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Research Article

MICROBIAL QUALITY OF READY TO EAT BARBECUE MEAT (SUYA) SOLD ON THE STREETS OF LAGOS STATE

HASSAN, ISIAKA ADIO[1], EMUN, HELEN OVUORAINI[2], ADEKUNLE ESTHER OLUBUNMI[1]

1. Department of Science Laboratory Technology[1]

2. Department of Hotel and Catering Management Technology[2]

Lagos state polytechnic, Ikorodu.

ABSTRACT

Ten (10) samples of barbecue meat (Suya) Meat from different location of Lagos State namely: Oshodi, Surulere Mushin, Ebute meta, Island, Ikeja, Ojota, Ketu, Ikorodu and Shomolu were collected randomly and analyzed microbiologically with streak method of inoculation with dilution factor of 10 $^{-3}$ aliquot inoculum The total viable count on nutrient agar ranged from 2.8 x 10^{6} - 5.465 x 10^{6} Cfu/g, the total coliform count on macConkey agar ranged from 0.2 x 105 - 6.35 x 105Cfo/g. the staphylococcus count on manitol salt agar ranged from 1.25 x 10^{5}- 3.9 x 10^{6}Cfu/g. fungi count (yeast mould) on potato dextrose agar ranged from 1.5 x 10^{6} - 0.15x10^{6}Cfu. The bacteria isolated were identified to include, *Escherichia coli, Staphylococcus species, Pseudomonas sp, Clostridium septicum, Micrococcus sp* and *Bacillus alvei.* The fungi isolates in this study are Mucor racmosios Geomyces panorus Penicillum sp and many Aspergillus sp.The result revealed that hygienic condition of the meat was below acceptable standard for human consumption. Finally, meat handlers should know that in meat processing; personal hygiene and proper means of transportation are very important and also Aseptic techniques should be adequately employed in the local barbecue (Suya Meat) spots.

Keyword: Microorganism, quality, barbecue, meat

INTRODUCTION

Meat is a flesh of animals which serves as food. It is obtained from sheep, cattle, goat and swine[1]. Meat is a major source of protein and important source of vitamins for most people in many parts of the world thus they are essential for the growth, repair and maintenance of body cells which are necessary for our everyday activities. Consumption of meat could be traced back in history to the period when primitive man ate raw flesh of animals and later developed the art of domestication of wild animals. Beef has been the major supply of meat in Nigeria as a result of extensive and semi-intensive cattle production system by the Fulani and Hausa people of the northern Nigeria[2]. Due to its chemical compositions and characteristics, meat is an highly perishable food. This provides an excellent medium for growth of many microorganisms that can cause infection in man and also lead to meat spoilage and economic loss. The most important bacterial meat spoilage is caused by lactic acid bacteria; these include many species such as *Lactobacillus, Leuconostoc, Pediococcus and Streptococcus* which are physiologically related to a group of fastidious and ubiquitous gram-positive organisms. The possible sources of contamination are through slaughtering of sick animals, washing the meat with dirty water by butchers, contamination by flies through processing done close to sewage or refuse dumps site, transportation by rickety vehicle, use of contaminated equipment such as knife and other utensils[3] and addition of unclean spices. The slaughtering process gives extensive contamination of sterile tissues with gram-negative enteric bacteria from animal intestine including *Salmonella species* and *Escherichia coli* as well as contaminants such as gram-positive *Lactic cocci* associated with human, animal and the environment[4]. *Enterococci* and *Clostridia* have been isolated from lymph node of red meat animals[4, 5]. Microorganisms grow on meat causing visual, textural and organoleptic changes when they release metabolite [6]. The smoke produced to roast meat (Suya meat) has a number of effects including preservative effect resulting from the deposition of organic compounds [7]. A preservative effect is also induced by the surface drying that result to the 30% of total weight loss in hot smoked product. Antioxidant effect is produced by the phenolic deposit unto the product [7]. Suya meat is a traditional stick meat product that is commonly produced by the Hausas in West Africa from beef, although chicken can also be used. It is produced from boneless meat hung on stick and spiced with peanut cake, salt, vegetable oil and other flavour, followed by roasting around a glowing charcoal fire. Meat spoilage is usually associated with gram-negative proteolitic bacteria which literally decompose the protein with production of offensive odour [1]. There are also other types of common microorganisms apart from enteric organisms found in meat which are members of *Micrococcaceae* and *Staphylococcaceae* families. The predominant types are coagulase-negative *Stapylococci* that are salt tolerant and can also grow with or without oxygen. The most common strain belongs to the species of *Stapylococcus carnosus*, *S. xylosus* and *S. kocuria*. However, these organisms are harmless and do not constitute any hazard. *Bacillus* species, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Proteus species*, *Serratia species* and *Aspergillus species* were isolated from suya meat samples collected from Awka, Anambra State [8]. *Staphylococcus aureus* require about 6.5% of sodium chloride for growth and is usually found in salty meat products [9]. The aim of this work is to isolate, characterize and identify microbial species associated with suya meat sold on the street of Lagos state and to offer useful information where necessary to the consuming public.

