A Research Note

Effect of Storage and Consumer Handling on Staphylococcal Counts of Dried Beef and Dried Fish

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ABSTRACT

Changes in staphylococcal counts of dried beef and dried fish during storage and while exposed to prospective buyers in a Nigerian market were investigated. The mean staphylococcal counts in dried beef and dried fish were $9.9 \times 10^5$ and $4.6 \times 10^6$ colony-forming units (CFU)/g and the mean aerobic plate counts were $2.0 \times 10^7$ and $1.2 \times 10^8$ CFU/g, respectively. Over a 28-d storage period at room temperature, the mean staphylococcal count declined about 100-fold for both products, i.e., from $9.9 \times 10^5$ to $3.0 \times 10^3$ CFU/g in dried beef and $4.6 \times 10^6$ to $2.2 \times 10^4$ CFU/g in dried fish. The decline in aerobic plate counts were from $2.0 \times 10^7$ to $6.5 \times 10^4$ CFU/g for dried beef and $1.2 \times 10^8$ to $1.4 \times 10^5$ CFU/g for dried fish, about a 1000-fold decline. Market samples of both products, though from the same batch but exposed to handling by prospective buyers, consistently showed higher staphylococcal contamination over the study period. Consumption of these products repeatedly exposed to human handling in the market for long periods may be a health hazard, particularly those that are ready-to-eat.

RESULTS AND DISCUSSION

Changes in mean staphylococcal counts and aerobic plate counts of stored and market samples of dried beef and dried fish over a 28-d period are shown in Table 1. For dried beef, mean staphylococcal counts declined 2 to 3 d to become crispy. Dried fish, however, is essentially smoked fish but thoroughly dried. Small, whole fish are put on spits and smoked in an open fire to dryness. If inadequately dried, maggots are commonly encountered in the product at the point of sale. Both dried beef and dried fish are products with low water activity and could keep well for weeks or months before sale when properly dried. They are sold in stalls at local markets, often exposed to prospective buyers.

Sample collection

Sumarre market, Nigeria, was the sampling area. The most patronized sale outlet for each product was initially identified and sampling units were purchased from these sources (25 to 27°C). The study was initiated when large consignments of products, which could last for weeks, were received by each of the sale outlets. Twenty-five 50-g units of each product were bought and transported to the laboratory in sterile wide-mouth bottles.

Storage of samples

Twenty-five-g units of each product were aseptically weighed and put in twenty petri plates slightly open for aerobic condition. Samples were incubated at room temperature (25 to 27°C) under a hood and the contents of five plates were assayed at each sampling time, i.e., at 7, 14, 21 and 28 d. Day 0 samples were composed of five 25-g units of each product bought at the start of the experiment.

Isolation and identification of microorganisms

Each Day 0 sample (25 g) was added to 225 ml of sterile 0.2 M NaCl and blended for 3 min. Serial dilutions made with saline were plated on nutrient agar (NA) for aerobic plate counts and on Baird-Parker agar (BPA) for staphylococcal counts. Plates were incubated at 37°C for 48 h. At subsequent sampling days, the same procedure was used, but in addition, for each product, five 25-g units of newly purchased market (exposed to human handling) samples from the same batch were similarly processed. Approximately 30% of black colonies randomly picked from BPA were identified as Staphylococcus aureus by: Gram staining, detection of catalase activity, anaerobic utilization of mannitol and glucose, coagulation of freshly prepared rabbit plasma (2) and thermonuclease production (3).

MATERIALS AND METHODS

Preparation of products

Dried beef, locally called ‘kilishi’, is made from thin slices of raw beef which are salted, spiced (pepper, ginger, etc.) and sun-dried for...
from 9.9 × 10^5 to 3.0 × 10^3 CFU/g and the aerobic plate counts decreased from 2.0 × 10^7 to 6.5 × 10^4 CFU/g, representing about a 100- and 1000-fold reduction, respectively. From 7 to 28 d, all market samples had higher staphylococcal counts than stored samples, but there was no progressive increase in counts during the study period. In dried fish, a similar trend was observed in the decrease of staphylococcal counts, i.e., from 4.6 × 10^6 to 2.2 × 10^4 (Day 28 CFU/g). Again, market samples contained more staphylococci than stored samples.

It can be concluded that dried beef and dried fish sold in Nigerian markets could be a health hazard as bought due to repeated staphylococcal contamination at the point of sale. There is a need to educate both vendors and prospective buyers of these products on sanitary practices during marketing.

REFERENCES


