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Abstract of the dissertation

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学位論文題名
The title of the doctoral dissertation

Characterization of antimicrobial resistant *Escherichia coli* isolated from food producing-animals in Thailand

（タイの食料生産用動物から分離された薬剤耐性大腸菌の性状解析）

Food contamination with antimicrobial-resistant bacteria is a public health concern because the resistant organisms can be transferred to humans through the consumption of contaminated food and can thus compromise human health.

Chapter I: To survey the risk, 312 *Escherichia coli* isolates from shrimp farms and markets in Thailand were examined for susceptibility to 10 antimicrobials. The results showed that 17.6% of isolates (55 of 312) were resistant to at least one of the tested drugs, and high resistance rates were observed to tetracycline (14.4%; 45 of 312), ampicillin (8.0%; 25 of 312), and trimethroprim (6.7%; 21 of 312); 29.1% (16 of 55) were multidrug resistant. PCR assay of the *tet*(A), *tet*(B), *tet*(C), *tet*(D), *tet*(E), and *tet*(G) genes detected one or more of these genes in 47 of the 55 resistant isolates. Among these genes, *tet*(A) (69.1%; 38 of 55) was the most common followed by tet(B) (56.4%; 31 of 55) and *tet*(C) (3.6%; 2 of 55). The resistant isolates were further investigated for class 1 integrons. Of the 55 resistant isolates, 16 carried class 1 integrons and 7 carried gene cassettes encoding trimethoprim resistance (*dfrA12* or *dfrA17*) and aminoglycosides resistance (*aadA2* or *aadA5*). Two class 1 integrons, In54 (*dfrA17-aadA5*) and In27 (*dfrA12*-orfF-*aadA2*), were found in four and three isolates, respectively. These results indicate a risk of drug-resistant *E. coli* contamination in shrimp farms and selling places.

Chapter II: The present cross-sectional study was conducted to investigate antimicrobial susceptibility and extended spectrum beta-lactamase (ESBL)-producing strains and to characterise class 1 integrons in *E. coli* in healthy swine in Thailand. Interestingly, all of the tested isolates (122 isolates) showed drug-resistant phenotypes. High resistance rates were observed to ampicillin (98.4%), chloramphenicol (95.9%), gentamicin (78.7%), streptomycin (77.9%) tetracycline (74.6%) and cefotaxime (72.1%).

Fifty-four (44.3%) *E. coli* isolates were confirmed as ESBL-producing strains. Among them, *bla*$_{\text{CTX-M}}$ (45 isolates) and *bla*$_{\text{TEM}}$ (41 isolates) were detected. Of all *bla*$_{\text{CTX-M}}$-carried *E. coli*, 37 isolates carried *bla*$_{\text{CTX-M-1}}$ cluster, 12 isolates carried *bla*$_{\text{CTX-M-9}}$ cluster and 5 isolates carried both of the clusters. Sequence analysis revealed that *bla*$_{\text{TEM-1}}$, *bla*$_{\text{TEM-135}}$ and *bla*$_{\text{TEM-175}}$ were found in 38, 2 and 1 isolates, respectively. Seventy-one percent (87/122) of the isolates carried class 1 integrons, in which eight distinct drug-resistance gene cassettes with seven different integron profiles were identified in 43 isolates. Gene cassettes were found to be associated with resistance to aminoglycosides (*aadA1, aadA2, aadA22* or *aadA23*), trimethoprim (*dfrA5, dfrA12* or *dfrA17*) and lincosamide (*linF*). Genes encoding for beta-lactamases were not found in class 1 integrons. This is the first study to report ESBL-producing *E. coli* and to identify a class 1 integron carrying *linF* gene cassette in swine in Thailand.

Hence, the results of present stud call for urgent surveillance of the emergence of antimicrobial resistance in commensal bacteria and prompt countermeasures to prevent the dissemination of antimicrobial-resistant genes to other bacteria in the same environment.