

Supplementary Materials: Repurposing of Ciclopirox to Overcome the Limitations of Zidovudine (Azidothymidine) against Multidrug-Resistant Gram-negative Bacteria

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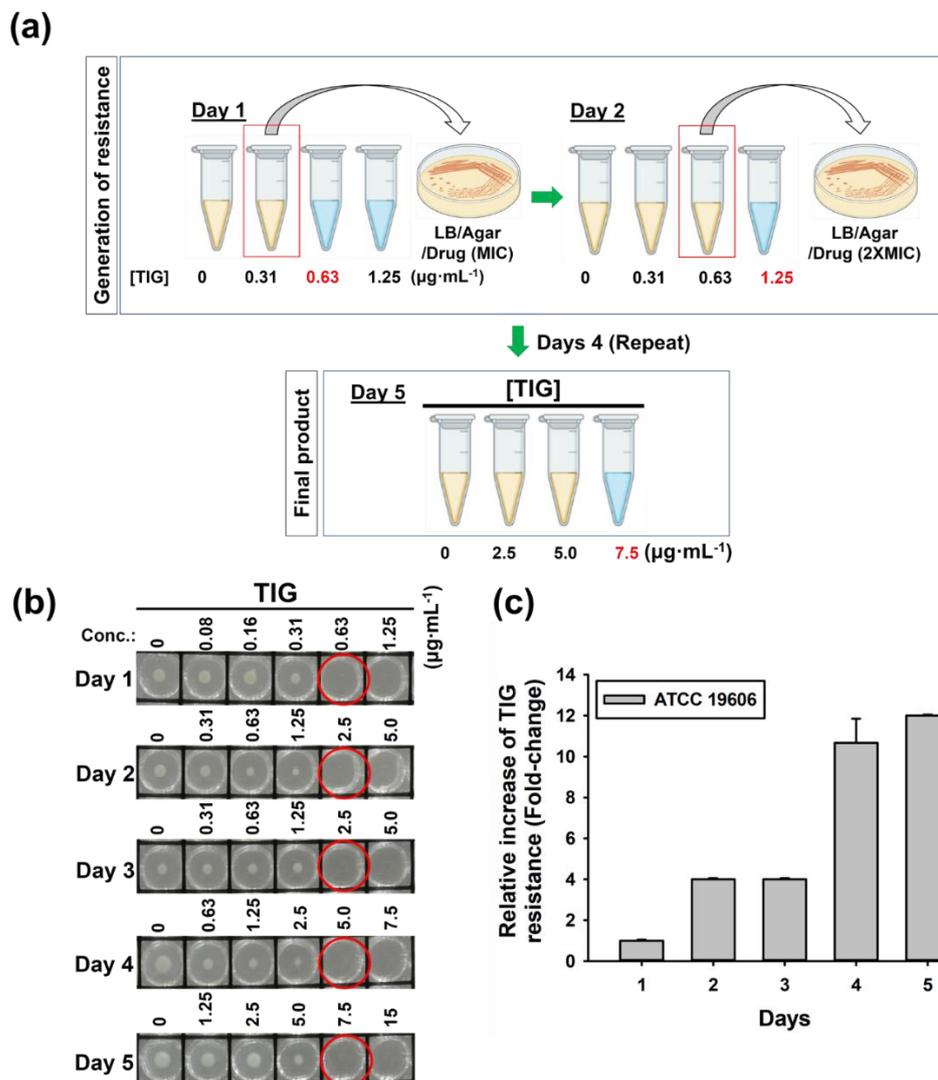


Figure S1. Generation of resistance phenotype by tigecycline (TIG). (a) Schematic representation of resistance generation method. (b) MIC values of TIG. One of the representative data from $n = 3$ was shown. (c) Relative increase of TIG resistance. The relative increase of resistance as a fold change to non-drug treated ATCC 25922 cells (set to 1) were calculated based on MIC changes from (b). The values shown in the graph at indicated days were averaged values from $n = 3$ with standard deviation ($p < 0.05$). The 96-well plates were imaged with digital camera (Samsung NX200, Suwon, Korea).

