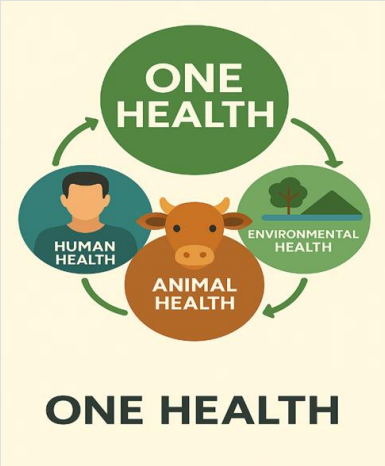
AN AQUATIC SYSTEM MULTI-LEVEL EVALUATION USING SPECIES-SPECIFIC SENSITIVITY BIOINDICATORS



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One Health
Student International Conference
Under the Patronage of the Romanian Academy
3-5th December 2025 | București, România

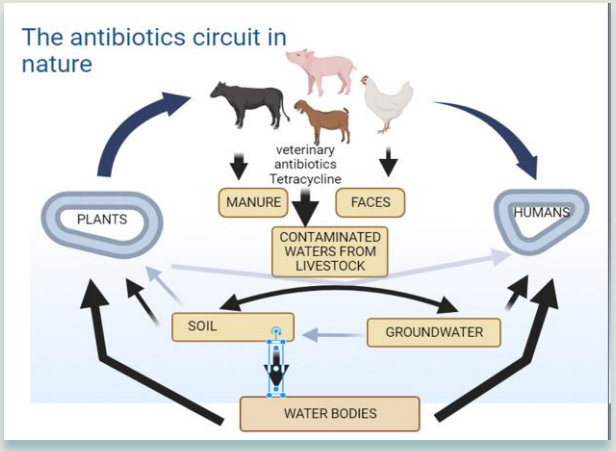
Antibiotic Pathways in the Environment

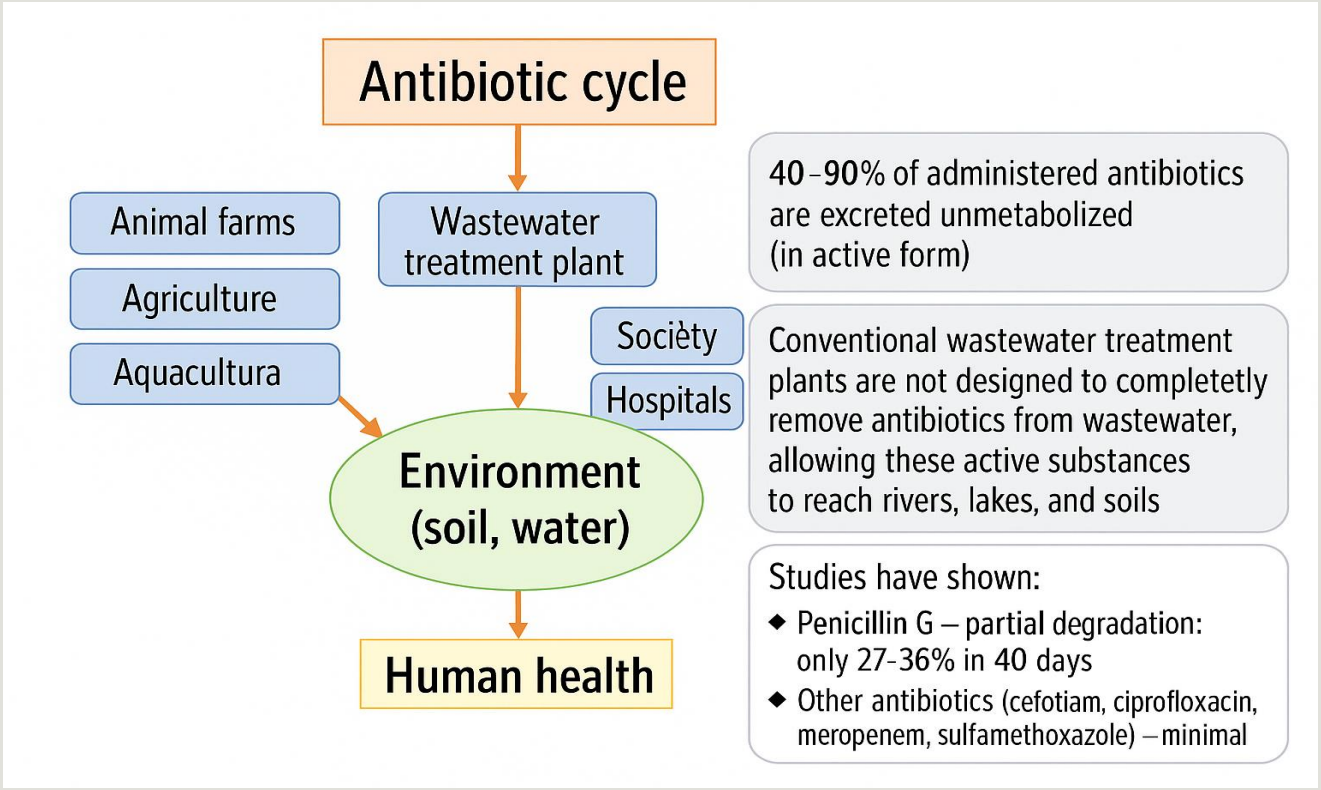
Medical use → Excretion → Wastewater → Natural waters

