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Assessment of Food Safety with Reference to *E. coli* in Broiler Chicken Meat

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According to WHO, one person in three in industrialized countries may be affected by foodborne illness each year. *Escherichia coli* O157:H7, more commonly referred to as *E. coli*, is an emerging cause of foodborne illness, and children and the elderly are at greatest risk for complications. An investigation was conducted at retail chicken markets from various areas at Namakkal of Tamilnadu to identify the broiler meat contamination by *E. coli* which might result in food intoxication in humans. Out of 210 meat samples collected, 32.38 % were positive by culture with a microbial load of 2.38 ± 0.19 $\log_{10}$ cfu/g for *E. coli*. All cultures of positives were confirmed by recommended biochemical and motility tests.

Key words: Broiler chicken, Food safety, *E. coli,* Microbial load, Confirmation.

World Health Organization (WHO, 2003) and the Center for Disease Control and Prevention (CDC, 2000) stated that every year a large number of people are being affected by diseases due to contaminated food consumption. The reduction of the level of human illness from food-borne pathogens is a public health goal worldwide and reduction of the prevalence of contaminated poultry meat is one major area of focus (Luber, 2009) since most of foodborne diseases have a zoonotic origin (Busani *et al*., 2006). However, no information exists on disease prevalence from India, even though it is well established in the west (Lovely Joshy *et al*., 2006). *E. coli* is a normal inhabitant of birds which in humans causes epidemics and sporadics of bloody diarrhoea (Dogan Halkman, 2004) and extraintestinal pathogenic *E. coli* (ExPEC) becomes the leading cause of community-acquired urinary tract infections (UTIs) (Racicot Bergeron *et al*., 2012). Food with counts ^{3} 1 x 10^7 per gram were put in the at-risk category, however, coliform levels vary from 10^1 to 10^4 per gram depending upon the type of food and whether infants or adults consume the food (Vanderiet and Woodburn, 1985). Hence, the study was aimed at the detection of degree of contamination of edible chicken meat by isolation of *E. coli* and biochemical tests, and to focus light on food safety concerns.

MATERIALS AND METHODS

A total of 210 chicken meat samples were collected under sterile conditions from the retail poultry meat processing plant in and around Namakkal and subjected to microbial assay on the

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day of collection itself. At present, the conventional means for diagnosing food-borne diarrhoea in the microbiology laboratory relies on the culture of bacteria from stool samples (Lovely Joshy *et al*., 2006) and the important indicator of microbial quality of food is Standard Plate Count (SPC) of *Escherichia coli* (Capita *et al*., 2002).

Five gram of chicken meat samples were taken aseptically and homogenized with 45 ml of normal saline, using sterile pestle and mortar to arrive an initial dilution of 10^{-1}. Serial ten fold dilutions were made up to 10^{-6} in pre-sterilized tubes containing nine ml of 0.85 per cent normal saline. One ml of inoculum of each dilution was placed aseptically in identified petridishes with 20 ml of molten and cooled (45°C) MacConkey agar (Himedia, Mumbai) which was the media for cultivation of *E. coli* and mixed thoroughly. After solidification of the medium, the petridishes were incubated at 37°C for 48 hours. The characteristic colonies were counted and expressed as $\log_{10}$ cfu/g of sample, by multiplying the counted colonies with the reciprocal of the dilution.

Suggestive isolates of *E. coli* were identified by Gram's staining and biochemically, IMViC reaction, triple sugar iron (TSI) test, H_2S production test, nitrate reduction test and other fermentative and non-fermentative sugar reactions as per the Bergeys Manual of Determinative Bacteriology (Holt *et al*., 1994).

RESULTS AND DISCUSSION

Pink colonies characteristic of *E. coli* were observed in MacConkey agar in 68 (32.38 per cent) of 210 samples, as observed by Baran and Gulmez (2006). However, Purabi Saikia and Joshi (2010) recorded a higher prevalence of 98% for *E. coli* than for *Salmonella* sp. from different parts of the raw meat in North- India. Microscopically, colonies of the coliforms revealed Gram negative rods after the colonies were stained with Gram's stain and by motility test, all the organisms were non-motile.

