# FAECAL STREPTOCOCCI IN FRESH FROZEN SHRIMP

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Present limit of Faecal streptococci as 100/g. in fresh frozen shrimp was found to be too strict a standard for commercially prepared products. Statistical analysis of the data collected indicates that fixing the maximum permissible limit as 1000/g. will be a more workable proposition.

## INTRODUCTION

It is a well accepted practice in Food Microbiology to enumerate certain faecal indicator organisms apart from the classical pathogens in processed food products to assess the hygienic conditions in which the material has been handled during processing. Suitability of *E. coli*. and faecal streptococci for the purpose has long been recognised as the former is invariably found in the intestinal tract of man while the latter in the faeces of both man and animals. While *E. coli*. is sensitive to many of the disinfectants and subzero temperatures, faecal streptococci are comparatively resistant and undergo least fluctuations during processing and subsequent frozen storage. This high resistance of faecal streptococci compared to *E. coli*. brings in more confidence in the acceptance of these organisms as faecal indicators in frozen foods. (Larkin, et. al. 1956: Raj & Listen, 1961; Iyer' et. al. 1969).

Indian Standard Institution has laid down standards for quick frozen shrimp which permit a maximum of only 100 enterococci/g. of material whether raw or cooked (Anon, 1962). This was later modified as 100 faecal streptococci/g. (not published). Bacterial analysis of fresh frozen prawn collected from the local processing factories during the past few years indicated that fixing the maximum tolerance limit as 100/g. may be too strict a standard to be attainable even in factories maintained under good sanitary conditions. Virgilio et. al. (1970) has also pointed out that Indian Standard of 100 microorganisms/g. is too difficult to be achieved for such an ubiquitous organism like enterococci. Many treatments tried to reduce the high numbers of streptococci in the raw prawns also did not turn out to be successful. Therefore, a survey was conducted to ascertain how far the factories will be in a position to comply with the requirements prescribed in the present standard.

## METERIALS AND METHODS

Samples of frozen shrimp precessed on different days were obtained from a number of factories and faecal streptococci count was determined using KF agar of Kenner et. al. (1961). A total of 357 frozen blocks of peeled and deveined (PD) shrimp, 340 headless shell on (HL) shrimp

Table I

*Faceal streptococci count in frozen shrimp processed in factories maintained under good hygienic conditions.*

| Factory | Product | No. of samples analysed | % Samples Below100/g. | Above 100/g. |
|---|---|---|---|---|
| A | Headless | 132 | 75 | 25 |
| | Peeled & Deveined | 134 | 71 | 29 |
| B | Headless | 85 | 70 | 30 |
| | Peeled & Deveined | 95 | 72 | 28 |

and 66 of peeled undeveined (PUD) variety obtained from most of the processing factories situated in Cochin area were analysed for this purpose. The minimum number of samples obtained from any factory was 5 and the maximum 40, the most common size of sample lying between 15 and 30.

## Results And Discussion

Initially, the results of bacterial analysis were sorted out to study how far the factories would be in a position to meet the tolerance limit of 100/g. Of the total samples, 64% of PD variety, 53% of HL variety and 74% of PUD variety failed to meet the specification. The incidence of failure (to meet the specification) varied between 70 to 100% of the samples obtained from a majority of factories. It was further observed that even in factories where good sanitary conditions are maintained, the achievement of 100/g. streptococci appears to be far fetched (Table I). Obviously, a tolerance limit leading to heavy rejections when implemented cannot be resorted to in such cases.

As a further step, to suggest an alternate tolerance limit in place of 100/g., the data were studied statistically which indicated that a count of 1000faecal streptococci/g as tolerance limit, will be a workable proposition. Even with the tolerance limit, no full uniformity among the factories in the extent of meeting the tolerance limit could be noticed. Two group of factories for each type of pack(HL,PD) showing a more or less uniform pattern in the percentage of compliance were obvious. PUD variety was not included in further analysis as the number of samples drawn was not adequate for this purpose.

Two groups of factories mentioned above, one showing a good degree of compliance with the new suggested standard were sorted out for each variety (Tables 2 and 3). For each set $x^2$ (chi-squre) test was was carried out to find out how far each group can be considered as homogeneous in the respect. In the group of factories, where compliance is better, the average percentage of acceptance works out to 88% for PD and 90% for HL products. Individual performance of the factories varied from 70% to total acceptance of the sampled blocks. In the other group where conditions are less favourable, the average percentage of compliance works out to 51% for PD and 55% for HL. The percentage of acceptance varied from 20% to 65% for individual factories in this group. The division into groups is only to show the extent of variation, but not to conclude that these two groups of factories really vary in their performance, since some of the percentages are arrived at on small number of samples.