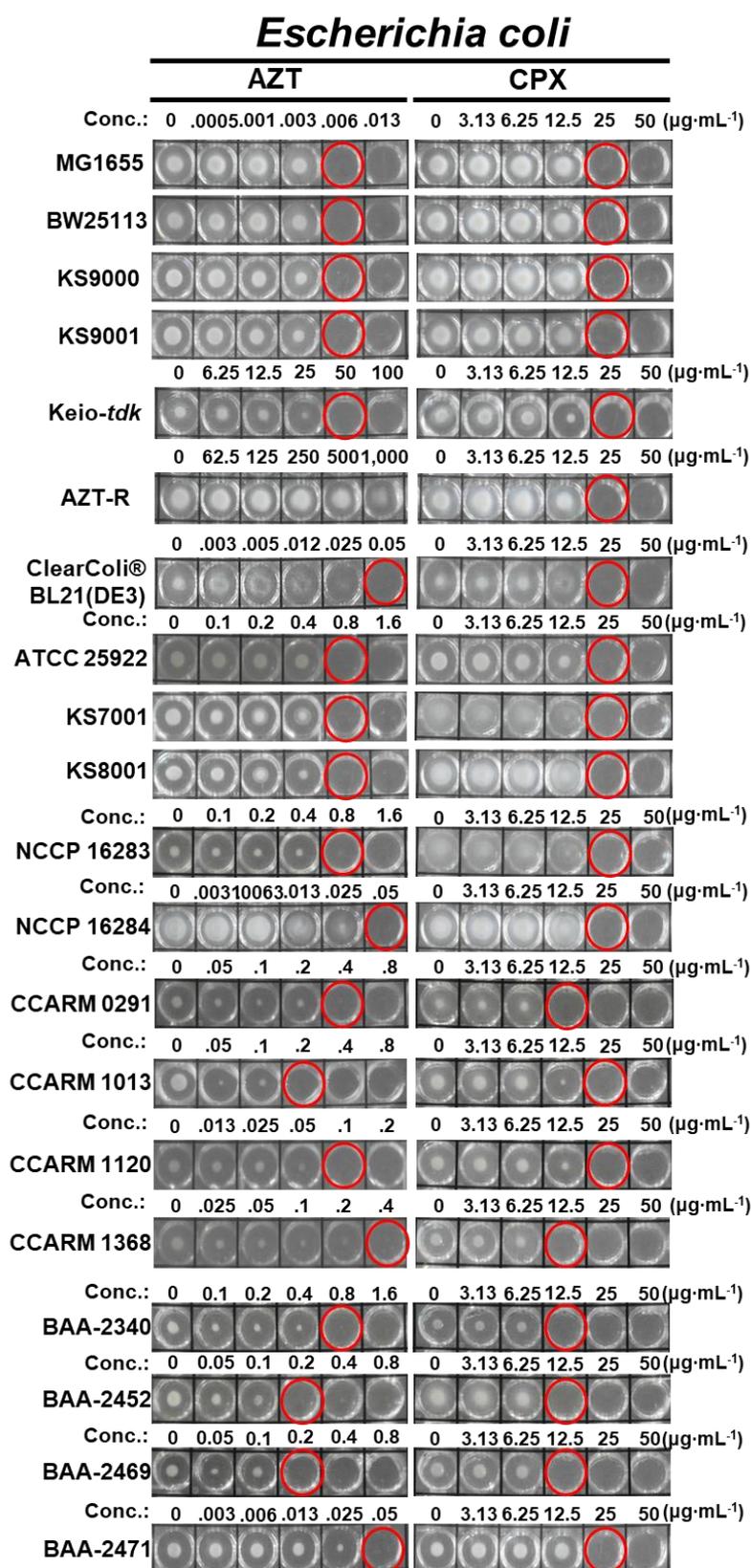


Figure S2. MIC determination of AZT and CPX against *E. coli* strains. MIC for individual strains was indicated by red circle. One of the representative data from $n = 3$ was shown. The 96-well plates were imaged with digital camera (Samsung NX200, Suwon, Korea).