✓ Sources

✓ Entry routes

✓ Point vs non-point contamination

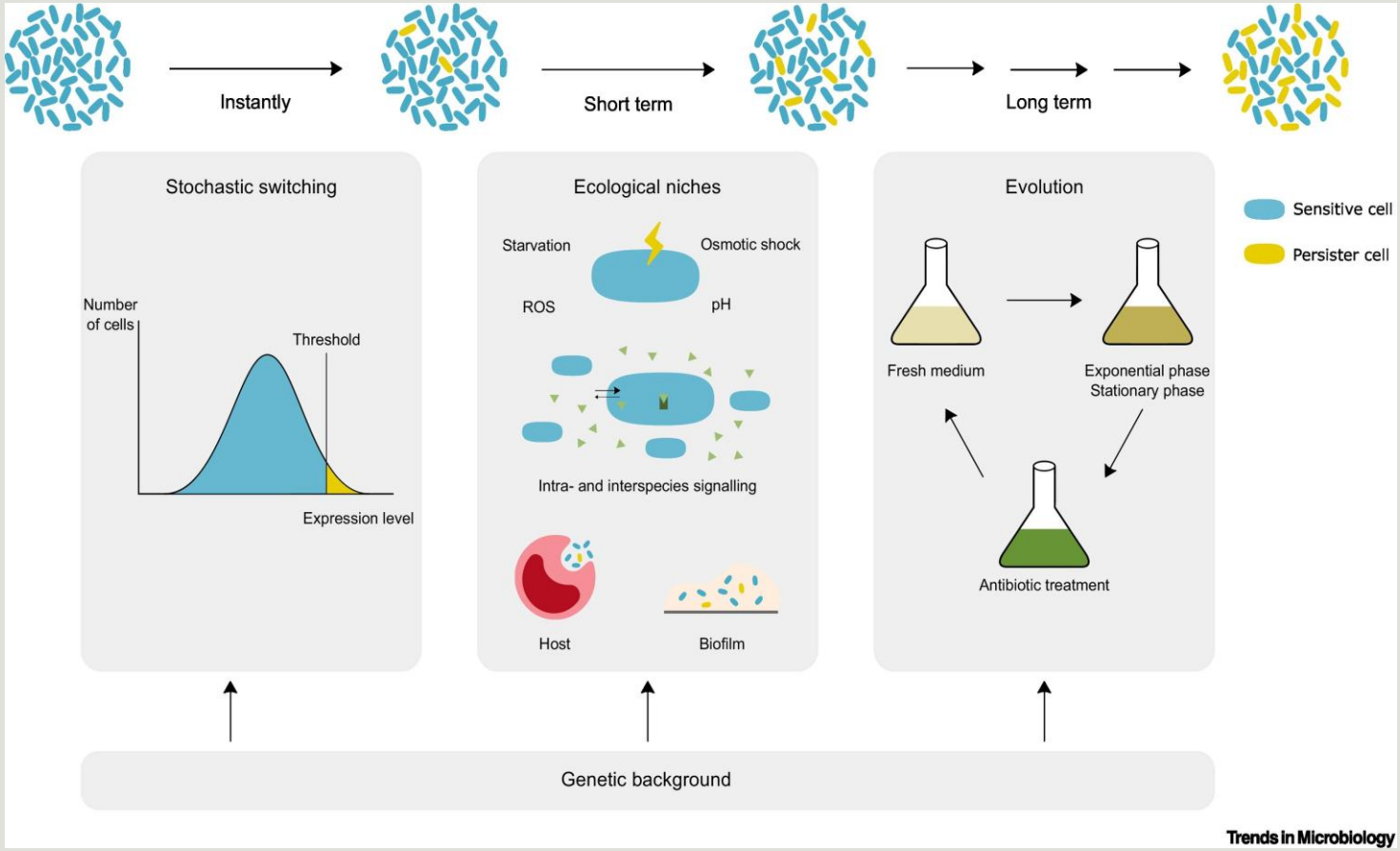




