TRIMETHYLAMINE OXIDE REDUCING BACTERIA IN *PENAEUS INDICUS* STORED AT DIFFERENT TEMPERATURES

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TRIMETHYLAMINE OXIDE (TMAO) is known to be reduced to trimethylamine (TMA) by bacteria (including non-marine forms) during fish spoilage[1] and this TMAO-TMA reduction is considered to be a valuable test for assessing the spoilage potential of bacteria present during spoilage[2]. With regard to prawns, except for a few reports on Mexican shrimps[3] and *Metapenaeus* sp[4], no report is available on *Penaeus indicus*. The present communication forms the first report on the generic composition of TMAO reducers during the storage of *P. indicus* at different temperatures

Penaeus indicus, collected live from Cochin backwater, were killed by shock treatment, thoroughly washed with sterile saline and stored in raw unprocessed conditions of 'whole', 'headless', 'peeled and undeveined' (PUD) and peeled and deveined (PD), at different temperatures. Samples were periodically drawn and analysed for spoilage.

Bacteriological analysis

Total heterotrophic bacteria (THB) was estimated using ZoBell's 2216e agar, employing pour plate incubated for 5–7 days at room temperature ($28 \pm 2°C$). Bacterial cultures were isolated from all samples randomly, checked for their purity and maintained on ZoBell's 2216e agar slants. The genera were identified by their morphological and biochemical characters[5,6].

Trimethylamine oxide reduction to trimethylamine test

Trimethylamine oxide to trimethylamine reduction was tested according to Wood and Baird[7] and Laycock and Reiger[2] using the original medium.

Among the cultures, 178 strains representing the species of *Vibrio, Pseudomonas, Acinetobacter, Alcaligenes, Micrococcus, Bacillus, Corynebacterium* and members of the family Enterobacteriaceae were selected from the strains which were recorded as dominant groups during storage at the three different temperatures. Results indicate that 92.1 % of the total isolates tested were TMAO reducers. All the strains of *Vibrio* (100%), *Alcaligenes* (100%) and *Corynebacterium* (100%) were TMAO reducers. Among the rest of the groups, the maximum number of TMAO reducers were represented by *Bacillus* (93.8%) followed by *Acinetobacter* (92.1%), *Pseudomonas* (89.2%), *Micrococcus* (84 6%) and members of Enterobacteriaceae (83.3%).

Maximum percentage of TMAO reducers was present (table 1) on the samples stored at 28°C (96.2%)

Table 1 *TMAO reducing bacteria isolated from prawns with respect to storage at three different temperatures*

Genera	28 ±2°C			4°C			– 18°C		
	Total No. of isolates	No. of TMAO reducers	% of TMAO reducers	Total No of isolates	No. of TMAO reducers	% of TMAO reducers	Total No. of isolates	No. of TMAO reducers	% of TMAO reducers
Vibrio	16	16	100.0	9	9	100.0	12	12	100.0
Pseudomonas	4	4	100 0	30	25	83 3	31	29	93.6
Alcaligenes	—	—	—	1	1	100.0	—	—	—
Acinetobacter	5	5	100.0	19	18	94 7	14	12	85.7
Entero-bacteriaceae	—	—	—	4	3	75.0	2	2	100.0
Micrococcus	1	—	—	1	1	100 0	11	10	90.9
Bacillus	—	—	—	6	5	83.3	10	10	100.0
Coryne-bacterium	—	—	—	2	2	100.0	—	—	—
Total	26	25	96.2	72	64	88 9	80	75	93 8

followed by −18°C (93.8%) and 4°C (88.9%). Among the different groups tested, *Vibrio, Pseudomonas* and *Acinetobacter*, were isolated at all the three temperatures and they constituted the major flora. Of them *Vibrio* was not influenced by the variation in storage temperature and all the strains were TMAO reducers. *Pseudomonas* and *Acinetobacter* were influenced by the change in the storage temperature. *Acinetobacter* recorded decrease in the percentage of TMAO reducers along with decrease in temperature (table 1). *Pseudomonas* recorded a higher percentage of TMAO reducers at −18°C (93.6%) than at 4°C (83.3%), although it formed the dominant flora during storage at 4°C.