A change in colour from red to yellow and formation of acid butt and acid slant were noticed in TSI indicating *E. coli*. The sugar fermentation reactions proved positive by lactose and sucrose tests and negative by glucose and maltose tests. (Sengupta *et al*., 2011). The colonies were oxidase negative and, catalase positive with oxygen released in the form of effervescence (Chatterjee and Kashyap, 2006). The microbial count of *E. coli* in all positive chicken meat samples is 2.38 ± 0.19 $\log_{10}$ cfu/g which agreed with that of Silva *et al*. (1997) and this study revealed the total *E. coli* count within the permissible level (2.7 – 6.7 $\log_{10}$ cfu/g) recommended by EU (2003). However**,** Sengupta *et al*. (2011) observed a mean coliform count in poultry meat from semi-urban and urban markets of Kolkata as 32.30×10^2 cfu/g and 6.50×10^2 cfu/g of chicken meat, respectively.

In this study, it was found that in each of the retail chicken markets, a number of broilers on the same day were chopped on a single wooden platform without intermediate cleaning and this seems to be a major risk factor associated with all chicken meats cleaned therein than the risk associated with undercooking of poultry meat in the establishment of contamination (Arul kumar and Saravanan, 2012; Luber, 2009). Hence, this important microbial contaminant in the retail chicken meats needs to be considered for prevention of health hazards to the consumers by adopting proper sanitation, storage and retail practices.

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REFERENCES

1. Arulkumar, T. Saravanan, S., Prevalence of *Clostridium perfringens* in the chicken meat rendered at retail outlets of Namakkal, Tamilnadu, *Journal of Advanced Veterinary Research*, 2012; 157-159.
2. Baran, F. Gulmez, M., The occurrence of *Escherichia coli* O157:H7 in the ground beef and chicken drumsticks. *Internet J. Food Safety*, 2006; **2**: 13- 15.
3. Busani, L., Scavia, G., Luzzi, I., Caprioli, A., Laboratory surveillance for prevention and control of foodborne zoonoses, *Ann. Ist Super Sanita*, 2006; **42**: 401-404.
4. Capita, R., Allonso-Clleja, Garcia-Fernandez, Moreno, B., Characterization of *Staphylococcus aureus* isolated from poultry meat in Spain. *Poult. Sci.*, 2002; **81**(3): 414-421.
5. Chatterjee, S., Kashyap, S.K., Serogroups of

Escherichia coli isolated from camel, cattle, sheep and poultry. *Indian Vet. J*., 2006; **83** : 479-482.

6. CDC., Annual report, CDC/USDA/FDA foodborne disease active surveillance network, CDC's Emerging Infections Program, 2000.
7. Dogan Halkman, Death kinetics of *E. coli* O157:H7, *E. coli* and natural contaminant coliforms in minced beef during irradiation treatment and storage, *Turk J. Vet. Anim. Sci*., 2004; **28**: 915-920.
8. EU 2003, Microbiological criteria for food stuff in community legislation in force for minced meat and meat preparations, European Union standards, www.europa.eu.int.
9. Holt, J.G., Krieg, N.R., Sneath, P.H.A., Staley, J.T. Williams, S.T., In: Bergey's Manual of Determinative Microbiology, Hensyl, W.R. (Ed.), 9th Edn., Williams and Wilkins, Baltimore, USA., 1994; pp: 527-558.
10. Lovely Joshy, Rama Chaudhry, Benu Dhawan, Das, B. K., Lalit Kumar, Shobha Broor, Enterotoxigenic *Clostridium perfringens* and sporadic diarrhoea: a study from an Indian tertiary care hospital, *J. Med. Microbiol.*, 2006; **55**:1757-1758.
11. Luber, P, Cross-contamination versus undercooking of poultry meat or eggs — which risks need to be managed first?- Review, *Int. J. Food Microbiol.*, 2009; **134**: 21–28.
12. Purabi Saikia, Joshi, S.R., Retail Market Poultry Meats of North-East India-A Microbiological Survey for Pathogenic Contaminants, *Res. J. Microbiol.*, 2010; **5***:* 36-43.
13. Racicot Bergeron, C., Prussing, C., Boerlin, P., Daignault, D., Dutil, L., Reid-Smith, R.J., Zhanel, G.G., Manges, A.R., Chicken as reservoir for extraintestinal pathogenic *Escherichia coli* in humans, Canada, *Emerg. Infect. Dis*., 2012;**18** (3):415.
14. Sengupta, R., Das, R., Ganguly, S., Mukhopadhayay, S. K., Survey on microbial quality of chicken meat in Kolkata, India. *Int. J. Res. in Pure and Appl. Microbiol*., 2011; **1** (3): 32-33.
15. Vanderiet, S.J., Woodburn, M.J., Microbial and quality assessment of household food discards. *J. Food Prot*., 1985; **48**: 924-931.
16. WHO., 2003, 8th Report of the WHO Surveillance Programme for Control of Foodborne Infections and Intoxications in Europe, WHO., Europe.