MATERIALS AND METHODS

SAMPLES COLLECTION

Ten skewers of suya meat were obtained randomly from suya vendors at popular suya spots in Lagos metropolis namely: Mushin, Oshodi, Ikorodu, Shomolu, Ketu, Ojota, Surulere, Ikeja, Ebute-meta and Island. The samples were immediately wrapped in sterile aluminum foil to prevent contamination and then transported to the laboratory for microbial analysis without delay.

METHOD

A suya piece from each sample was removed from the skewers, and mashed in a sterile laboratory mortar and pestle. 1g of the mashed suya meat was weighed and then aseptically introduced into 9ml of sterile distilled water, properly shaken and sieved before a twofold dilution was performed. The samples were inoculated aseptically using streak technique on macConkey, mannitol and nutrient agar for bacteria and Potato dextrose agar for fungi plates respectively and incubated at 37°C between 18hours and 24hours while at 25± 2°c for 3-5 days for fungi. Then, the plates were read for growth of organisms.

IDENTIFICATION OF THE ORGANISMS ISOLATED

The representative colonies were chosen from each plate based on the colonial morphology similarity; isolates were identified using various number of morphological and biochemical tests such; colonial characterisation, cellular characterisation Gram staining reaction

RESULT AND DISCUSSION,

In the present study, the microorganisms isolated were *Staphylococcus* species, clostridium septicum, *Escherichia coli, Bacillus alvei and Pseudomonas* species etc as shown in the table4.2 and4.3. The results were in consonance with the report of [8] which stated that microbiological analysis of meat samples in Awka, the capital of Anambra State, in Nigeria indicated contamination of meat samples with various bacteria species including *Staphylococcus aureus,* and some enteric bacteria. The organisms isolated in this study were the organisms usually implicated in meat spoilage and unhygienic condition of meat handling. This is also in agreement with the report of [2] that the presence of *Escherichia coli* probably may arise from the use of non portable water during washing of raw meat. In table 4.2 the meat also showed presence of *Pseudomonas aeruginosa*, which usually occurs in soil, surfaces of plants, man and animals [10].

On the whole, the major sources of microbial contamination of suya meat appear to come from butchers and the use of contaminated water and equipment. So control of suya meat contamination can be achieved if aseptic techniques are employed during preparation of suya.

CONCLUSION

The organisms isolated from the suya meat indicated that the standards of preparation and preservation have not improved much over the years and facilities used for preparation are not sterile. Aseptic techniques should be adequately employed in the meat industries so as to reduce microbial load of meat and its products for safe consumption by consumers and thus prevent food-borne diseases or infections.

RECOMMENDATIONS

Quality control unit should be established in meat processing industries in Nigeria and Hazard Analysis Critical Control Point (HACCP) concept should be applicable to the processing of suya meat and beef products. These will go a long way in reducing contamination and spoilage of meat products. Other preventive measures include: Proper animal husbandry; hygienic slaughtering; adequate meat inspection; proper meat transportation; sanitation of utensils and equipment; provision of potable drinking water; prevention of preparation of food on the streets or open spaces like motor parks and market places; and proper storage of meat should be employed to reduce microbial contamination. Research work should be carried out by scientist in area of preservation of meat for a long period with a shelf life not less than one year. A breakthrough will encourage a long period of storage, thus preventing contamination.

