Occurrence of tylosin in swine wastewater in Mexico

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ABSTRACT

This study determined a tylosin concentration in swine wastewater located in a Mexican pig farm, during different stages of the pigs' growth. The detection of antibiotics in swine wastewater is complex due to its high concentration of solids. Analytical method was developed for detection of tylosin in swine wastewater and swine slurry. Average recoveries of tylosin in the liquid and solid phase were greater than 51 and 44%, respectively, with a greater total recovery of 95%. The results indicated the presence of tylosin in swine wastewater and slurry at concentrations greater than the ones reported in the literature. In grab samples of swine wastewater, the tylosin detected showed concentrations of 56, 72 and 8.6 $\mu g\ L^{-1}$, in breeding-gestation, nursery pigs, and grow-finishing area, respectively. In composite samples, the concentration of tylosin was 11.8 $\mu g\ L^{-1}$ for the breeding-gestation area and 2.4 $\mu g\ L^{-1}$ for the grow-finishing area. For slurry, the concentration of tylosin was 20.6 and 17.8 $\mu g\ L^{-1}$, for the breeding-gestation and grow-finishing area, respectively. This study presents the detection of a high concentration of tylosin in breeding-gestation and nursery pigs. Traces of tylosin in wastewater from grow-finishing stage were found although the animals were not receiving antibiotics.

Key words | pig farm, swine slurry, swine wastewater, tylosin

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INTRODUCTION

One of the characteristics of swine wastewater is a high concentration of the total solids, organic matter, nutrients, and metals; its main components are a mixture of excreta (feces and urine), water, wasted feed, bedding, soil, and debris produced during the delivery. Recently, there have been reports about the presence of emerging compounds, for example, hormones (17 β-estradiol, estriol, estrone, and testosterone) and antibiotics (amoxicillin, tetracycline, tylosin, sulfonamide) in swine wastewater (Cang *et al.* 2004). The antibiotics, Endocrine Disrupting Compounds (EDC) and Pharmaceuticals and Personal Care Products (PPCPs) are micropollutants of environmental concern due to their persistence and bioaccumulation in the environment at low concentrations (ng L^{-1}) (Daughton 2004).

Approximately, the USA uses 20.5 million kg of antibiotics per year in livestock (Kolpin *et al.* 2002). From this amount, about 10% corresponds to the treatment of active infections, while 90% work as a growth promoter and prophylactic care. In 1999, in the European Union, animals got 5,000 tons of antibiotics (70% for non-therapeutics purposes) (Sarmah *et al.* 2006). However, due to concerns about the potential of antibiotic resistance, the USA banned the use of subtherapeutic antibiotics (growth promoting and prophylactic care) in the year 2006. The problems related to antibiotics are: (a) bacterial resistance; (b) their use is in amounts greater than appropriate; (c) they are partially metabolized; and (d) there is an ineffective removal in the treatment systems. So, trace concentrations of veterinary antibiotics around the world have been reported in soils (Zilles *et al.* 2005), manure (Huang *et al.* 2009), surface water (Watkinson *et al.* 2009), and wastewater (Watkinson *et al.* 2009). However, these investigations have been carried out in developed countries where the use of antibiotics is more restricted, while in developing countries where laws

doi: 10.2166/wst.2013.323