TMAO reduction to TMA by *Vibrio*[8,9], *Pseudomonas*[10,11] and members of Enterobacteriaceae[8] is known. TMAO reduction by species of *Alcaligenes, Micrococcus, Bacillus* and *Corynebacterium* is not reported earlier. Occurrence of these groups in *P. indicus* during storage and their ability to reduce TMAO to TMA suggest that they are the potential spoilers of prawn, as TMAO-TMA reduction is considered one among the reliable test for detecting and characterizing spoilage bacteria[10]. The presence of higher percentage of *Vibrio, Pseudomonas* and *Acinetobacter* in prawns during storage at various temperatures and the presence of the maximum percentage of TMAO-TMA reducers in these groups, suggest their dominant role in the rapid deterioration of prawns, and increase in the TMA content during storage.

The authors thank Dr John D. Castell, Fisheries and Environmental Sciences Division, Halifax, N.S. Canada for a gift of TMAO, the authorities of University of Cochin and to the ICAR for financial support.

7 March 1985; Revised 8 May 1985

1. Shewan, J. W., *Recent advances in food science*, (eds) J. Hawthorn and J. M. Leitch, Butterworth, London, 1962.
2. Laycock, R. A. and Reiger, L. W., *J. Fish. Res. Bd. Canada*, 1971, **28,** 305.
3. Williams, O. B., Campbell, L. L. and Reese, H. B., *Texas J. Sci.*, 1952, **4,** 53.
4. Sajan George, M. F. Sc. Thesis, University of Agricultural Science, Mangalore, 1979.
5. Buchanan, R. E. and Gibbons, N. E., *Bergy's manual of determinative bacteriology*, 8th ed. The Williams & Wilkins Co., 1974.
6. Cowan, S. T., *Cowan and Steels manual for the identification of medical bacteria*, Cambridge University Press, Cambridge, 1974.
7. Wood, A. J. and Baird, E. A., *J. Fish. Res. Bd. Canada*, 1943, **6,** 194.
8. Easter, M. C., Gibson, D. M. and Ward, F. B., *J. Appl. Bacteriol.*, 1982, **52,** 357.
9. Unemoto, T., Hayashi, M., Miyaki, K. and Hayashi, M., *Biochim. et. Biophys. Acta*, 1965, **110,** 319.
10. van Spreekens, K. J. A., *Antonie van Leeuwenhoek*, 1977, **43,** 283.
11. Lee, J. V., Gibson, D. M. and Shewan, J. M., *J. Gen. Microbiol.*, 1977, **98,** 439.

ACTION OF HALOPERIDOL ON MEIOTIC CHROMOSOMES OF MALE MICE

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IN view of the emphasis on evaluation of cytogenetic effects of all new and established drugs, the authors had studied the effects of Haloperidol, an extensively used antipsychotic and anxiolytic agent, on somatic chromosomes of mice and reported a negative clastogenic and mitoclasic property[1]. Further, observations on meiotic chromosomes which are regarded as a test of the potential mutagenicity of chemicals in mammals[2] yield additional information. Hence investigations on these lines have been carried out to study the effects of Haloperidol and the results are reported in this paper.

Haloperidol (Serenace) was administered orally at doses of 0.312, 0.624 and 1.248 μg in 0.5 ml of sterile distilled water to Swiss albino male mice belonging to 8–10 week age group and weighing 25 g on an average. Single and cumulative series have been employed; in the latter, the same doses of the drug were fed consecutively for 15 days at 24 hr intervals[1]. The doses computed on body weight basis correspond to human therapeutic levels. Animals belonging to control group were fed with an equal volume of distilled water and processed simultaneously. Animals were sacrificed after 24 hr and at weekly intervals upto the fifth week in single dose series, and after the same periods in cumulative treatments following last day of drug administration. Testes were processed by the standard air-drying technique for obtaining meiotic chromosome preparations and stained with Giemsa. One