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Table 4.1
Total Mesophile Aerobic microbial population in suya sample

Sample name	Total Viable count on nutrient agar (NA)CFU/g	Coliform count on MacConkey agar CFU/g	Staphylococcus count on Mannitol salt agar (MSA) CFU/g	Fungi count (yeast/molds) on Potatoes dextrose agar PDA CFU/g
Ebute Metta 1	2.8 x 10^6	0.02 x 10^5	0.125 x 10^6	0.015 x 10^5
Mushin 2	0.06 x 10^6	3.75 x 10^5	2.6 x 10^6	0.04 x 106^6
Oshodi 3	5.05 x 10^6	3.4 x 10^5	0.18 x 10^6	0.04 x 10^6
Ikorodu 4	4.05 x 10^6	2.6 x 10^5	0.135 x 10^6	0.05 x 10^6
Shomolu 5	7.7 x 10^6	4.75 x 10^5	3.5 x 10^5	0.075 x 10^6
Ketu 6	8.9 x 10^6	6.1 x 10^5	3.9 x 10^5	0.11 x 10^6
Ojota 7	0.06 x 10^6	4.35 x 10^5	0.165 x 10^6	0.14 x 10^6
Surulere 8	7.65 x 10^6	4.1 x 10^5	3.8 x 10^5	0.075 x 10^6
Ikeja 9	5.465 x 10^6	6.15 x 10^5	4.5 x 10^5	0.15 x 10^6
Island 10	9.4 x 10^6	6.35 x 10^5	3.7 x 10^5	0.11 x 10^6

TABLE: 4.2

BIOCHEMICAL TESTS AND CHARACTERIZATION OF BACTERIAL ISOLATES FROM SUYA MEAT ON NUTRIENT AGAR

Sample Site	Sample Code	Colour / Piginent	Gram Reaction	Cellular morphology	Catalase Test	Oxilase Test	indole Test	Motility Test	MR-methyl Red	Vp- Voges Proskaeur	Urease activity	Citrate Utilization	Starch Hydrolysis	Gelation Hygrolysis	Casein Hydrolysis	Spore test	NO3 duction	GLUCOSE	SUCROSE	ARABINOE	MALTOSE	MANNTOL	XYLOSE	GALATOSE	SORBITOL	INVOSITOL	RAFFINOSE	FRAUCTION	**PROBABLE IDENTITY**
Ebute metta	1	Cream	+ve	Rods	+	+	-	+	-	-	+	-	+	+	-	+	+	+	-	+	+	-	+	+	-	-	-	+	*Bacillus stearothermophithus*
	2	Cream	+ve	Rods	+	+	-	+	-	+	+	+	+	+	-	+	+	+	+	-	-	-	-	+	-	-	+	+	*Bacillus amylolquefasciens*
	3	Cream	+ve	Rods	+	+	-	+	-	+	-	-	+	-	-	+	+	+	+	-	-	-	-	-	-	-	+	-	*Bacillus coagulans*
	4	Pink	+ve	Rods	+	-	-	+	-	+	-	+	-	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	*Klebsiella aerogenes*
	5	Green	+ve	Rods	+	+	-	+	-	-	-	-	-	+	-	-	+	+	+	+	-	+	-	-	-	-	+	-	*Pseudomonas fluorescens*
