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M. Giuliotti ^a, A. Zuarro ^b, R. Lavecchia ^b, O. Basloudj ^c, S. Garcia-Segura ^d, M. Brienza ^e 

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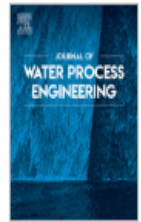
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Advanced Oxidation for Antibiotic Removal: A Study on Chloramphenicol Degradation

Description



Synergistic effects of UV irradiation and hydrogen peroxide in the degradation of chloramphenicol: Mechanism and identification of reaction byproducts and intermediates

M. Giulietti ^a, A. Zuorro ^b, R. Lavecchia ^b, O. Baaloudj ^c, S. Garcia-Segura ^a, M. Brienza ^{c, a}  

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Published within the scope of the **PRIMA-SAFE** project, this study in *Journal of Hazardous Materials* presents a systematic approach to identifying pharmaceuticals in reclaimed water that may pose risks when reused for **crop irrigation**. It provides a basis for safer water reuse strategies in Mediterranean agriculture.

Key Findings

- Under optimized conditions (25 mM H₂O₂, 1240 W/cm² UV intensity, pH 6.2), the process achieved **~100% degradation** of a 50 mg/L CHP solution within 60 minutes.

- The combination of UV and hydrogen peroxide generated hydroxyl radicals ($\bullet\text{OH}$), which played a key role in the non-selective degradation of CHP and its by-products.
- A detailed kinetic model and response surface methodology were used to optimize the treatment conditions, supported by experimental validation.
- The study identified multiple transformation by-products and proposed a **comprehensive degradation pathway**, confirming the breakdown of harmful intermediates into low-risk compounds such as carboxylic acids.

Implications

The findings demonstrate that UV/H₂O₂ treatment is a **cost-effective, scalable, and low-input method** for degrading resistant antibiotics like CHP. This process is particularly well suited for **aquaculture and decentralized wastewater systems**, where conventional treatments often fail to eliminate pharmaceutical residues and where the risk of antimicrobial resistance is significant.

Reference

Giulietti M., Zuorro A., Lavecchia R., Baaloudj O., Garcia-Segura S., Brienza M. (2025). *Synergistic effects of UV irradiation and hydrogen peroxide in the degradation of chloramphenicol: Mechanism and identification of reaction byproducts and intermediates.* *Journal of Water Process Engineering*, 71, 107290.
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