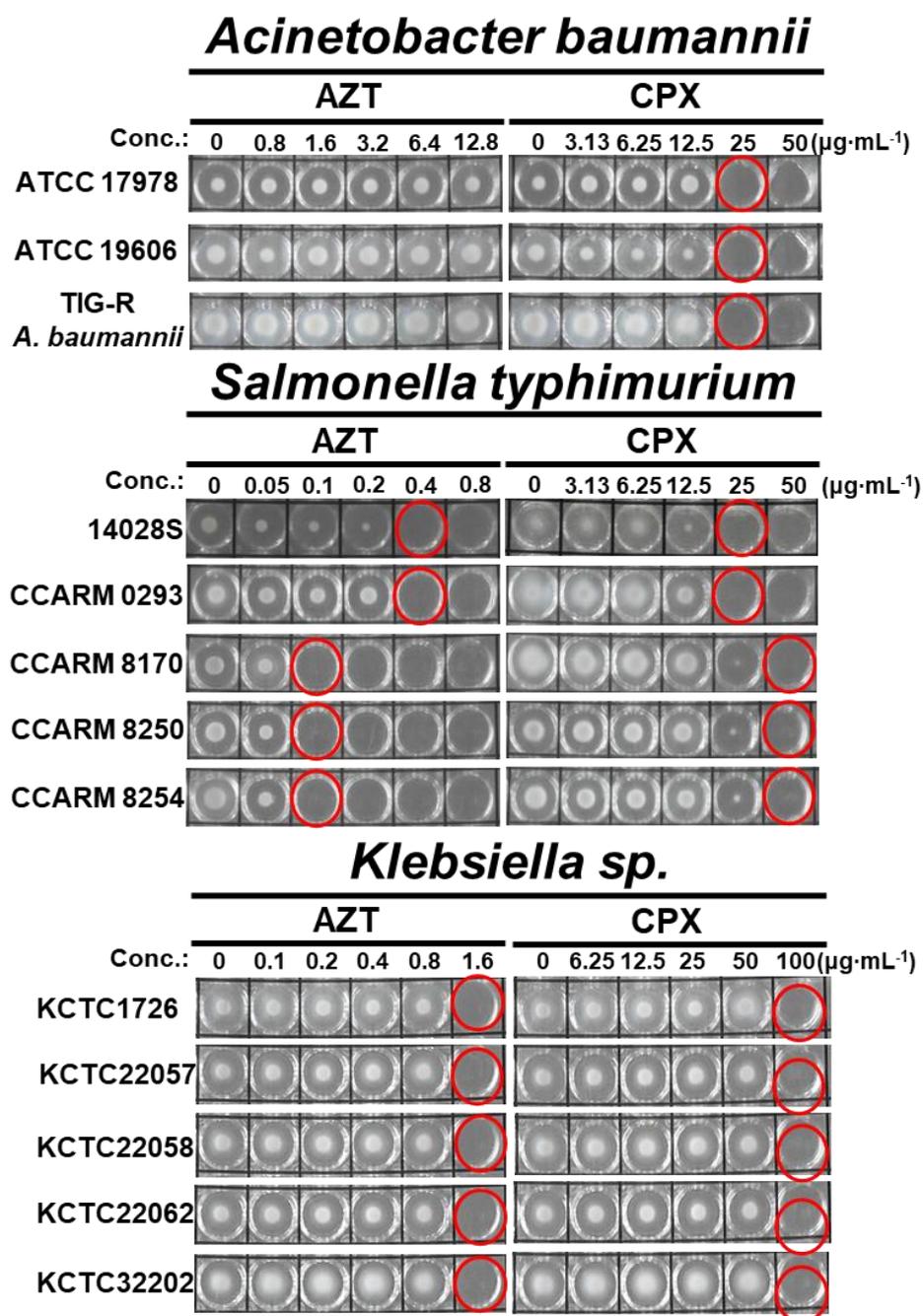


Figure S3. MIC determination of AZT and CPX against *A. Baumannii*, *Klebsiella sp.*, and *Salmonella typhimurium* strains. MIC for individual strains was indicated by red circle. One of the representative data from $n = 3$ was shown. The 96-well plates were imaged with digital camera (Samsung NX200, Suwon, Korea).