Mushin	1	Cream	+ve	Rods	+	+	-	+	-	+	-	+	+	+	+	+	+	+	+	+	-	+	-	+	-	-	-	+	*Bacillus subtilis*
	2	Cream	+ve	Rods	+	+	-	-	-	+	-	-	+	+	+	+	+	+	+	-	-	+	-	-	-	-	-	-	*Bacillu mycoides*
	3	Cream	+ve	Rods	-	-	-	+	-	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-	-	+	+	*Clostridium butyricum*
	4	Pink	+ve	Rods	+	-	-	+	-	-	+	+	+	+	+	-	-	-	+	+	-	+	+	-	+	-	+	-	*Enteribacter cloucae*
	5	Pink	+ve	Rods	+	+	-	+	-	+	-	+	-	+	-	-	-	+	+	+	+	+	+	-	-	+	+	+	*Enteribacter cerogenes*
Oshodi	1	Cream	+ve	Rods	+	+	-	+	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	*Bacillus polymyxa*
	2	Cream	+ve	Rods	+	+	-	+	-	+	-	+	+	+	+	+	+	+	+	+	-	+	-	+	-	-	-	+	*Bacillus subtilis*
	3	Cream	+ve	Rods	+	-	-	+	+	-	-	-	+	+	-	-	-	+	-	-	+	+	-	-	-	-	-	+	*Clorynebacterium striatum*
	4	Pink	+ve	Rods	+	-	-	-	+	+	+	+	+	-	-	-	-	+	+	+	+	+	-	+	-	+	-	-	*Klebsiella planticola*
	5	Pink	+ve	Rods	+	-	-	-	-	+	+	+	+	+	+	-	+	+	+	+	+	+	+	- -	-	+	-	+	*Klebsiella pneumonia*
Ikorodu	1	Cream	+ve	Rods	+	+	-	+	-	-	-	+	+	+	+	+	-	+	+	+	-	+	+	-	-	-	-	+	*Bacillus megateriem*
	2	Cream	+ve	Rods	+	+	-	+	-	-	+	_	+	+	+	+	+	+	-	+	+	-	+	+	-	-	-	+	*Bacillus stearothermophithus*
	3	Cream	+ve	Rods	+	+	-	+	-	-	+	-	+	+	+	+	+	+	-	+	+	-	+	+	+	-	-	-	*Bacillus stearothermophithus*
	4	Pink	+ve	Rods	+	+	+	+	+	-	-	+	-	-	-	-	-	+	+	-	+	+	-	-	+	-	+	+	*Citrobacter diversus*
	5	Pink	+ve	Rods	+	-	-	-	+	+	+	+	+	-	-	-	-	+	+	+	+	+	+	-	+	-	+	+	*Klebsiella planticola*
Shomolu	1	Cream	+ve	Rods	+	+	-	+	-	+	-	+	+	+	+	+	+	+	+	+	-	+	-	+	-	-	-	+	*Bacillus subtilis*
	2	Cream	+ve	Rods	+	-	-	+	-	-	-	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	-	+	*Clostridium septicum*
	3	Cream	+ve	Rods	+	+	+	+	-	+	+	-	+	+	+	+	-	+	+	-	-	-	-	- -	-	-	-	+	*Bacillus alvei*
	4	Pink	+ve	Rods	+	-	-	-	+	-	+	+	-	-	-	-	-	+	+	+	+	+	+	+	-	+	-	+	Klebsiella liquefasciens
	5	Pink	+ve	Rods	+	-	-	-	-	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-	+	+	-	+	Euterobacter aerogenes

