

food samples as a convenient alternative to conventional method for enumeration of aerobic microorganisms, Enterobacteriaceae, Total Coliforms, *E. coli* and *S. aureus*.

In the field of food protection, early screening of food products is an important measure to prevent epidemics relating to food-borne pathogens. Novel techniques should be adopted to reduce the work load and laboratory expenses. Petrifilms are a good alternative as it can enhance accuracy of test results and address the overall concerns facing the laboratory today: job satisfaction, decreased length of stay and safety. Financial savings can also be realized as a result of labor reduction.

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Multi-drug resistant *Salmonella* in seafood

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Salmonella is a gram negative bacteria which belongs to the family Enterobacteriaceae and is one of the most important food-borne pathogens globally. Non typhoidal *Salmonella* (NTS) refers to a range of *Salmonella* serotypes other than typhi and paratyphi. They mainly cause diseases ranging from mild gastroenteritis to life threatening illness and is of great public health concern world-wide. Due to indiscriminate use of antibiotics in animal and human disease treatment, there is an increasing incidence of antibiotic resistance in non-typhoidal *Salmonella* and it is quite alarming too. Along with this, disposal of untreated organic wastes also adds significantly to the development and wide spreading of Multi-drug resistant (MDR) *Salmonella* strains recently. There are only limited

studies in India regarding the prevalence of multi-drug resistance in seafood *Salmonella*.

In this context, the present study was conducted to estimate the antibiotic sensitivity pattern of *Salmonella* isolates collected from seafood. *Salmonella* isolates (n=157) from seafood of Cochin local markets were tested for antibiotic susceptibility using Kirby-Bauer disc diffusion method as per CLSI standards. The test was performed on Mueller-Hinton agar (Difco, USA) using *Escherichia coli* (ATCC 25922) as a reference organism for quality control. The isolates were tested for the 20 antibiotics using ICOSA G-II minus disc (Himedia, India). These antibiotics belongs to different classes viz., quinolones, aminoglycosides, carbapenems, cephalosporins,

sulfonamides, polypeptides, nitrofurans and combinations.

The antibiotic susceptibility pattern indicated that 15.92% of the *Salmonella* isolates were multi-drug resistant (Fig. 1 and 2). Fortysix, 45, 26, 8, and 6% of the isolates showed resistance towards imipenem, nitrofurantoin, cefpodoxime, ceftriaxone and augmentin, respectively. A total of 1.27% of the isolates showed resistance towards ceftazidime, aztreonam, nalidixic acid and

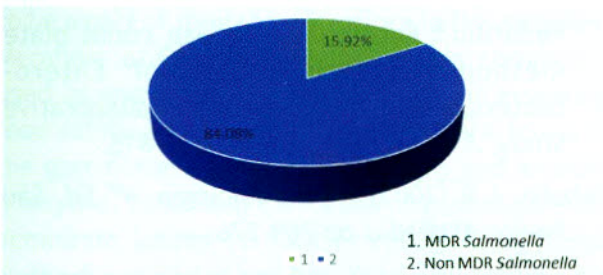


Fig. 1. Prevalence of multi-drug resistant *Salmonella* in seafood

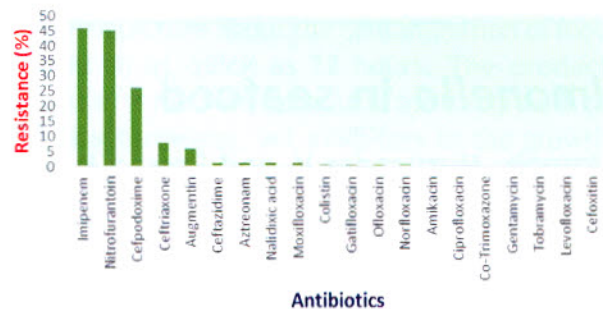


Fig. 2. Resistance pattern of *Salmonella* isolates

moxifloxacin, while only 0.63% of the isolates showed resistance towards colistin, gatifloxacin, ofloxacin and norfloxacin. One hundred percentage of the isolates studied were susceptible towards amikacin, ciprofloxacin, cotrimoxazole, gentamycin, tobramycin, levofloxacin and cefoxitin. Among the multi-drug resistant isolates 87.5% showed resistance towards three antibiotics viz., imipenem (Carbapenem class), nitrofurantoin (Nitrofurans class) and cefpodoxime (3rd generation Cephalosporin class). A total of 4.25% of the MDR isolates showed resistance to more than five classes of antibiotics studied.

The results of this study revealed higher incidence of multi-drug resistance in *Salmonella* towards the frequently used classes of antibiotics in human medicine. In this study, maximum resistance (46%) was shown for imipenem (Carbapenem class) which is generally considered as the last choice of medicine for infections caused by gram negative bacilli. Hence, judicious use of antibiotics in human and veterinary medicine is mandatory and inevitable to avoid MDR *Salmonella*.

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Antibiotic resistance to third generation cephalosporins of *Escherichia coli* isolated from seafood

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Occurrence of pathogenic *Escherichia coli* in seafood is directly related to faecal contamination and through infected handlers during pre and post harvest stages. Frequent use of large number of

antibiotics in human therapies, farm animals and aquaculture led to increase the incidence of antimicrobial resistant bacterial strains (Sapkota *et al.*, 2008 and Cheong *et al.*, 2014). Third