Even with the suggested tolerance limit of 1000/g., the number of rejections may

Table II

Group A

*Faecal streptococci in PD frozen shrimp.*

| Serial No. of factory. | Samples with count <1000/g. | Total No. of samples | Proportion of (1) to (2) |
|---|---|---|---|
| | (1) | (2) | |
| 1. | 31 | 31 | 1.00 |
| 2. | 9 | 9 | 1.00 |
| 3. | 7 | 8 | 0 88 |
| 4. | 12 | 14 | 0.86 |
| 5. | 18 | 23 | 0.78 |
| 6. | 4 | 4 | 1.00 |
| 7. | 6 | 8 | 0.75 |
| 8. | 7 | 7 | 1.00 |
| 9. | 5 | 7 | 0.71 |
| 10. | 10 | 12 | 0.83 |
| 11. | 8 | 8 | 1.00 |
| 12. | 18 | 20 | 0.90 |
| 13. | 16 | 18 | 0.89 |
| 14. | 34 | 42 | 0.81 |
| Total | 185 | 211 | 0.88 |

$X^2$ : 15.22

Group B.

| Serial No. of factory | Samples with count <1000/g. | Total No. of Samples | Proportion of (1) to (2) |
|---|---|---|---|
| | (1) | (2) | |
| 1. | 5 | 23 | 0.22 |
| 2. | 12 | 18 | 0.67 |
| 3. | 13 | 20 | 0.65 |
| 4. | 14 | 26 | 0.54 |
| 5. | 9 | 16 | 0.56 |
| 6. | 8 | 16 | 0.50 |
| 7. | 5 | 10 | 0.50 |
| 8. | 8 | 17 | 0.47 |
| Total | 74 | 146 | 0 51 |

*$X^2$ : 11.59*

Table III

*Faecal streptocci in HL frozen sh:imp.*

Group A

| Serial No. of factory | No of samples with count <1000/gm. | Total No. of samples | Proportion of (1) to (2) |
|---|---|---|---|
| | (1) | (2) | |
| 1. | 28 | 32 | 0.88 |
| 2. | 11 | 11 | 1.00 |
| 4. | 16 | 18 | 0.89 |
| 4. | 11 | 12 | 0.92 |
| 5. | 22 | 29 | 0.76 |
| 6. | 15 | 17 | 0.88 |
| 7. | 3 | 3 | 1.00 |
| 8. | 19 | 24 | 0.79 |
| 9. | 3 | 3 | 1.00 |
| 10. | 13 | 15 | 0.87 |
| 11. | 2 | 2 | 1.00 |
| 12. | 6 | 6 | 1.00 |
| 13. | 11 | 11 | 1.00 |
| 14. | 11 | 11 | 1.00 |
| 15. | 3 | 3 | 1.00 |
| 16. | 26 | 28 | 0.93 |
| 17. | 34 | 34 | 1.00 |
| 18. | 17 | 19 | 0.89 |
| Total | 251 | 278 | 0.90 |

$X^2$ : *20.18*

Group B.

| Serial No. of factory | No. of samples with count <1000/g. | Total No. of samples | Proportion of (1) to (2) |
|---|---|---|---|
| | (1) | (2) | |
| 1. | 8 | 14 | 0.57 |
| 2. | 11 | 17 | 0.65 |
| 3. | 13 | 27 | 0.48 |
| 4. | 2 | 4 | 0.50 |
| Total | 34 | 62 | 0.55 |

$X^2$ : *12 2*

Group A: Factories where compliance with the suggested tolerance limit of 1000/g. is good.
Group B: Factories where the compliance with the suggested tolerance limit is poor.

be on the higher side. But, the total acceptability of samples from some of the factories on the basis of 1000/g. indicates that if proper attention is paid to sanitary aspects, this limit is not unattainbale. Of the two groups of factories (for both varieties), the one which is considered to be better has still a rejection rate as high as 20%. No industry can sustain when 20% of its product faces the risk of rejection. With some additional care these factories can bring down the percentage of incidence of streptococci to the limits prescribed. With regard to second group, a lot of additional care and training for the staff are necessary for prevention of heavy rejections. This being the case with a suggested tolerance limit of 1000/g. the present limit of 100g. suggested in I. S. I. Specification for fresh frozen shrimp may be amended accordingly.

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