A Research Note

Identity of Microorganisms from 'Khundi' - A Smoked Meat

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(Received for publication August 1, 1980)

ABSTRACT

Microorganisms from 45 pieces of 'khundi' - a dried and smoked meat produced from beef and mutton - were cultured on various media. Twelve species of bacteria, ten yeasts and sixteen molds were isolated during a period of 20 months. The microorganisms were compared with those obtained from two raw ingredients, that is, fresh beef and mutton. There were similarities between the raw and dried meats. Some of the microorganisms are known to produce toxins which might be the cause of frequent illnesses often reported after the consumption of 'khundi' meat.

Smoked, dried beef and mutton called 'khundi' is common to Nigeria. The meat is first boiled and then smoked until it is dry. The dried meat is packed in jute bags or wrapped in leaves for transporting to market. The drying process is used in conserving excess meat that would otherwise go to waste. There are frequent reports of illnesses following social parties, attended mainly by peasants, at which 'khundi' is served. Owing to the unhygienic conditions under which 'khundi' is prepared, it is expected that growth of microorganisms might take place before smoking as well as after the smoking; however, most of the contamination on the raw meat would be eliminated during the boiling and drying. An attempt was made to identify the contaminants associated with the 'khundi' with the aim of identifying organisms that might be associated with the illnesses from its consumption.

RESULTS AND DISCUSSION

Twelve species of bacteria were isolated in counts of 2.85 × 10³ to 4.5 × 10⁸/g: Bacillus megaterium (from 20 samples), Bacillus subtilis (from 25 samples), Brevibacterium acetylicum (from 25 samples). Lactobacillus viridescens (from 25 samples), Micrococcus conglomatus (from 25 samples), Micrococcus luteus (from 25 samples), Microbacterium thermosphactum (from 33 samples), Pediococcus cerevisiae (from 33 samples), Proteus vulgaris (from 28 samples), Serratia marcescens (from 20 samples), Staphylococcus epidermidis (from 20 samples), and Streptococcus faecalis (from 20 samples). Some of the same organisms were present in the fresh beef and mutton: B. megaterium, M. conglomatus, M. thermosphactum, P. vulgaris, S. marcescens, S. faecalis; four additional species were present: Clostridium haemolyticum, Micrococcus candidus, Micrococcus roseus and Staphylococcus aureus. The counts in the fresh meat were 1.72 × 10³ to 2.8 × 10⁵/g.
Ten yeasts were isolated from the ‘khundi’ samples in counts of $5.0 \times 10^{2}$ to $6.2 \times 10^{4}$: Candida albicans (from 41 samples), Candida krusei (from 20 samples), Candida tropicalis (from 35 samples), Rhodotorula glutinis (from 33 samples), Saccharomyces guttulata (from 25 samples), Saccharomyces telluvis (from 30 samples), Torulopsis candida (from 40 samples), Torulopsis glabrata (from 30 samples), Trichosporon cutaneum (from 25 samples), and Trichosporon pullulans (from 30 samples). Seven of these yeasts were isolated from the fresh meat: C. albicans, C. krusei, C. tropicalis, R. glutinis, S. guttulata, S. telluvis and T. glabrata; two additional ones were present in the fresh meat: Candida slooffii and Candida utilis. The counts in the fresh meat were $0.73 \times 10^{2}$ to $5.8 \times 10^{4}$.

Sixteen species of molds were isolated from the ‘khundi’ samples: Aspergillus flavus (from 42 samples), Aspergillus glaucus (from 20 samples), Aspergillus niger (from 34 samples), Aspergillus oryzae (from 35 samples), Cladosporium fulvum (from 15 samples), Fusarium moniliforme (from 20 samples), Geotrichum candidum (from 18 samples), Mucor mucedo (from 34 samples), Mucor racemosus (from 20 samples), Penicillium candidum (from 20 samples), Penicillium citrinum (from 28 samples), Penicillium expansum (from 21 samples), Phycomyces sp. (from 10 samples), Rhizopus stolonifer (from 25 samples), Sporotrichum cernius (from 20 samples) and Staphylocrichum cocosporum (from 12 samples). Eight of the same molds were found in the fresh meat: A. flavus, A. niger, A. oryzae, C. fulvum, G. candidum, M. mucedo, M. racemosus and P. expansum; two additional ones were found: Rhizopus nigricans and Thamnium elegans.

Boiling, smoking and drying can produce dual effects on the meat. Only a few of the microorganisms will survive the boiling and the hydrocarbons from the smoke. Drying reduces the water activity of the meat which results in further reduction in number of surviving organisms. Some of the sporeforming organisms may survive these adverse conditions and remain to contaminate the dried meat. However, it is expected that most contaminants found in the dried meat resulted from recontamination because the procedures of handling the dried meat were no better in most instances than those used in handling the fresh meat. It is expected that the sources of contamination will vary from place to place as the methods for preparing and transporting the dried meat are not standardized. ‘Khundi’ is transported in various containers, such as metallic bowls and jute bags, and the meat may be left uncovered in the market where it is touched by many customers during examination for purchase. It is not surprising that ‘khundi’ is highly contaminated.

Although the types of illnesses that occur after the eating of ‘khundi’ are not well documented, the high degree of contamination, particularly with molds, implicates microbial contamination in the illnesses. A study is underway to determine what toxins may be present in the ‘khundi’.

REFERENCES


Newell, con't. from p. 580