, circle). EcN expressing the OF genes *oxdC*, *oxIT*, and *frc* on p15a (orange, square). EcN expressing the OF genes including *scaaE3* on p15a (light blue, triangle). Biological duplicates were run and plotted separately.
- C SYN8802 vs. SYN1388. Y-axis shows oxalate in mM. X-axis: time in minutes. Wild type EcN (pink, circle). Prototype strain SYN1388 (blue, square). SYN8802 (light blue, triangle). Biological duplicates were run and plotted separately.
- D Overexpression of individual pathway components. Y-axis shows oxalate in mM. X-axis: time in hours. SYN8802 (blue, circle). SYN8802, with added plasmid-based expression of *oxdC* (orange, square). SYN8802, with added plasmid-based expression of *oxIT* (blue, triangle). SYN8802, with added plasmid-based expression of *scaaE3* (pink, triangle). SYN8802, with added plasmid-based expression of *frc* (black, diamond). Biological duplicates were run and plotted separately.



**Figure EV2. EcN and SYN8802 intestinal distribution and fecal clearance in mice.**

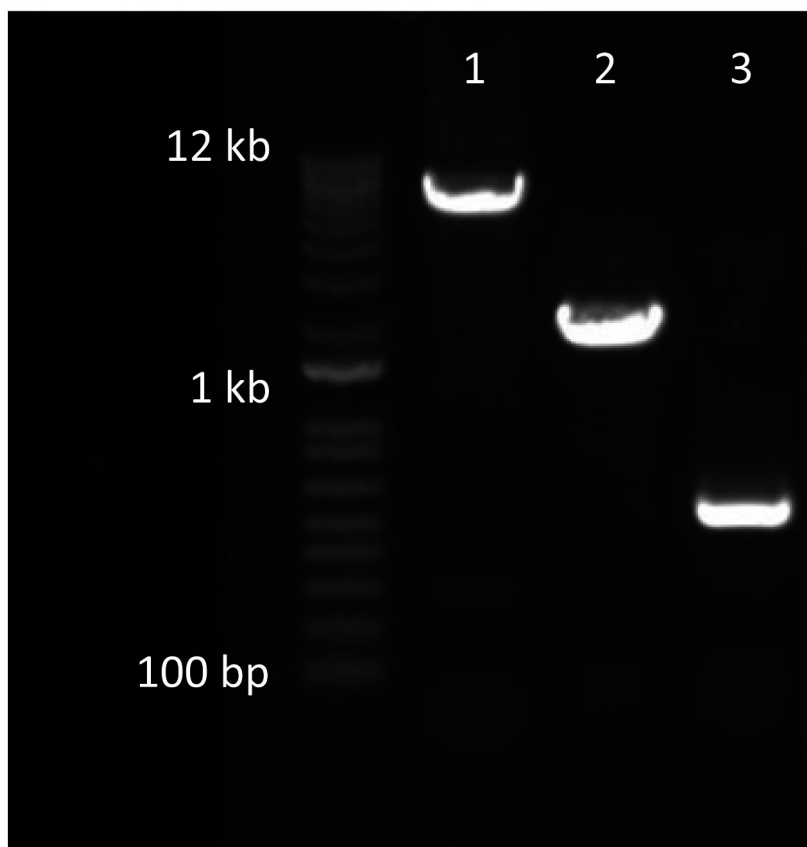
A EcN and SYN8802<sup>AbxR</sup> *in vivo* kinetics. Abundance of EcN or SYN8802<sup>AbxR</sup> in gut effluents of healthy mice following single oral dose of bacteria. Data represented as mean  $\pm$  SEM,  $n = 4$ /group/timepoint. Full lines represent EcN and hatched lines represent SYN8802<sup>AbxR</sup>.

B EcN and SYN8802<sup>AbxR</sup> fecal clearance. Abundance of EcN or SYN8802<sup>AbxR</sup> in fecal pellets of healthy mice following single oral dose of bacteria. Data represented as mean  $\pm$  SEM,  $n = 5$ /group. Dark blue curve represents EcN and light blue curve represent SYN8802<sup>AbxR</sup>.



**Figure EV3. SYN8802 pH inhibition *in vitro* simulation.**

SYN8802 activity as a function of exposure time to medium at pH ranging from 2.0 to 7.0. Points and error bars in black represent *in vitro* measurements ( $n = 3$  replicate cultures per group; mean  $\pm$  SD). Blue curves represent exponential decay models fit to *in vitro* measurements for each pH level.



**Figure EV4. Agarose gel of PCR verification for SYN8802.**

Lane 1 shows insertion of *agal/rsmI::P<sub>FnrS</sub>-scaaE3-oxdC-*frc**. Lane 2 shows insertion of *exo/cea::P<sub>FnrS</sub>-oxIT*. Lane 3 shows knock out *thyA*.