(a) **ATCC25922** ATGGCACAGCTATATTTCTACTATTCCGCAATGAATGCGGGTAAGTCTACAGCATTG
BW25113 ATGGCACAGCTATATTTCTACTATTCCGCAATGAATGCGGGTAAGTCTACAGCATTG
ATCC25922 TTGCAATCTTCATACAATTACCAGGAACGCGGCATGCGCACTGTCGTATATACGGCA
BW25113 TTGCAATCTTCATACAATTACCAGGAACGCGGCATGCGCACTGTCGTATATACGGCA
ATCC25922 GAAATTGATGATCGCTTTGGTGCCGGGAAAGTCAGTTCCGCTATAGGTTTGTTCATCG
BW25113 GAAATTGATGATCGCTTTGGTGCCGGGAAAGTCAGTTCCGCTATAGGTTTGTTCATCG
ATCC25922 CCTGCAAAATTTATTTAACCAAAATTCATCATTATTTGATGAGATTCGTGCGGAACAT
BW25113 CCTGCAAAATTTATTTAACCAAAATTCATCATTATTTGATGAGATTCGTGCGGAACAT
ATCC25922 GAACAGCAGGCAATTCATTGCGTACTGGTTGATGAATGCCAGTTTTTAACAGACAA
BW25113 GAACAGCAGGCAATTCATTGCGTACTGGTTGATGAATGCCAGTTTTTAACAGACAA
ATCC25922 CAAGTATATGAATTATCGGAGGTTGTCGATCAACTCGATATACCCGTACTTTGTTAT
BW25113 CAAGTATATGAATTATCGGAGGTTGTCGATCAACTCGATATACCCGTACTTTGTTAT
ATCC25922 GGTTCACGTACCGATTTTCGAGGTGAATTATTTATTGGCAGTCAATACTTACTGGCG
BW25113 GGTTCACGTACCGATTTTCGAGGTGAATTATTTATTGGCAGCCAATACTTACTGGCA
ATCC25922 TGGTCCGACAAACTGGTTGAATTA AAAAACCATCTGTTTTTGTGGCCGTAAAGCAAGC
BW25113 TGGTCCGACAAACTGGTTGAATTA AAAAACCATCTGTTTTTGTGGCCGTAAAGCAAGC
ATCC25922 ATGGTGCTGCGTCTTGATCAAGCAGGCAGACCTTATAACGAAGGTGAGCAGGTGGTT
BW25113 ATGGTGCTGCGTCTTGATCAAGCAGGCAGACCTTATAACGAAGGTGAGCAGGTGGTA
ATCC25922 ATTGGTGGTAATGAACGCTACGTTTCTGTATGCCGTAAACACTATAAAGAAGCGTTA
BW25113 ATTGGTGGTAATGAACGCTACGTTTCTGTATGCCGTAAACACTATAAAGAAGCGTTA
ATCC25922 GAAGTCGCTCATTAAACGGCTATTTCAGGAAAGGCATCGCCACGATTAA
BW25113 CAAGTCGCTCATTAAACGGCTATTTCAGGAAAGGCATCGCCACGATTAA

(b) **ATCC25922** MAQLYFYYSAMNAGKSTALLQSSYNYQERGMRTVVYTAEIDDRFGAGKVSSRIGLSS
BW25113 MAQLYFYYSAMNAGKSTALLQSSYNYQERGMRTVVYTAEIDDRFGAGKVSSRIGLSS
ATCC25922 PAKLNFQNSLFLDEIRAEHEQQAIHCVLVDECQFLTRQQVYELSEVVDQLDIPVLCY
BW25113 PAKLNFQNSLFLDEIRAEHEQQAIHCVLVDECQFLTRQQVYELSEVVDQLDIPVLCY
ATCC25922 GLRTDFRGELEFIGSQYLLAWSDKLVELKTICFCGRKASMLRLDQAGRPYNEGEQVV
BW25113 GLRTDFRGELEFIGSQYLLAWSDKLVELKTICFCGRKASMLRLDQAGRPYNEGEQVV
ATCC25922 IGGNERYSVCRKHYKEALEVGS LTAIQERHRHD*
BW25113 IGGNERYSVCRKHYKEALQVDSLTAIQERHRHD*

Figure S4. Sequence alignment of Tdk encoding genes from *E. coli* ATCC 25922 and BW25113 strains. Results of (a) DNA or (b) amino acid sequence alignments of ATCC 25922 and BW25113 strains using Clustal Omega (ClustalW2, v2.1, <http://www.clustal.org>; accessed on 1 March 2022). Nucleotides in red were indicated different positions in two strains.