Environmental Fate of Antibiotics

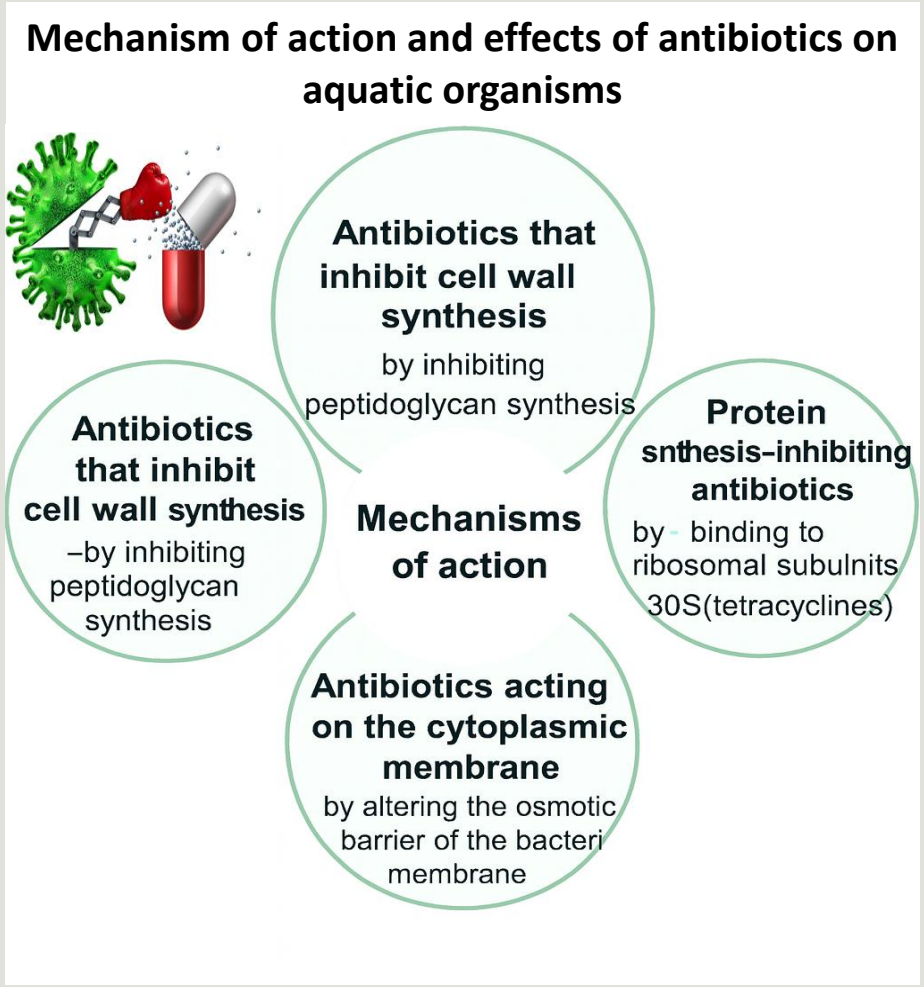
Environmental persistence and microbial disturbance

