production in fresh fish is initiated when background load of *S. aureus* increased to 5.8 log cfu/g. Therefore, proper icing is necessary to prevent the growth of these organism and its enterotoxin production in the fish and also prevent prolonged exposure of fish to ambient temperature before undergoing processing.

References

Alves, D.R., Gaudion, A., Bean, J.E., Perez Esteban, P., Arnot, T.C., Harper, D.R., Kot, W., Hansen, L.H., Enright, M.C., Tobias, A. and Jenkinsa, A. (2014) - Combined use of bacteriophage K and a novel bacteriophage to reduce *Staphylococcus aureus* biofilm formation, *Appl. Environ. Microbiol.* **80:** 694-703.

Chung, S.I., Kim, S.Y., Nam, Y.J. and Kang, M.Y. (2010) - Development of surimi gel from King oyster mushroom and cuttlefish meat paste, *Food. Sci. Biotech.* **19:** 51-56.

Rosengren, A., Lindblad, M. and Lindqvis,t R. (2013) - The effect of undissociated lactic acid on *Staphylococcus aureus* growth and enterotoxin A production. *Intl J. Food Microbiol.* **162:** 159-166.

Simon, S.S. and Sanjeev, S. (2007) - Prevalence of enterotoxigenic *Staphylococcus aureus* in fishery products and fish processing factory workers, *Food Control* **18:** 1565-1568.

Antibiotic resistant profile of *Escherichia coli* isolated from the seafood samples of Veraval coast, Gujarat

Ahamed Basha K., [1]Sivaraman G.K. and Prasad M.M.

ICAR-Central Institute of Fisheries Technology, Cochin

[1]Veraval Research Centre of ICAR-Central Institute of Fisheries Technology, Veraval

India is bestowed with diversified aquatic resources with great potential of capture and culture fisheries. Seafood is an important source of nutrient-rich diet to humans in many industrialized countries. Aquaculture production is progressing and seafood trade is gaining more importance across the world. Indian seafood market is well established in the international seafood trade in terms of supplying quality fish and shellfish products. The present trend in the seafood trade lies with demand and supply of the processed aquatic products by importing countries. Till date, seafood trade barriers are of major concern to the industry and more attention should be given to overcome the barriers. Many consignments from India were withdrawn by importing countries over the years due to the presence of microbial hazards, banned antibiotics etc. The importance of the antibiotics as a growth promoter and bacterial suppressors are no way encourageable in aquaculture and seafood trade. Use and misuse of antibiotics contributed to the development of antibiotic resistance in bacteria and industrialized countries are combating hard to overcome this critical scenario. *Escherichia coli* is a known bacteria related to water contamination and unhygienic conditions during the handling process. Currently, six categories of diarrheagenic *E. coli* has been recognized: Enterotoxigenic *E. coli* (ETEC), Enteropathogenic *E. coli* (EPEC), Enteroinvasive *E. coli* (EIEC), Enterohemorrhagic *E. coli* (EHEC, Shiga toxin-producing *E. coli* or STEC), Enteroaggregative *E. coli* (EAEC or EAggEc), and diffusely adherent *E. coli* (DAEC) (Costa, 2013). In the present study, antibiotic resistance pattern in *E. coli* isolates from the seafood was carried out. A total of 31 *E. coli* were isolated from fish and shellfish of retail markets of Veraval coast, Gujarat, India as per the United States Food and Drug Administration Bacteriological Analytical Manual (Peter Feng *et al.*, 2011). All the 31 isolates were purified and characterized biochemically as rod shaped, catalase positive, oxidase negative, indole positive, methyl red positive, voges-