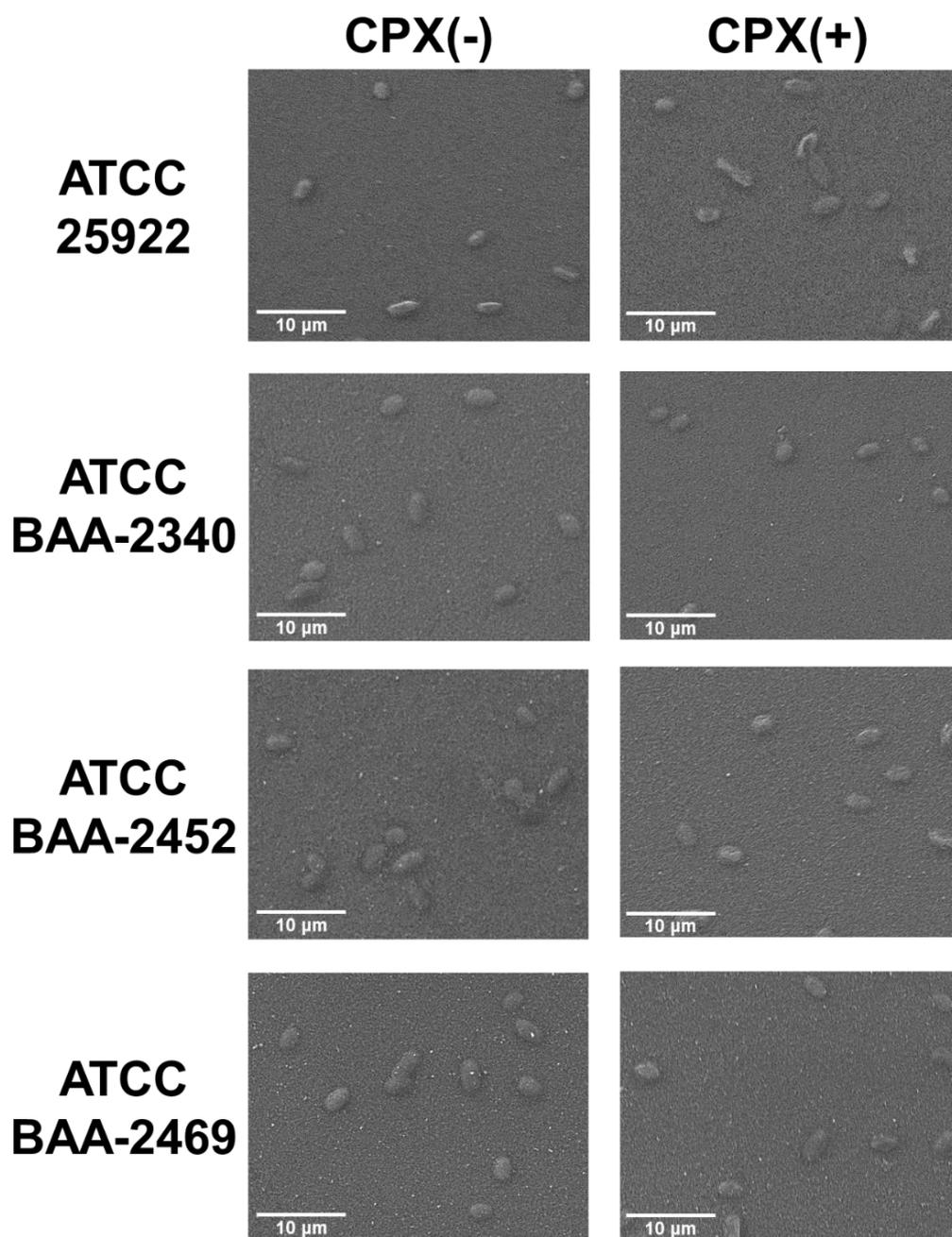


Figure S5. Morphological analysis. *E. coli* ATCC25922, ATCC BAA-2340, -2452, and -2469 cells with (+) or without (-) CPX at a sublethal concentration ($6.25 \mu\text{g} \cdot \text{mL}^{-1}$). Scanning Electron Microscopy (SEM) images. The same cells were imaged using Scanning Electron Microscopy (TESCAN, Fuveau, France). One representative from $n = 3$ was shown.

