

## Abstract

Antibiotic resistance is an emerging global problem threatening human health as resistant bacteria become difficult or impossible to treat with existing antibacterial drugs. Contamination of antibiotics or substances with antimicrobial activity from human discharge activities including domestic, agricultural, and industrial activities is believed to be the leading cause of antibiotic resistance development. In this study, the indole test and the disk diffusion method are used to confirm *E. coli* and to measure the multidrug resistance of *E. coli* in wastewater.

As the results, the indole test showed that the highest percentage of positive colonies in S1 about 75-100% and the lowest in S5 about 45-60%. The disk diffusion test showed that *E. coli* strains resistant to 1 of 5 target antibiotics (Amikacin, Amoxicillin/clavulanic acid, Cefixime, ciprofloxacin, Sulfamethoxazole/Trimethoprim) isolated from wastewater samples gave a total of cross-resistance with other antibiotics is very high. Many strains are resistant to more than 1 antibiotic, especially Amikacin resistant strains have the resistance rate to all 5 antibiotics tested up to 31.25%.

The results showed that antibiotic-resistant pollution is present in wastewater in Ho Chi Minh City, and specific action plans need to be taken to minimize the level of pollution as well as the possibility of spreading antibiotic resistance in the environment.

## Material and Methods

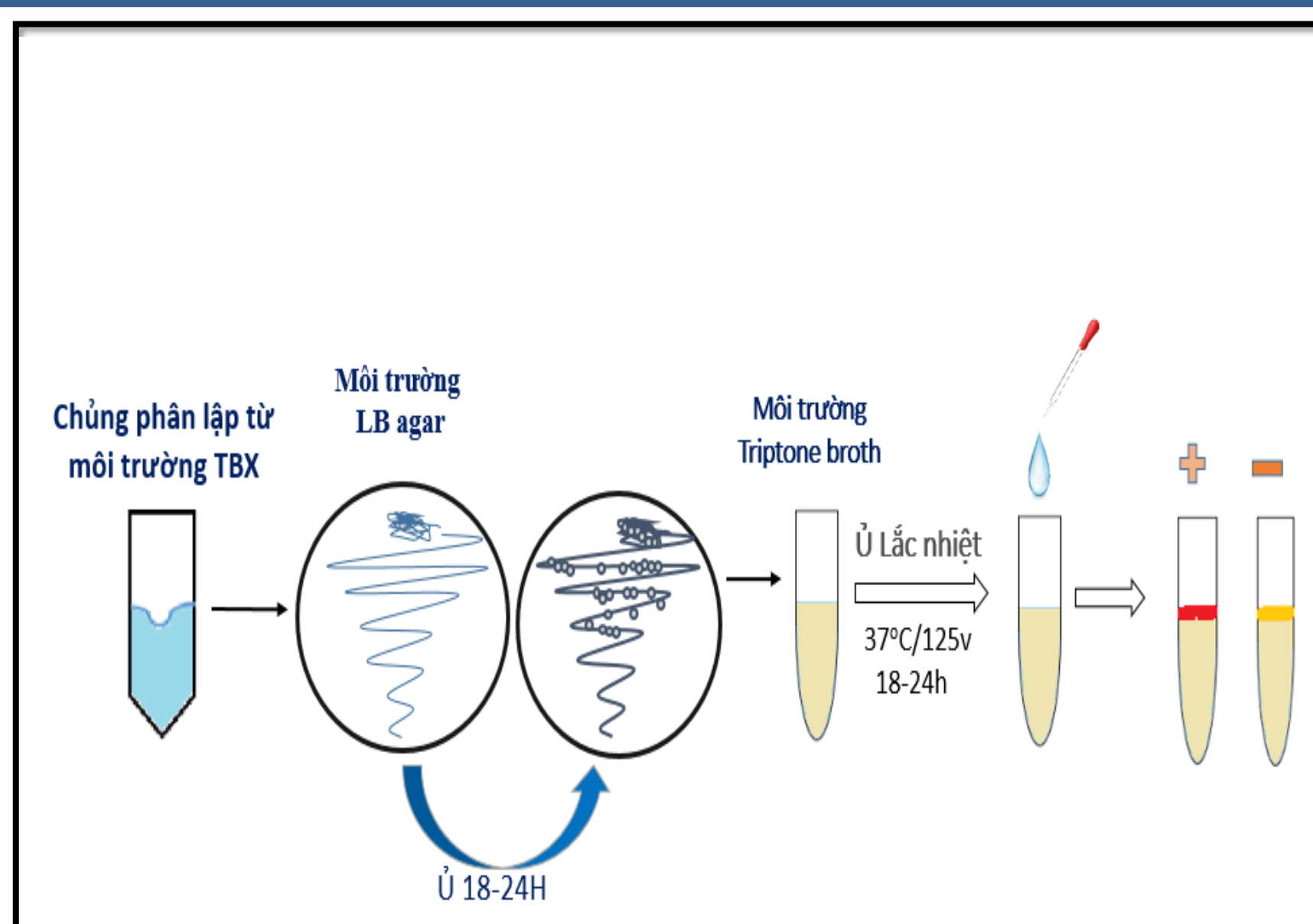


Figure 1. Steps to perform indole test

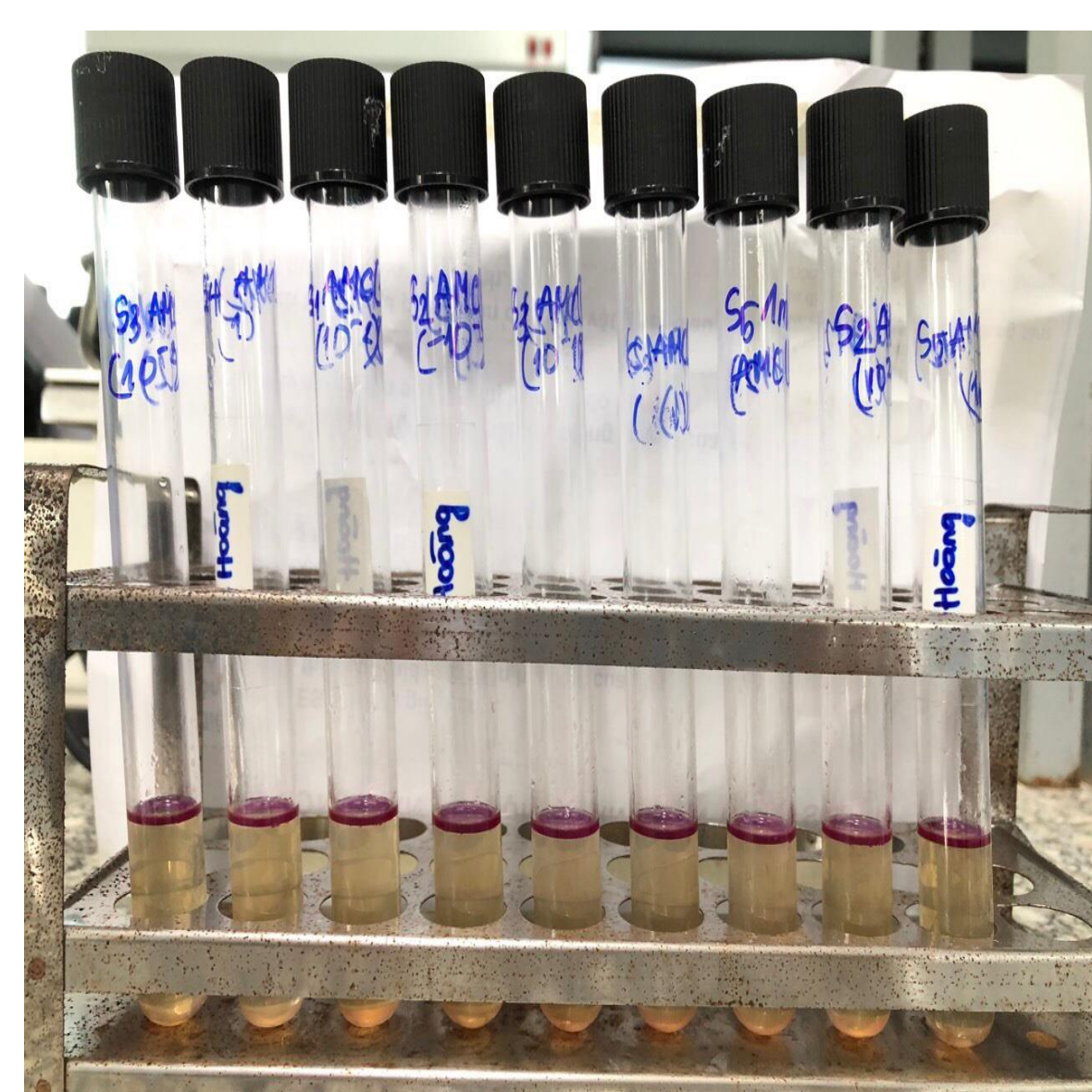


Figure 3. Samples with red color layer on top of the solution were considered positive with the indole test