TABLE: 4.2 CONTINUED

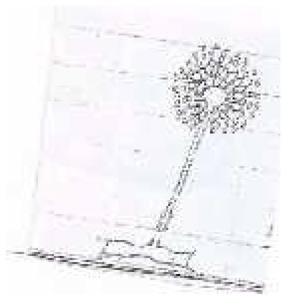
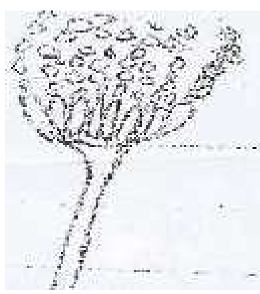
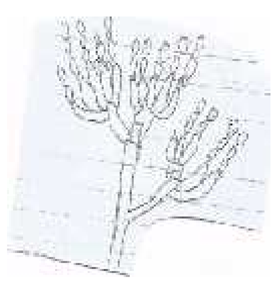
BIOCHEMICAL TESTS AND CHARACTERIZATION OF BACTERIAL ISOLATES FROM SUYA MEAT ON NUTRIENT AGAR																													
Sample Site	Sample Code	Colour / Piginent	Gram Reaction	Cellular morphology	Catalase Test	Oxilase Test	indole Test	Motility Test	MR-methyl Red	Vp- Voges Proskaeur	Urease activity	Citrate Utilization	Starch Hydrolysis	Gelation Hygrolysis	Casein Hydrolysis	Spore test	NO3 duction	GLUCOSE	SUCROSE	ARABINOE	MALTOSE	MANNTOL	XYLOSE	GALATOSE	SORBITOL	INVOSITOL	RAFFINOSE	FRAUCTION	**PROBABLE IDENTITY**
Ketu	1	Cream	+ve	Rods	+	+	- -	+	-	-	+	+	+	+	+	+	-	+	+	-	-	-	-	+	+	+	-	-	*Bacillus subtilis*
	2	Cream	+ve	Rods	+	+	-	+	-	-	+	+	+	+	-	+	-	+	+	+	+	+	-	+	-	-	+	-	*Bacillus subtilis*
	3	Red	-ve	Rods	+	+	-	+	-	+	-	+	+	+	-	-	-	+	+	+	+	+	-	-	-	-	+	+	*Serratia rubidaea*
	4	Cream	+ve	Rods	+	+	-	+	-	+	-	+	+	+	-	+	-	+	+	+	+	+	-	+	-	-	+	+	*Bacillusc cereus*
	5	Pink	-ve	Rods	+	+	-	+	+	+	-	+	-	+	-	-	-	+	+	+	+	+	-	-	-	-	+	+	*Klebsiella planticola*
Ojota	1	Cream	+ve	Rods	+	+	-	+	-	+	-	+	+	+	-	+	-	+	+	+	-	+	-	+	-	-	-	+	*Bacillus subtilis*
	2	Cream	+ve	Rods	+	+	-	+	-	+	+	+	+	+	-	+	-	+	+	+	-	+	-	-	-	-	-	+	*Bacillu subtilis*
	3	Cream	+ve	Rods	+	+	-	+	-	+	-	+	-	+	-	+	-	+	+	-	-	+	-	-	-	-	+	+	*Bacillus cereus*
	4	Pink	-ve	Rods	+	+	-	+	+	+	-	+	-	+	-	+	-	+	+	-	-	+	-	-	-	-	+	+	*Klebsiella liquefasciens*
	5	Red	-ve	Rods	+	+	-	+	+	+		+	-	+	-	+	+	+	+	-	- -	+	-	-	-	-	+	+	*Serratia phymuhia*
Suruler e	1	Cream	+ve	Rods	+	+	-	+	-	+		+	-	+	+	+	+	+	+	-	-	+	-	+	-	-	+	+	*Bacillus cereus*
	2	Cream	+ve	Rods	+	+	-	+	-	+		+	-	+	-	+	+	+	+	-	+	+	-	+	-	-	-	+	*Bacillus alvei*
	3	Cream	+ve	Rods	+	+	-	+	-	+		+	-	+	+	+	-	+	+	+	+	+	+	-	-	-	-	+	*Clostridium septicum*
	4	Green	-ve	Rods	+	+	-	+	-	+		+	-	+	-	-	+	+	+	+	+	+	+	+	-	-	+	+	*Pseudomonas aeruginosa*
	5	Orange	-ve	Rods	+	-	-	+	-	+		+	-	+	+	+	-	+	+	+	+	+	+	-	-	-	-	-	*Flavobacteriu m rigense*
Ikeja	1	Cream	+ve	Rods	+	-	-	+	-	+		+	-	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	*Corynebacteri um pilosum*
	2	Cream	+ve	Rods	+	-	-	+	-	+		+	-	-	+	+	-	+	+	+	-	+	+	+	-	-	-	+	*Bacillus laterosporus*
	3	Cream	+ve	Rods	+	-	-	+	-	+		+	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	*Bacillus licheniformis*
	4	Black	-ve	Rods	+	+	-	+	+	+		+	-	-	+	+	+	+	+	+	-	+	+	-	-	-	-	+	*Escherichia coli*
	5	Pink	-ve	Rods	+	+	-	+	+	+		+	-	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	*Acimebacter aniiratus*
Island	1	Cream	+ve	Rods	+	+	-	+	-	+		+	-	-	+	+	+	+	+	+	-	+	+	+	-	-	-	+	*Clostridium septicum*
	2	Cream	+ve	Rods	+	+	-	+	-	+		+	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	*Bacillus licheniformis*
	3	Red	-ve	Rods	+	+	- -	-	-	+		+	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	+	*Serratia phymuhia*
	4	Black	--ve	Rods	+	+	-	-	-	+		+	+	+	+	+	+	+	+	-	+	-	-	+	-	-	-	+	Escherichia coli
	5	Pink	-ve	Rods	+	+	-	+	+	+		+	+	-	+	-	-	+	+	-	-	-	-	-	-	-	-	+	*Pseudomonas putida*

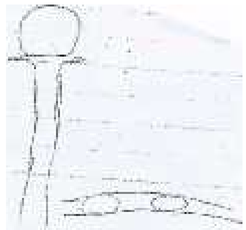
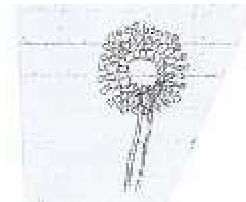
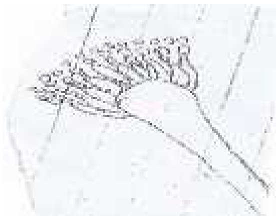
TABLE: 4.3