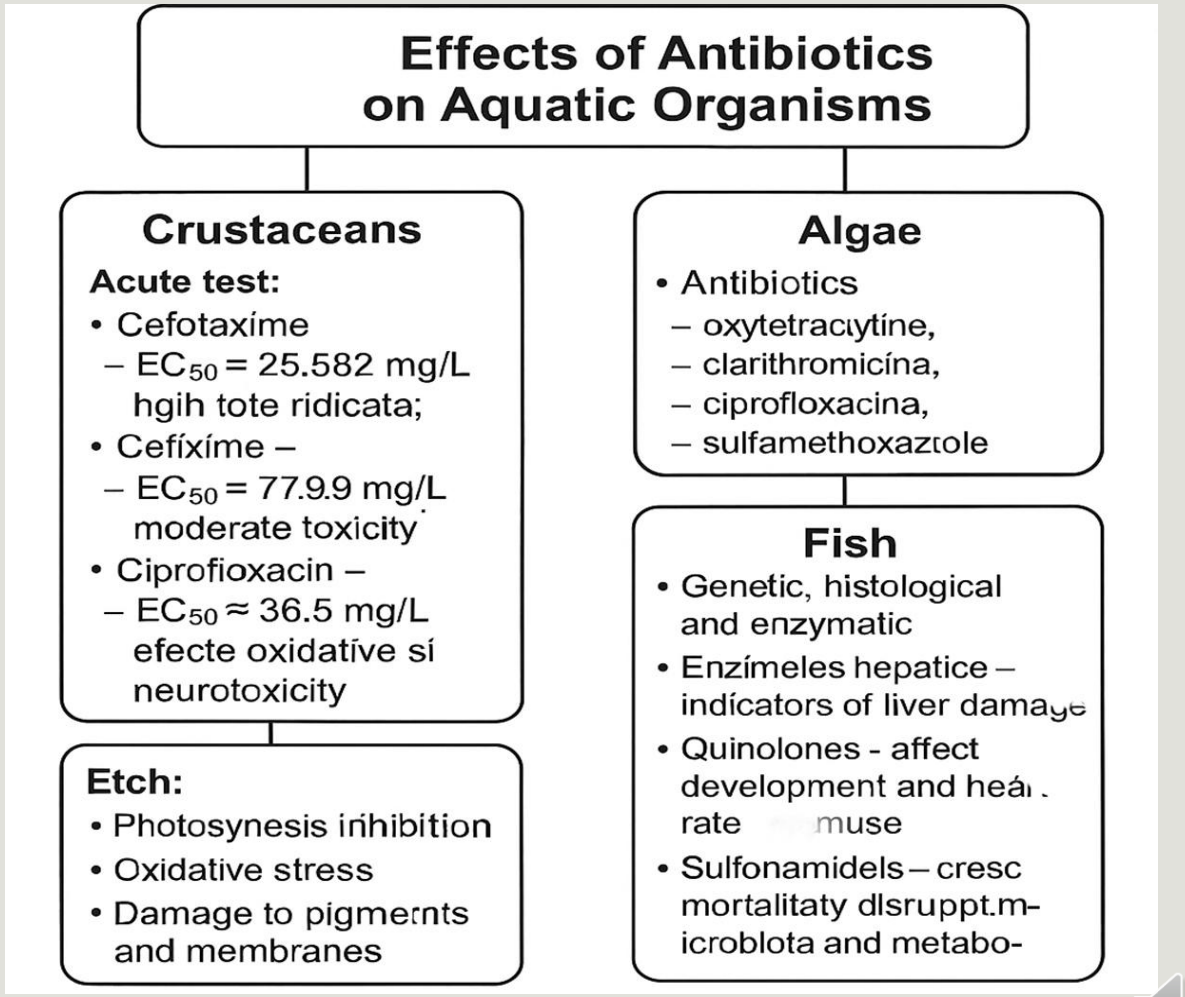
✓ Persistence
✓ Transformation
✓ Bioaccumulation



