Toxicity of tetracyclines and tetracycline degradation products to environmentally relevant bacteria, including selected tetracycline-resistant bacteria

Tetracyclines used in veterinary therapy invariably will find their way as parent compound and degradation products to the agricultural field. Major degradation products formed due to the limited stability of parent tetracyclines (tetracycline, chlortetracycline, and oxytetracycline) in aqueous solution were theoretically identified at various environmental conditions, such as pH, presence of chelating, metals, and fight. Their potency was assessed on sludge bacteria, tetracycline-sensitive soil bacteria, and tetracycline-resistant strains. Several of the degradation products had potency at the same concentration level as tetracycline, chlortetracycline, and oxytetracycline on both the sludge and the tetracycline-sensitive soil bacteria. Further, both 5α,6-anhydrotetracycline and 5α,6-anhydrochlortetracycline had potency on tetracycline-resistant bacteria supporting a mode of action different from that of the parent compounds.