

MICROBIOLOGICAL STATUS OF LIVE EEL AND PROCESSED FISH PRODUCTS FOR EXPORT TO JAPAN

MA Rohaya, BH Chuink and K Aniran

Regional Veterinary Laboratory, Department of Veterinary Services,
25100 Kuantan, Pahang, Malaysia

Abstract. Live eels and processed fish products from Malaysia are routinely checked for microbial pathogens before export to Japan. The eels and water from the ponds are screened for *Vibrio cholerae* and *Salmonella* spp, whereas the processed fish products are tested for microbial contamination (aerobic plate count), coliforms, *E. coli* and *Vibrio cholerae*.

Results showed that live eels and water samples were negative for *Vibrio cholerae* but *Salmonella* spp were isolated occasionally. Various types of processed fish products had counts below 1.0×10^5 whilst coliforms, *E. coli* and *Vibrio cholerae* were absent. Records available showed that procedures involved in the production and transportation of live eel, preparation and processing of fish products have resulted in relatively safe food products.

INTRODUCTION

Fish and shellfish are second only to meat and poultry as staple animal protein foods in most of the world. In some countries (eg Japan), they are the principal source of protein. Awareness of microbiological health hazards arising from consumption of food has grown among the public. Fish and shellfish products are a minor source of bacterial food-borne disease in North America, United Kingdom and Australia (Todd, 1978), but there is a continuing high relative incidence of bacterial food-borne disease from fish products in Japan and probably in Southeast Asian countries where fish are commonly eaten raw or with little cooking (Sakazaki, 1979). *Vibrio* and *Salmonella* are among the most widely distributed pathogenic organisms in nature and, as such, can pose major public health problems.

In Malaysia about 500-1,500 metric tons of live eels are exported annually to various countries in the world, especially to Japan. To control food-borne microbiological hazards, general measures including the sanitary production of raw materials, cleaning disinfection of food plants, personal hygiene, equipment etc should be practised. Microbial examination of food also plays an important part in maintaining a safe food supply and serves to complement basic hygiene measures.

The public health section of Regional Veterinary Laboratory, Department of Veterinary Services, Kuantan, Pahang, Malaysia receives about 750 samples of live eels, pond water and various types of processed fish products during the period of July 1992 to October 1995 for microbial examination prior to export to Japan. The purposes of this study were as below:

- a. To isolate and identify specific microbial pathogens from live eel and processed fish products.
- b. To ensure the quality of food before export to Japan.
- c. To evaluate the microbial status of live eels and processed fish products.

MATERIALS AND METHODS

Samples

Regional Veterinary Laboratory, Kuantan, Pahang, Malaysia receives about 5×0.5 kg of live eels, 5×200 ml of pond waters and 5×0.3 kg of each type of processed fish products once every 2 months for routine microbial examination before export to Japan.

Microbiological analyses

The live eels and pond water were analysed for

Vibrio cholerae and *Salmonella* spp, whereas the various type of processed fish products were analysed for Aerobic Plate Count (APC), Coliform count (MPN), *E. coli* (MPN) and *V. cholerae*. The analyses were carried out using procedures described by Zaliha (1991). All *Salmonella* are sent to the Veterinary Research Institute (VRI), Ipoh for serotyping.

RESULTS

Live eels and pond water samples

The results are summarized in Table 1. Results showed that live eel and pond water were found to be negative for *V. cholerae* but *Salmonella* spp were found to be presence occasionally.

Table 1
Microbial isolation for live eel and pond water.

Samples	Microbial pathogen	
	<i>Vibrio cholerae</i>	<i>Salmonella</i> spp
Live eel	-	+
Pond water	-	+

Table 2
Types of *Salmonella* isolated.

Samples	Types of <i>Salmonella</i> spp
Live eel	<i>S. saintpaul</i> (4)
Pond water	<i>S. virchow</i> (3)
	<i>S. javiana</i> (1)
	<i>S. rubibislaw</i> (1)
	<i>S. ngulani</i> (1)
	<i>S. weltevreden</i> (1)
	<i>S. hvittingfoss</i> (3)
	<i>S. saintpaul</i> (1)

() number isolation.