Ecological Implications of Antibiotic Pollution

✓ Microbial disruption
✓ Ecosystem imbalance
✓ AMR acceleration

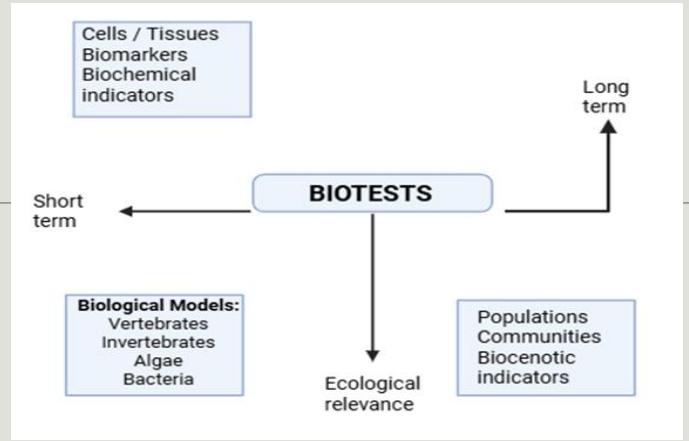




Aquatic System Toxicity Evaluation

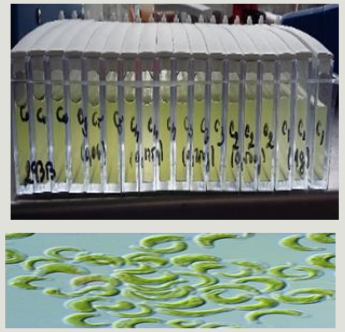
Tetracycline & Co-trimoxazole Assessment

Daphnia magna & Vibrio fischeri



Fish

Daphnia



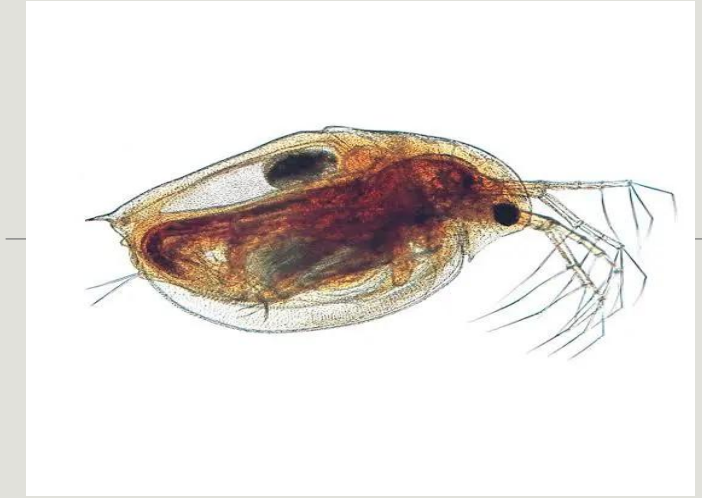
Algae

Aquatic plant Earthworms Higher plants Bacteria

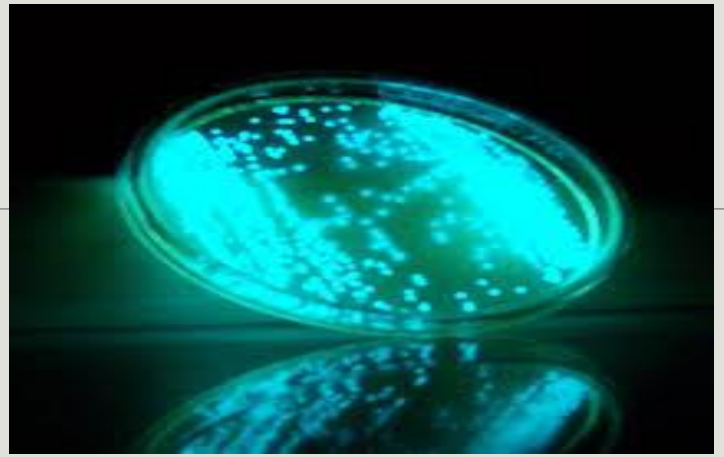
OECD/ ISO/EPA
Testing and interpretation Methodologies

EC50, EC20, LOEC, NOEC, PEC, PNEC, risk coefficients, ecotoxicological limits based on the most detrimental case