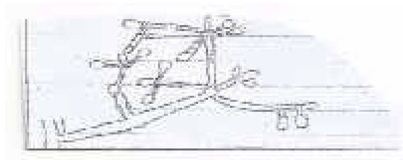
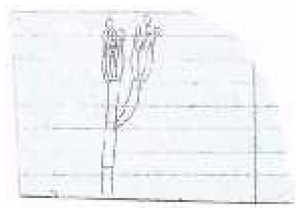
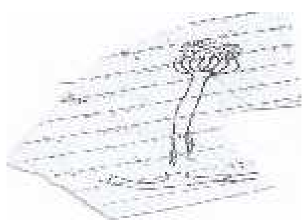
BIOCHEMICAL TESTS AND CHARACTERIZATION OF STAPHYLOCOCCUS ISOLATES FROM SUYA MEAT

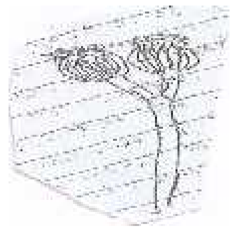
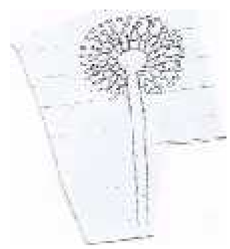
Sample Site	Sample Code	Colour / Piginent	Gram Reaction	Cellular morphology	Catalase Test	Oxilase Test	indole Test	Motility Test	MR-methyl Red	Vp- Voges Proskaeur	Urease activity	Citrate Utilization	Starch Hydrolysis	Gelatin Hygrolysis	Casein Hydrolysis	Spore test	NO3 duction	GLUCOSE	SUCROSE	ARABINOE	MALTOSE	MANNTOL	XYLOSE	GALATOSE	FRAUCTION	**PROBABLE IDENTITY**
Ebute – metta	1	Orange	+ve	Cocci	+	-	-	-	-	+	+	-	-	+	+	-	+	+	+	-	+	+	-	+	+	*Staphylococcus aureus*
Ebute metta	2	Yellow	+ve	Cocci	+	-	-	-	-	-	+	-	-	+	-	-	-	+	+	-	+	+	-	-	-	*Micrococcus luteus*
Mushin	1	Cream	-ve	Cocci	+	-	-	-	-	+	+	-	-	+	-	-	+	+	+	-	+	+	-	-	-	*Staphylococcus simulans*
Mushin	2	Cream	+ve	Cocci	+	-	-	-	-	+	+	-	-	+	-	-	-	+	+	+	+	-	-	-	-	*Staphylococcus albus*
Oshodi	1	Cream	-ve	Cocci	+	-	-	-	-	+	+	-	-	+	-	-	-	+	+	+	+	-	-	+	+	*Staphylococcus aureus*
Oshodi	2	Cream	+ve	Cocci	+	-	-	-	-	+	+	-	-	+	-	-	-	+	+	+	-	-	-	-	-	*Staphylococcus albus*
Ikorodu	1	Orange	+ve	Cocci	+	-	-	-	-	+	+	-	-	+	-	-	-	+	+	-	-	-	-	-	+	*Staphylococcus epidermis*
Ikorodu	2	Orange	+ve	Cocci	+	-	-	-	-	+	+	-	-	+	-	-	-	+	+	-	-	-	-	+	+	*Staphylococcus aureus*
Shomolu	1	Yellowe	-ve	Cocci	+	-	-	-	-	-	+	+	-	+	-	-	-	+	+	-	+	-	-	-	-	*Micrococcus kristinae*
Shomolu	2	Yellow	-ve	Cocci	+	-	-	-	-	-	+	+	-	+	-	-	-	+	+	-	+	-	-	-	-	*Micrococcus luteus*
Ojota	1	Yellow	+ve	Cocci	+	-	-	-	-	-	+	+	-	+	+	-	-	+	+	-	+	+	-	+	-	*Micrococcus varians*
Ojota	2	Orange	+ve	Cocci	+	-	-	-	-	+	+	+	-	+	-	-	-	+	+	-	+	+	+	+	+	*Staphylococcus epidermis*
Suruler e	1	Cream	+ve	Cocci	+	-	-	-	-	+	+	+	-	-	+	-	+	+	+	-	+	+	+	-	-	*Staphylococcus simulans*
Suruler e	2	Cream	-ve	Cocci	+	-	-	-	-	+	+	+	-	+	-	-	+	+	+	-	-	+	+	+	-	*Staphylococcus simulans*
Ikeja	1	Yellow	-ve	Cocci	+	-	-	-	-	-	+	+	-	-	+	-	+	+	+	-	-	-	+	-	-	*Micrococcus varians*
Ikeja	2	Orange	+ve	Cocci	+	-	-	-	-	+	+	-	-	+	+	-	+	+	+	-	-	-	+	-	+	*Staphylococcus aureus*
Island	1	Yellow	+ve	Cocci	+	-	-	-	-	-	+	-	-	+	+	-	-	+	+	-	-	-	-	+	-	*Micrococcus krisstinae*
Island	2	Cream	+ve	Cocci	+	-	-	-	-	+	+	-	-	+	+	-	-	+	+	-	+	-	-	+	-	*Staphylococcus albus*
Ketu	1	Cream	-ve	Cocci	+	-	-	-	-	+	+	-	-	+	+	-	-	+	+	-	+	+	-	-	-	*Staphylococcus albus*
Ketu	2	Orange	-ve	Cocci	+	-	-	-	-	+	+	-	-	+	+	-	- -	+	+	-	+	+	-	-	+	*Staphylococcus epidermis*