Proskauer negative, glucose fermenters, lactose fermenters and non-citrate utilizers. Antibiotic resistance in these 31 isolates were tested simultaneously using the standard agar disc diffusion method (CLSI, 2012) using Mueller-Hinton agar. All these isolates were grown overnight in Tryptic soya broth at 37 °C and adjusted to 0.5 McFarland Standard. The multidisc (Icosa G-II-Minus, Himedia, India) used in the study contained the following antibiotics arranged equidistant to each other: Imipenem (IPM) - 10µg; Ciprofloxacin (CIP) - 5µg; Tobramycin (TOB) - 10µg; Moxifloxacin (MO) - 5µg; Ofloxacin (OF) - 5µg; Ceftazidime (CAZ) - 30µg; Levofloxacin (LE) - 5µg; Norfloxacin (NX) - 10µg; Co-Trimoxazole (COT) - 25µg; Colistin (CL) - 10µg; Nalidixic acid (NA) - 30µg; Augmentin (AMC) - 30µg; Cefoxitin (CX) - 30µg; Gatifloxacin (GAT) - 5µg; Gentamicin (GEN) - 10µg; Amikacin (AK) - 30µg; Aztreonam (AT) - 30µg; Ceftriaxone (CTR) - 30µg; Cefpodoxime (CPD) - 10µg and Nitrofurantoin (NIT) - 300µg. The plates were incubated at 37 °C for 18 h. The diameters of inhibition zones were measured in millimetre, and interpreted in accordance to CLSI recommendations. Among the 20 antibiotics tested against 31 isolates, 15 isolates showed resistance to Imipenem (IPM) with 48.38%, 12 isolates showed resistance to Nitrofurantoin (NIT) with 38.70% and 11 isolates showed resistance to Cefpodoxime (CPD) of 35.48% and eight isolates showed resistance to Nalidixic acid (NA) of 25.8%. None of the isolates showed resistance to Norofloxacin (NX), Levofloxacin (LE), Tobramycin (TOB), Amikacin (AK) and Cefoxitin (CX). The results are shown in (Fig. 1). Six out of 31 isolates have shown multi-drug resistance to more than three classes of antibiotics (16.1%). Multi-drug resistance in pathogenic bacteria is an universal problem across the globe and is prevailing in many fields of science. Therefore, strict awareness, measures and regulations are to be standardized for use in seafood production to combat this problem.

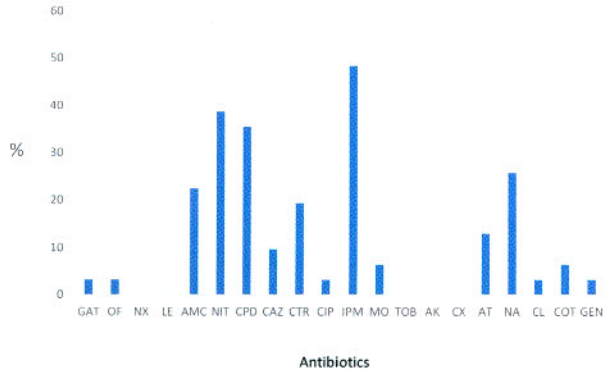

Fig. 1. Antibiotic resistance pattern of *E. coli* Isolates

References

Costa (2013) - *Escherichia coli* in seafood: A brief overview. *Adv. Biosci. & Biotechnol.*, **4**: 450-454.

Clinical and Laboratory Standards Institute (CLSI) (2012) - Performance standards for antimicrobial susceptibility testing; Twenty - Fifth information supplement. Clinical and Laboratory standards institute, Wyne.

Peter Feng, Stephen D. Weagant, Michael A. Grant and William Burkhardt (2011) - Enumeration of *Escherichia coli* and the Coliform bacteria: In: Bacteriological Analytical Manual, USFDA.

Isolation and antibiotic resistance pattern of Staphylococci from seafood of Veraval, Gujarat

Ranjit Kumar Nadella, Murugadas V., [1]Sivaraman G.K. and Prasad M.M.

ICAR-Central Institute of Fisheries Technology, Cochin

[1]Verval Research Centre of ICAR-Central Institute of Fisheries Technology, Veraval

Staphylococci are commonly associated with the skin of the food handlers which can act as a source of food contamination and is considered as a versatile human pathogen. In the recent years it has emerged as a major and most difficult pathogen to treat due to the resistance developed