Bioindicators used and study objectives



Daphnia magna:
sensitive crustacean



Vibrio fischeri:
bioluminescent bacterium used in Microtox® assays

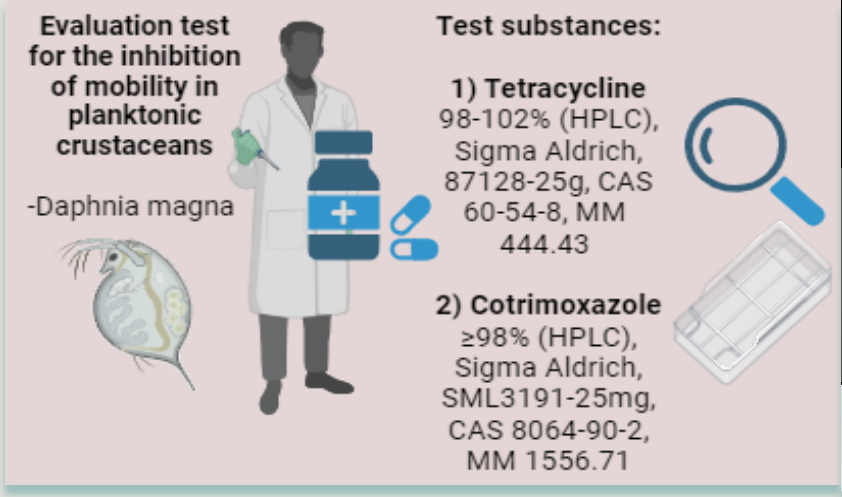
- Assess acute and chronic toxic effects.
- Determine EC50, NOEC and LOEC.
- Evaluate adaptive responses to sublethal stress.

Materials & Methods

- Microtox® luminescence assay

Organism: *V.fischeri* (ATCC 7744)	**Acute testes: 1 mg/L-1 gr/L) 30 min**	**Chronic testes: 48 h**	**Bioluminescence inhibition measured by Microtox® → EC_{50} via 4PL model**

- Daphnia acute and chronic exposure tests



Method	*Biological material*	*Test conditions*	*Tested concentrations*	*Monitored parameter*	*Final result*
Acute toxicity					
OECD 202/ SR EN ISO 6341:2013/ Daphtoxkit F magna kit	*Daphnia magna* (water fleas) Age 90 h	Test duration 48h Incubation at 20±2°C, light Control with culture medium	Tetracycline 6.25-100mg/L Cotrimoxazole 6.25-100mg/L	Mortality/ immobilization	EC50-48h (mg/L) and <10% effect in control

- Statistical models: ANOVA, 4PL

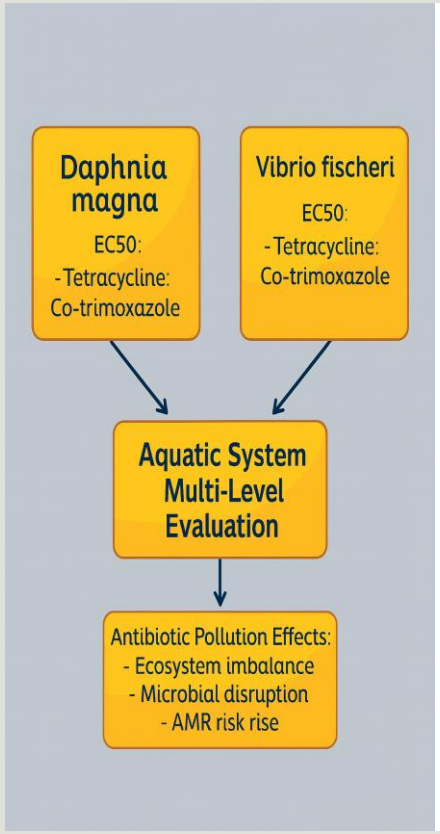
- Concentrations: environmentally relevant ranges

