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Characterization of *Escherichia coli* isolated from cultured catfish by antibiotic resistance and RAPD analysis

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Abstract: Antibiotic susceptibility and genetic diversity of *E. coli* isolated from cultured catfish and their surrounding environment were determined. The levels of resistance of the *E. coli* isolates towards six different antibiotics tested differed considerably. Though the isolates displayed resistance towards some of the antibiotics tested, none of the isolates showed resistant towards norfloxacin, sulphametoxazole/trimethoprim and chloramphenicol. RAPD-PCR analysis using single primer and primers combination clustered the *E. coli* isolates into 3 and 5 groups, respectively. The results of this study suggest that the *E. coli* isolates from the catfish and their surrounding environment derived from a mixture of sensitive and resistant strains with diverse genetic contents. The use of the RAPD analysis is sufficiently discriminatory for the typing of the *E. coli* isolates.

Keywords: *E. coli*, antibiotic resistance, genetic diversity, RAPD-PCR

Introduction

Escherichia coli has been known as one of the most common bacteria found in the intestinal tract of human and warm blooded animals (Levine, 1987). Their ability to survive outside the body for longer period of time makes them an ideal indicator organism to test food and environmental samples for fecal contamination (Geldrich, 1966; Levine 1987; Lihan *et al*., 1999). Though people generally understand *E. coli* as harmless intestinal flora, they are opportunistic and some of the strains have been identified as the serious causal agents of various illnesses (Levine, 1987). In our local setting, the health hazards associated with *E. coli* have become complicated by the fact that some of the causal agents have over the years, developed resistance against commonly used antibiotics (Son *et al*., 1997a; Son *et al*., 1998a; Son *et al*., 1999; Son *et al*., 2001; Wan *et al*., 2003).

Antibiotics are widely used in livestock, poultry and fish farming as therapeutic and prophylactic purposes. They are used to increase growth and feed efficiencies. They represent an extremely important tool in the efficient production of animal products such as eggs, milk and meat. Antibiotics used in both veterinary and human medicine include penicillins, cephalosporins, tetracyclines, chloramphenicols, amynoglycosides, spectinomycin, lincosamide, macrolides, nitrofurans, nitromidazoles, sulfonamides, trimethoprim, polymyxins, quinolones and many others (Michael, 2001). However, evolution of bacteria towards resistance has been considerably accelerated by the selective pressure exerted by over prescription of drugs in clinical settings and their heavy use as growth promoters for farm animals such as fish. When antimicrobial drugs are administered to food animals, they can thus promote the emergence of resistance in bacteria that may not be pathogenic to the animals, but are pathogenic to humans (Bates, 1994; Piddock, 1996).

It is important to implement monitoring systems to be aware of the emergence and spread of bacterial resistance to antimicrobial agents. There is limited data on the antibiotic resistance of bacteria in fish sampled directly from the farm in Malaysia although the antibiotic resistance of bacteria isolated from fish and shellfish samples purchased from wet markets has been studied (Son *et al*., 1997b; Son *et al*., 1998b; Zaiton *et al*., 2001). This study was undertaken to determine the incidence of antimicrobial resistance and genetic diversity among *E. coli* isolated from cultured catfish and its water environment.

Materials and Methods

Bacterial strains, cultivation and media

Seventeen strains of *E. coli* isolated from cultured catfish and water from four different aquaculture locations within Kuching, Sarawak were analyzed in this study (Table 1). These *E. coli* strains were isolated by direct plating of the fish intestine and water

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