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## **Impact of direct application of biogas slurry and residue in fields: in situ analysis of antibiotic resistance genes from pig manure to fields**

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### **Highlights**

- Tetracycline resistant bacteria and genes were dominant in pig manure.
- Anaerobic digestion (AD) reduced resistant rate of antibiotic resistant bacteria (ARB) to tetracycline.
- AD enriched ARB and resistance genes for sulfa, aminoglycoside and FCA in biogas residue.
- Long-term application of the biogas slurry and residue contaminated with antibiotics increased ARB and ARGs in fields.
- Nineteen genera were identified as possible hosts of various ARGs.

**Abstract:** Biogas slurry and residue contaminated with antibiotics are widely used as fertilizers in vegetable crop planting. However, their impact on the spreading of antibiotic resistance genes (ARGs) in vegetable fields is still largely unknown. In the present study, antibiotic resistant bacteria (ARB), ARGs and bacterial communities from pig manure to fields were monitored by using viable plate counts, high-throughput fluorescent quantitative PCR (HT-qPCR) and Illumina MiSeq sequencing. Eighty-three ARGs and 3 transposons genes were detected. Anaerobic digestion reduced relative

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