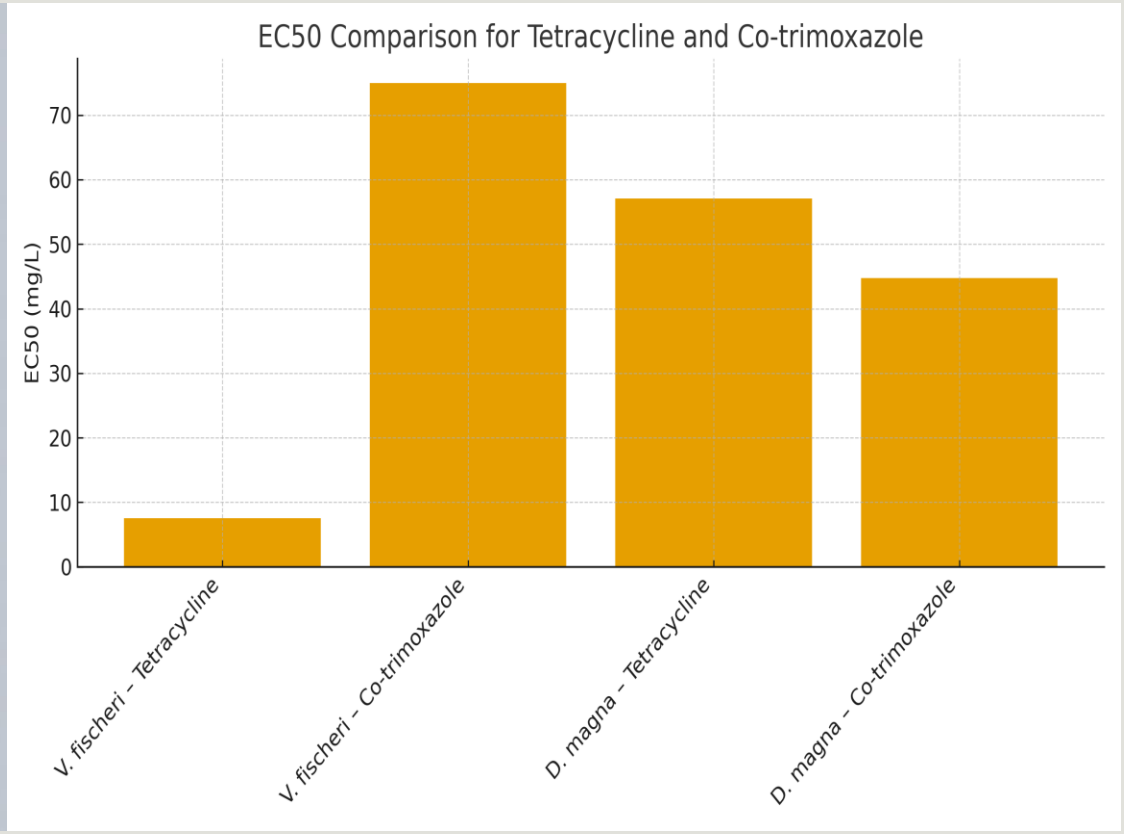
Results

- *Vibrio fischeri:*
  - Tetracycline EC50 = 5–10 mg/L
  - Co-trimoxazole EC50 = 50–100 mg/L
  - Significant inhibition of bioluminescence

- *Daphnia magna*:
  - Tetracycline EC50 = 57.10 mg/L
  - Co-trimoxazole EC50 = 44.76 mg/L
  - Chronic exposure reduced mobility

- Comparative Insights:
  - Vibrio detects rapid metabolic disruption
  - Daphnia reveals ecological-level chronic impacts





Conclusions

Antibiotics pose complex ecological risks by disrupting microbial communities, impairing aquatic organisms, and promoting antimicrobial resistance.

Mitigations:

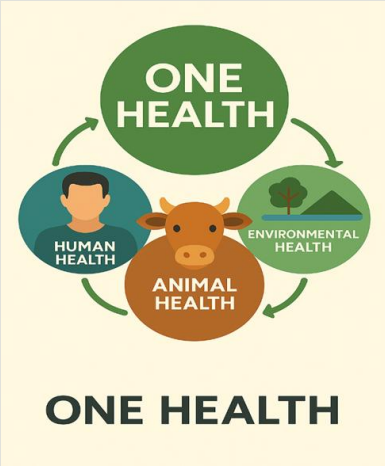
- Wastewater regulations must be strengthened.
- Advanced treatment technologies are essential.
- Reducing antimicrobial resistance requires integrated action.

Future Directions

- Further Toxicity Testing on Other Species
- Mechanistic Studies
- Chronic Toxicity Studies
- Mitigation Strategies
- Risk Assessment
- Regulatory Considerations
- Synergistic/ Antagonistic Effects

This study supports the **integration of biosensor-based tools** in environmental monitoring programs, promoting **early detection of antibiotic pollution** and contributing to **sustainable water management and ecosystem protection.**

THANKS



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