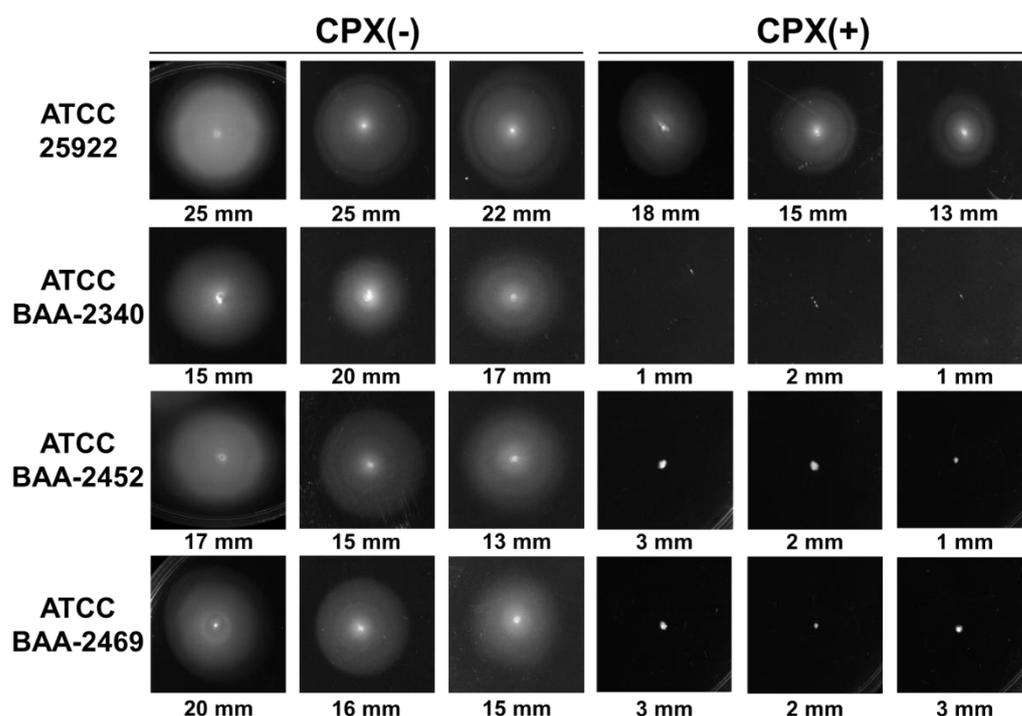


Figure S6. Motility assays. Swimming motility of *E. coli* ATCC 25922, ATCC BAA-2340, -2452, and -2469 cells with (+) or without (-) CPX at a sublethal concentration ($6.25 \mu\text{g}\cdot\text{mL}^{-1}$) was analyzed. Images of agar plates from triplicate experiments were captured by Image Lab™ Software (ver 5.2.1; Bio-Rad, Hercules, CA, USA) and averaged values with standard deviations were shown in Table 2. The diameter of grown bacterial cells on the plates were measured by a transparent ruler and was indicated.

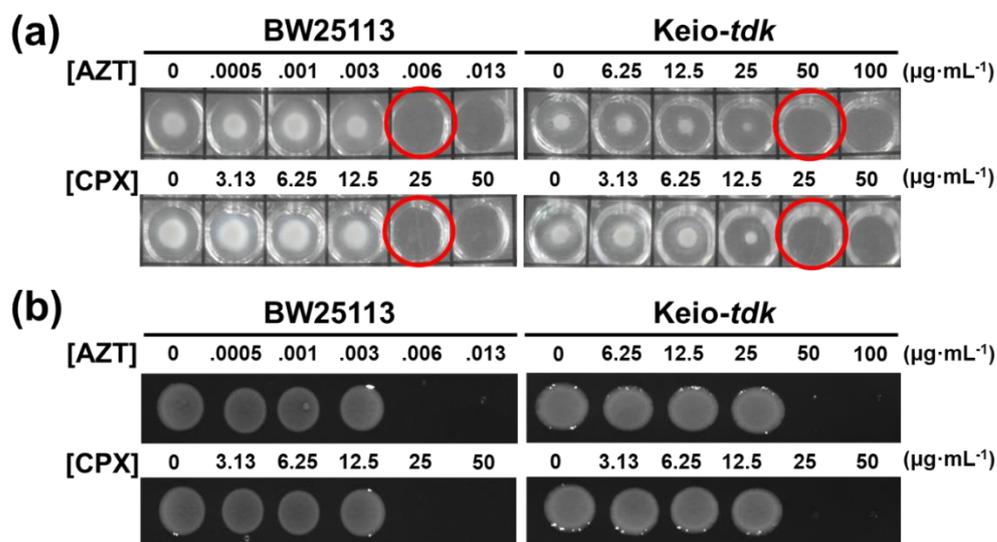


Figure S7. AZT and CPX activity against *tdk* knockout *E. coli* cells. (a) Determination of MIC and (b) bactericidal activity of AZT and CPX against *tdk* knockout (Keio-*tdk*) cells (Table 1). BW25113 was used as a control strain. Data shown here is one representative from $n = 3$. The 96-well and LB agar plates were imaged with digital camera (Samsung NX200, Suwon, Korea). One representative from triplicate experiments was shown. Red circles indicate MIC value for individual drugs.