

# Antimicrobial resistance of *Salmonella* Typhimurium in pig production in Poland: phenotypic and genotypic analysis

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**Introduction:** *Salmonella enterica* serovar Typhimurium remains one of the most important zoonotic pathogens associated with pig production. Its ability to persist and disseminate multidrug resistance (MDR) poses a significant challenge within the One Health framework. This study aimed to characterize phenotypic and genotypic antimicrobial resistance among *S. Typhimurium* isolates obtained from pigs and their environment in Poland between 2014 and 2019.

## Material and Methods:

- From ~580 *Salmonella* isolates collected in Poland (2014–2019), 36 *Salmonella* Typhimurium (including monophasic and atypical variants) isolates were selected for further analysis.
- Isolates originated from feces/manure, boot swabs, environmental dust, rectal swabs, and pork.
- Antimicrobial susceptibility was determined using the broth microdilution method (EUVSEC plates, TREK Diagnostic Systems), covering 14 antimicrobial agents. Minimum inhibitory concentration (MIC) values were interpreted according to EUCAST epidemiological cut-off values (ECOFFs).
- Whole-genome sequencing (WGS) was performed on the MiSeq platform (2×300 bp; Illumina). Sequence data were analyzed using Staramr tools implemented in Galaxy ARIES.

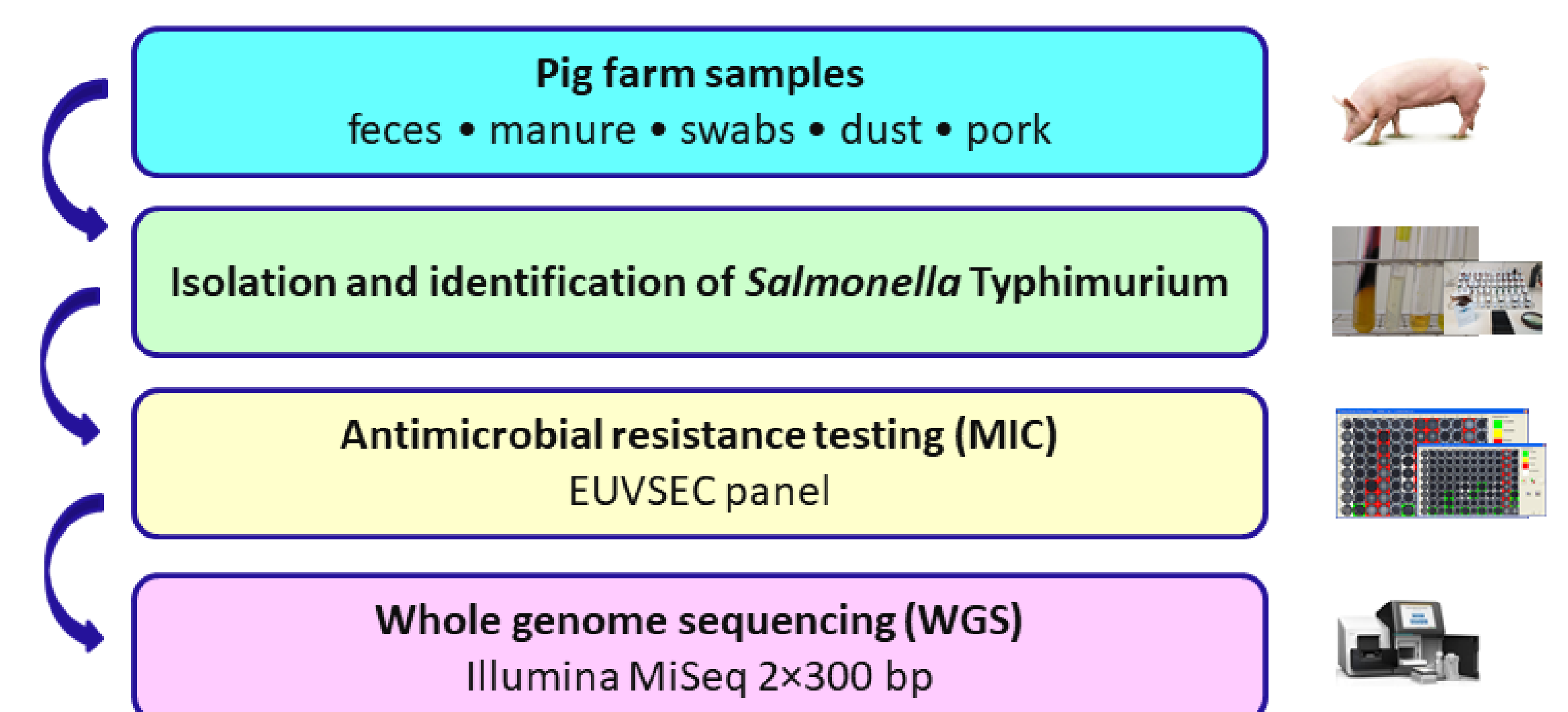


Figure 1. Study design and workflow.

