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Bacterial degradation of tetracycline (TET) by TET resistant bacteria; A green solution for antibiotic pollution

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Tetracyclines (TET) have been extensively used in aquaculture for chemotherapy against various fish diseases such as fin rot, skin ulcers. Overuse and misuse of antibiotics are widely regarded as two of the major factors promoting antibiotic resistance. Resistance to TET occurs via two primary mechanisms; ribosomal protection and enzyme inactivation. To minimize the development of resistance, excess amount of TET should be removed from the aquatic environment. Therefore, studies on the biodegradability of TET can be taken as a very first step of an environmental risk assessment. The present study reports the biodegradation of TET by *Enterobacter* sp., *Micrococcus luteus*, *Enterobacter ludwigii*, *Bacillus* sp. and *Streptomyces* sp., which were isolated as TET resistance, non-pathogenic bacteria. In a previous study, TET resistant bacterial isolates were identified using the 16s rRNA sequencing. Overnight bacterial cultures grown in a medium without TET, were introduced into a medium containing TET at final concentration of 5 µg/ml. Triplicate samples were incubated at 28 °C with shaking at 100 rpm under dark conditions. Subsamples (0.5 ml) were removed at 2 days interval for a period of 14 days. Remaining TET in the subsamples was analyzed using High Performance Liquid Chromatography (HPLC). Complete degradation of TET by *M. luteus* and *E. ludwigii* was detected at the end of 14 days of incubation. Descending degradation percentages were followed by *Enterobacter* sp. (74%), *Streptomyces* sp. (72%) and *Bacillus* sp. (70%) at 14 days, respectively. Lowest half-life time of TET was shown by *M. luteus* and *E. ludwigii* (6 days), whereas half-life time of 8 days, 11 days and 12 days were recorded for *Enterobacter* sp, *Streptomyces* sp. and *Bacillus* sp., respectively. According to the degradation results obtained, it can be concluded that the selected bacterial strains can be used as potential candidates to be introduced into wastewater effluents to remove TET in effluent water, before reaching natural environments

Keywords: Tetracycline, Degradation, Fourier Transform Infrared Spectroscopy (FTIR), High Performance Liquid Chromatography (HPLC), *M. luteus*

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