VIETNAM NATIONAL UNIVERSITY - HCMC
UNIVERSITY OF TECHNOLOGY

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DISSERTATION INFORMATION

Thesis title:	Distribution of antibiotics in the Sai Gon River basin water
Major:	Natural Resource and Environment Management
Major code:	62850101
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Major Contributions of This Dissertation

Antibiotics are emerging pollutants and occur at low concentrations in the aquatic environment, from only a few ng/L to several hundred ng/L. Studies have shown that there are more than 30 - 40 different types of antibiotics in surface water and they are considered to be a potential risk to aquatic ecosystems. This is one of the important reasons that studying the occurrence and distribution of antibiotics in surface water and river basins is of interests to scientists and managers.

In this study, for the assessment of antibiotic distribution in the Saigon River basin water, 12 locations in the Saigon River basin - from the downstream of Dau Tieng Lake to the Soai Rap River mouth were surveyed, sampled and analyzed by HPLC MS-MS in the rainy season (September 2015) and dry season (April 2016). A normal distribution function was used in this research which resulted in clarifying the characteristics and nature of the occurrence and distribution of antibiotics in the Saigon River basin water.

The study identified the presence of 12 antibiotics in the Saigon River basin water with frequencies ranging from 75% to 91.3% and the lowest being 50% for vancomycin. The concentration of antibiotics ranges from non-detectable to 697.3 ng/L (in the rainy season) and from non-detectable to 869.3 ng/L (in the dry season). The difference in antibiotic concentrations at different areas is due to the impacts of different living and production activities. The total antibiotics concentration was lowest in the upstream (not detectable) whereas highest in the areas where there are livestock farms (3048 - 3304 ng/L, in the rainy - dry season, respectively).

The antibiotics concentration in the Saigon River basin water is not affected by weather (seasonally) but only by the sampling locations, that is to say, by human activities. The research results have shown that ciprofloxacin (representing the studied antibiotics) has a significant influence on the decomposition of organic matter by microorganisms, with the organic decomposition efficiency of only 69,2 - 75,0% for BOD_5. Besides, the inhibition of microbial activity by ciprofloxacin was also recorded with a ratio of about 137.5 - 240.0% depending on the type of wastewater. These all factors do affect the distribution of antibiotics in the Saigon River basin water.

Distribution of antibiotics according to the actual situation: The trend of antibiotic distribution in the Saigon River basin water is gradually increasing from the upstream to downstream and the spatial relationship between antibiotic concentrations is quite good, with the correlation coefficient r = 0.70. The correlation between antibiotics is gradually increasing from the 02-variable relationship (at an average level with the correlation coefficient r = 0.57,) to the 03-random variable correlation (at a rather good level with r = 0.43 - 0.68,) and reaching highest for the multivariate correlation (at an excellent level with r > 0.90,). The normal distribution according to the current situation is non symmetrical (with mean μ = 1485.7 ng/L and standard deviation σ = 1068.4 ng/L).

Distribution of antibiotics according to simulation using Telemac-2D hydraulic model: The spatial correlation coefficient of total antibiotic concentration by the simulation model is of an excellent level (r = 0.97). The normal distribution according to the Telemac-2D

hydraulic model simulation is symmetrical (with mean μ = 1273.2 ng/L and standard deviation σ = 618.9 ng/L).

Conclusion: Based on the normal distribution of the simulation model, it is possible to predict the antibiotic concentration at any location in the Saigon River basin water within the determined concentration range. The research results have determined the characteristics and nature of the antibiotics distribution in the Saigon River basin water based on the antibiotics occurrence, properties and their relationships. The results of this doctoral thesis research can serve as a basis for water resource management planning and further studies on antibiotic distribution in water sources.

Supervisors PhD Student

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