## Results:

- MIC above ECOFF values were observed for ampicillin ( $\geq 32$  mg/L), sulfamethoxazole ( $\geq 512$  mg/L), tetracycline ( $\geq 32$  mg/L), trimethoprim ( $\geq 16$  mg/L), and nalidixic acid ( $\geq 128$  mg/L).
- Reduced susceptibility to ciprofloxacin correlated with mutations in *gyrA*.
- All isolates were susceptible to medically important meropenem and colistin.
- Two major clonal lineages predominated: ST19 (n = 12) and ST34 (n = 24).
- ST19 isolates most frequently harbored *bla*<sub>CARB-2</sub>, *floR*, *tet*(G), *sul1*, and *aadA2*, together with the *gyrA* (D87N) mutation.
- ST34 isolates showed more diverse MDR profiles, including *bla*<sub>TEM-1B</sub>, *sul2*, *tet*(A/B), *aadA1*, *aph*, and sporadically *qnrS1*.

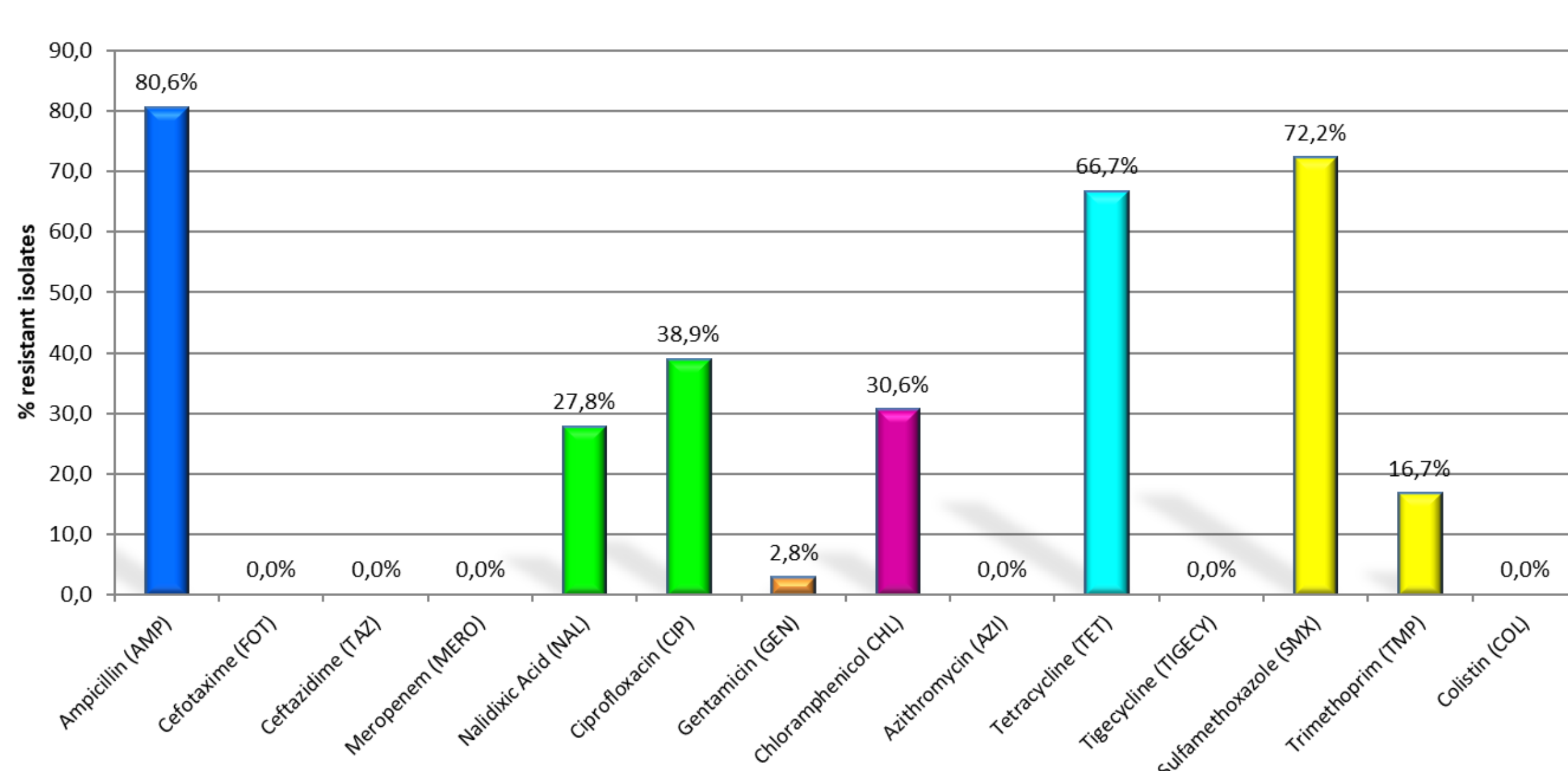


Figure 2. Percentage of *Salmonella* Typhimurium isolates resistant to selected antimicrobials (above ECOFF values).

