

Microbiological Evaluation of Antibiotic Resistance and Pathogenicity in Auto Thermal Aerobic Digestion (ATAD)-Treated Manure Waste

한일 · *이영신 · **위은광 · **최연풍 · 박준홍

Il Han · *Young-Sin Lee · **Eun-Kwang Wee · **Youn-Poong
Choi · Joonhong Park

연세대학교 사회환경시스템공학부, *한서대학교 환경공학과, **㈜삼정건설

1. Introduction

In agricultural industry, antibiotic compounds are widely to stimulate growth and to control infections in livestock [Halling-Sorensen et al., 2004]. In addition, to minimize use of chemical fertilizers, animal manure after stabilization is often used as an organo-fertilizer [Division of Sustainable Development, 2000]. Because the amount of antibiotics amended in feed is generally high (~20% w/w), the antibiotic concentration in organo-fertilizers is found to remain high [Christian, 2003; Walsh, 2003]. Exposure of microbial communities to antibiotics generally result in increase in detection of antibiotic resistant microorganisms (ARM) [Walsh 2003]. If human-pathogenic microorganisms contain multiple antibiotics resistance (MAR), the existing antimicrobial agents may be ineffective in treating infections caused by them. However, it is not known whether microbial pathogens from antibiotic-containing animal manure and its stabilized fertilizer contain MAR phenotype. Examining this possibility is a key task to evaluate microbial risk to farmers who may be directly exposed to animal manure and related materials.

Fermentation method is generally used for stabilization of animal manure prior to soil application. However, this method requires several months of stabilization period until animal manure can be used as a fertilizer. To reduce the length of stabilization period, aerobic method is applicable. ATAD (auto-thermal aerobic digestion) is one of aerobic manure stabilization method. According to our preliminary results ATAD method only requires 3 days for complete stabilization [Samjung Construction LTD, 2005]. During the ATAD operation, thermopile condition was developed at high temperature (60~65°C), this suggested to us that ATAD method is applicable in control of microbial risk when livestock manure is used for organic-farming. In this study, we microbiologically evaluated the effect of ATAD treatment on microbial risk in swine manure. Also we tested the possibility of co-existence of pathogenicity and MAR phenotype in microbial communities from swine manure and its stabilized materials.