

Antibiotic Resistance Genes (ARG) in the Environment: Effect of Composting

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Abstract. Though there are benefits to antibiotic use in agriculture, there is growing concern about the adverse consequences that this use may have on the environment and human health. In order to identify a possible method of remediating antibiotics and antibiotic resistance genes (ARG) present in animal waste, a field study was conducted in which horse manure was spiked with known amounts of three commonly used agricultural antibiotics (chlortetracycline, monensin, and tylosin at 328 µg/kg manure). The horse manure was subjected to two different treatments: (1) active management by composting and (2) passive management by stockpiling. The concentrations of tetracycline and tetracycline ARG in these two treatments were monitored with time. The results showed that initially chlortetracycline degraded rapidly in both the composted and stockpiled manure, however, degradation eventually leveled off in the stockpiles while following a log-linear pattern in the composted manure. ARG in the compost and stockpiles were monitored by direct quantification of the tetW, tetO, and tetX ARG using quantitative real-time polymerase chain reaction (Q-PCR). The response patterns of these three ARG was observed to be strikingly different. The concentrations of tetW increased rapidly before peaking on day 54 in the all treatments. By contrast, concentrations of tetO for all of the treatments showed sharp initial reduction before approaching the detection limit by day 54. TetX genes were present at low levels in both treatments with no obvious response pattern. The results of this research will be useful for understanding the overall relationship between antibiotics and ARG in the environment, while at the same time investigating a practical solution to the emerging problem of ARG as environmental contaminants.

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