**Conclusions:** The study demonstrates the circulation of MDR *Salmonella enterica* serovar Typhimurium ST19 and ST34 clones in Polish pig production between 2014 and 2019, highlighting the value of integrated AMR surveillance within the One Health approach.

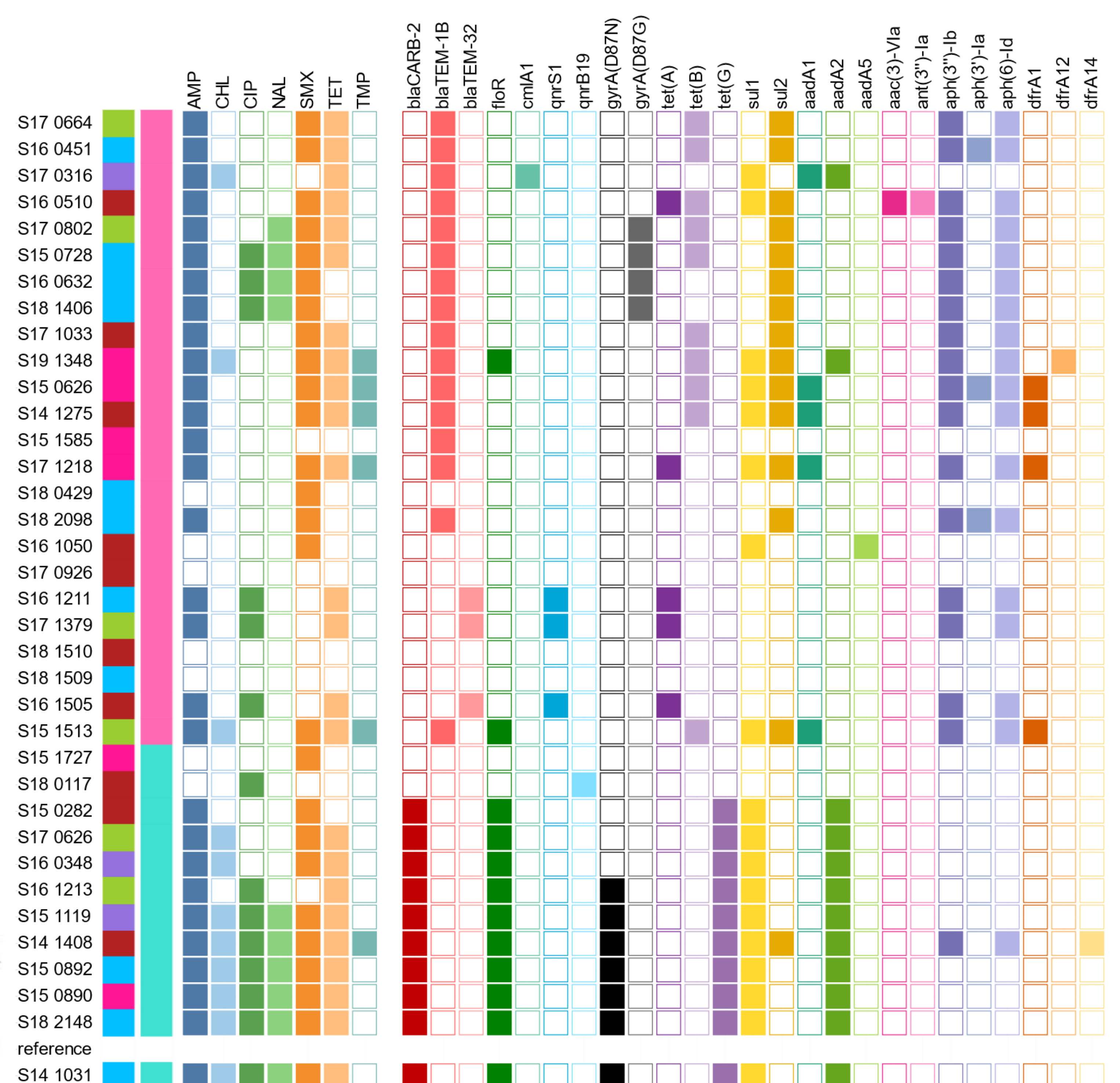


Figure 3. Phenotypic and genotypic antimicrobial resistance profiles of *Salmonella* Typhimurium isolates.