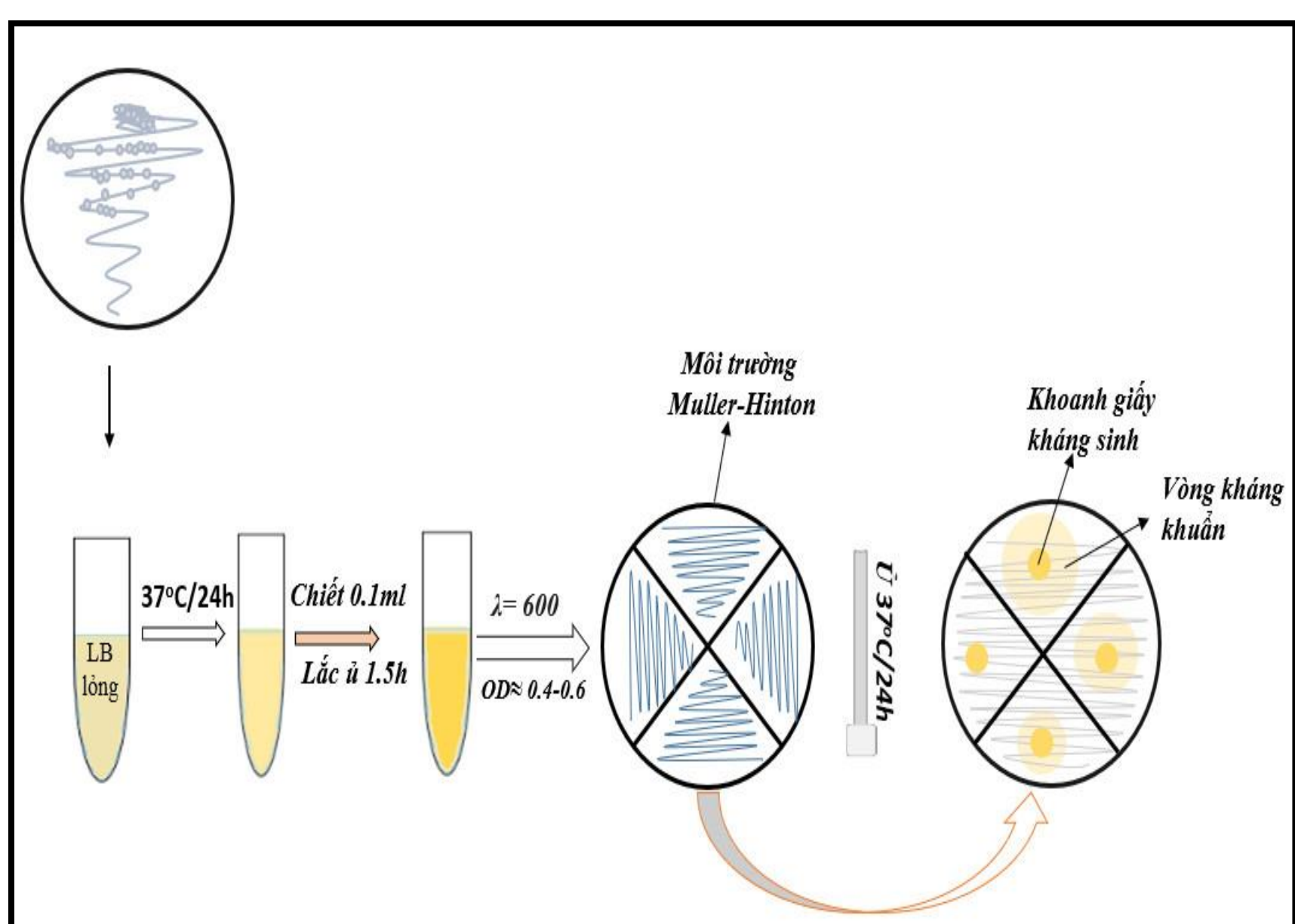


Figure 2. Steps to perform a disk diffusion test



Figure 5. The colonies shown the inhibition zone (clear zone) higher than CLSI standard were considered as resistant colonies.

## Results

Table 1. Total number of antibiotic resistant colonies positive with indole tests

Samples	Total number of colonies tested with indole	The number of colonies negative with indole	The number of colonies positive with indole
AMI resistant colonies	20	4	16
AMC resistant colonies	20	4	16
CEF resistant colonies	20	5	15
CIP resistant colonies	20	4	16
SXT resistant colonies	20	5	15
Total number of colonies on TBX	100	22	78

Table 2. The resistance rate of colonies resistant to multi antibiotics

Samples	Resistant rate of AMC colonies (%)	Resistant rate of AMI colonies (%)	Resistant rate of CEF colonies (%)	Resistant rate of CIP colonies (%)	Resistant rate of SXT colonies (%)
1 Ab	13,33	6,25	26,67	7,14	21,42
2 Ab	53,33	6,25	13,33	28,57	21,42
3 Ab	26,67	25	6,67	21,42	28,57
4 Ab	0	25	26,67	14,28	21,42
5 Ab	6,67	31,25	13,33	14,28	7,14

## Discussion

- ✓ AMI-resistant strains showed the highest resistance level to many antibiotics, specifically 25% of the isolates were resistant to more than 3 and 4 antibiotics, 31.25% were resistant to 5 antibiotics tested.
- ✓ Antibiotic-resistant *E. coli* isolated from wastewater samples are not only resistant to only one drug, but also have cross-resistance to many drugs
- ✓ Amikacin-resistant strains (AMI) showed the strongest multi-drug resistance among the tested antibiotics.