Table 2 shows the serotypes of *Salmonella* isolation. Most of *Salmonella* spp were isolated from the pond water (11 spp) compared to live eel (4 spp). A total of 5 isolates were serotyped as *Salmonella saintpaul*.

Processed fish products

The results of microbial counts for various type of processed fish products was summarized in Table 3. In general the APC for processed fish products vary widely from 10^1 to 10^3 . There were also coliform and *E. coli* present with very low count.

DISCUSSION

Live eel and pond water samples.

In this farm, the ponds are disinfected with lime after each harvesting and left vacant for at least 10-14 days before the next batch of eels are put in. Since the water source is drawn from underground at a depth of about 200-400 feet, the chances of *Vibrio* to survive is less except if that area is endemic for *V. cholerae*. Survival in water and presumably food also depends on the temperature, pH, salt, the organic content and the bacteria count (Barua, 1970). The eel farm always maintained the optimum level of water quality. There is a somewhat greater potential for contamination by microorganism if the pond water are more likely to be polluted.

Salmonella spp was present in live eel as well as in pond water, especially *S. saintpaul*. This showed that the live eels and pond water could have been contaminated during culturing and rearing. In this case the possibility of contamination in pond water is through the discharge of animal wastes. In areas with a dense population *Salmonella* can easily be recovered from birds, flies and rodents as well as from surface waters to which effluents are discharged (Edel *et al*, 1973).

The possibility of contamination in live eels is through the contaminated pond water and feed. Personnel in feed processing plants can contaminated during handling and processing. The eels are captured by net close to the processing point, the problem of transportation and intermediate handling are greatly reduced.

Processed fish products

Microbiological standards of Japanese Regulatory Authorities for frozen food is $< 1.0 \times 10^5$ per gram as the maximum level for APC in forzen fresh for raw serving and negative for Coliform and *Vibrio*. From Table 3, The APC count for frozen tilapia and frozen tilapia fillet is from 10^1 to 10^3 but still within range of the standard of Japanese Regulatory Authorities. This

showed the fish meats could have been contaminated during handling, cutting or skinning and filleting. Although freezing destroys some microorganism in food, many will survive and cause undesirable changes when the thawed food reaches a suitable temperature.

Table 3 also shows results for cooked processed fish products. The Japanese Regulatory Authorities standard stated the maximum APC counts for frozen roasted eel was moderately high and did not exceed the level of 1.0×10^5 per gram. There were also Coliform and *E. coli* present with very low counts in

all types of processed fish products. The food Act (1983) stated that the coliform counts must not exceed 50 per gram. This showed that the cooking temperature for the cooked eel meat did not heat to penetrate to the internal part of the food and for destruction of non-spore pathogens. Generally temperatures of 70-90 °C with certain duration of exposure to the internal 90 °C parts of the food is enough for the destruction of the pathogen (Babjee and Rangunathan, 1987). There were no *V. cholerae* present in any processed fish products samples either raw or cooked fish meats.

Table 3

Microbial count for processed fish products.

Processed fish products	Aerobic plate count No. microorganism/ g samples	Coliform count (MPN)/100g samples	<i>E. coli</i> count (MPN)/100g samples	<i>V. cholerae</i>
Frozen roasted eel seasoned	1.8×10^3 4.0×10^4	< 3	< 3	-
Frozen roasted eel	9.4×10^3 4.0×10^4	< 3	< 3	-
Frozen tilapia	1.8×10^3 5.0×10^4	23	< 3	-
Frozen tilapia fillet	1.1×10^3 5.0×10^4	9	< 3	-

CONCLUSION

The microbial quality of live eels and processed fish products is generally good as APC are low to moderate counts. All live eels and various types of processed fish products were free from *V. cholerae* but *Salmonella* spp, are isolated occasionally. The processed fish products were acceptable with low Coliform and *E. coli* counts.

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