## Conclusions

- ✓ High percentage of antibiotic resistant bacteria in the wastewater are *E. coli*, an indicator bacteria for human pathogen.
- ✓ Antibiotic resistant *E. coli* in the wastewater treatment plant can resist to many different antibiotic.
- ✓ The presence of antibiotic-resistant *E. coli* in the effluent can be a source of antibiotic resistance spread into the environment.

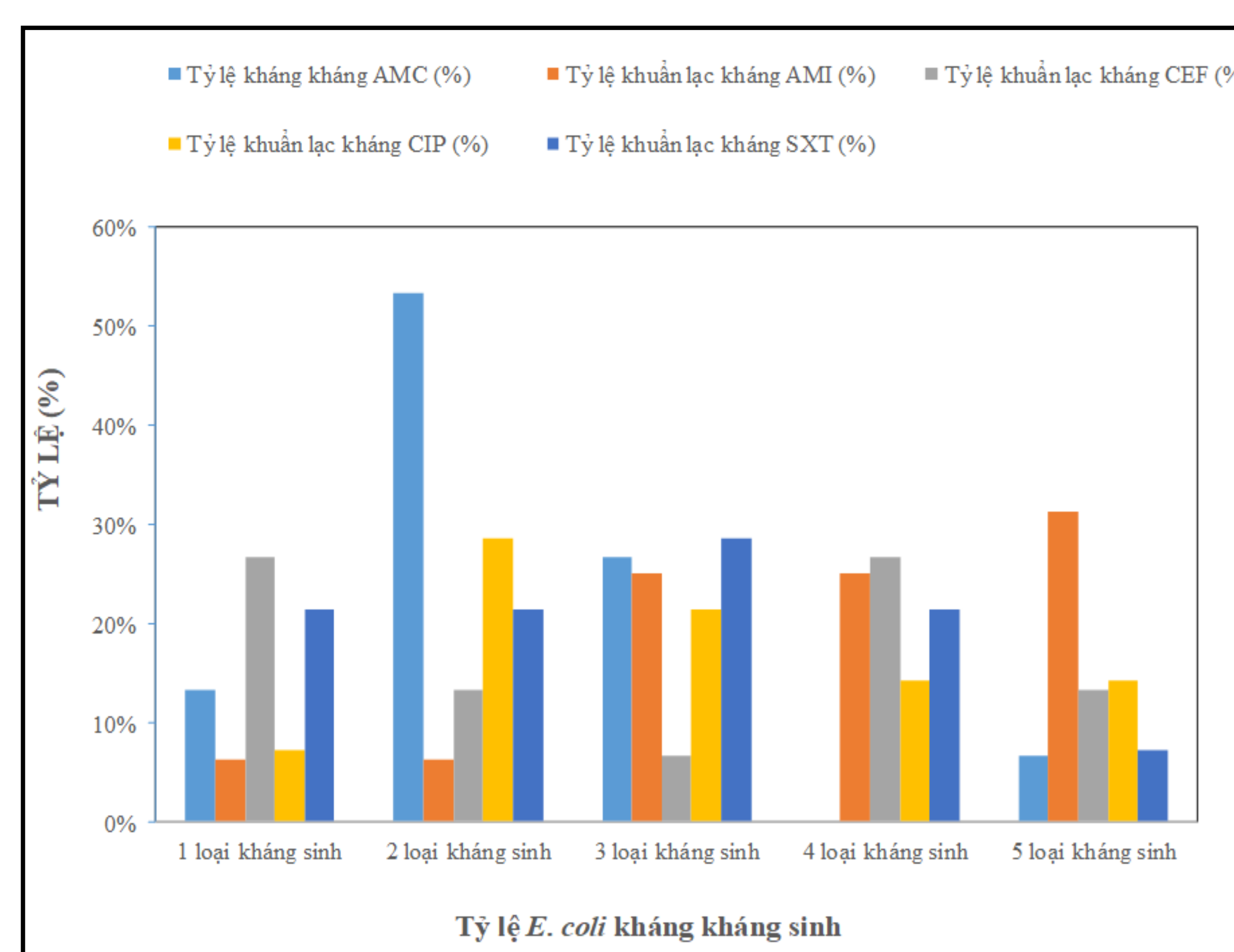


Figure 4. The percentage rate of *E. coli* resistant to multi antibiotics

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## References

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