TABLE: 4. 4
IDENTIFICATION OF MOULDS

Isolate Code	Colonial Morphology on Agar	Microscopy Morphology
Oshodi Ikorodu Ketu Ojota Surulere Ikeja Island	Growth, colonies growth spreading within 2 -3 days of incubation with fluffy and velvety texture the aerial mycelium white at first frequently developing into dark brown to black conidial heads with no reverse colour  **Aspergillus niger**	Conidial heads are round or globose, large and also radiate or as they grow splitting into loose odumns of conidia chains with age. Condiosphores arising from the substratum mostly colourless to brown, smith, splitting when crushed like a pieces of cone vesicle globose while phialides borne directly on the vesicle matulae and foot cells are usually present.
Mushin Oshodi Ketu Surulere Ikeja	Growth, colonies growth are broadly spreading and consist of a somewhat loose feet blue green to gray-green to gray-green becoming definitely grayish in old cultures reverse white  **Penicillum spinulosum**	Conidiosphores arising from either submerged or aerial hyphae, smooth or slightly rough with ape swollen, phialides not very numerous conidia globose, spinulose borne in loose columns.
Mushin Oshodi Shomolu Ketu Ojota Surulere Ikeja Island	Growth, colonies growth usually broadly spreading within 2-3 day of incubation, colony blue-green to deep green, smooth, velvety texture with reverse almost colourless.  **Penicillium roquefortii**	Penialli districtly asymmetric commonly with three stages of branding, stipes rough, metulae often rough, phialides about 8-12, conidia globose, but occasionally large, smooth, borne in loose column. Entangled chains conidiosphores but smooth

Ketu Ikeja Island	Growth, colonies grow spreading moderately within 3-4 days of inacubation with granular to velvety texture from mixed conidial heads - colonies are pale yellow to orange.  **Mucor racmosios**	The conidial-heads are smaller and slightly paler, splitting into delicate columns. Conidiospores coloured usually coarsely roughened long, vesicle globose, metullae and phialides are usually present conidia globose to elliphical fairly yellowish, cleistothecia and scleorotia are frequently produced.
Shomolu Ketu Ojota Surulere Ikeja Island	Growth, colonies growth spreading less rampantly than Rhizopus stotonifer within 2-3 days with brownish black colour.  **Aspergillus melleus**	Sporangiophores erect arising from hyphae with rhizoids sporangia globose, Rhizolds shorts, pale and ragged spores ellipsoidal and striate in by anus.
Ikeja	Growth, colonies growth spreadings rapidly with dark smokey green surface becoming darker more or less velvety texture and occasionally flogiose with reverse cream colour.  **Aspergillus fumigatum**	Conidial head columner of varying length, columns fragment forming masses of green durt-conidiosphores, smooth,short often greenish-vesicles flask-shaped phialides borne directly on the vesicles conidia. Small, globose or gouge cleiothecia white to off white, producing 8-spores asci-ascospores uncoloured bivalve with equatorial crests and ornamented convex surface.

Ojota	Growth, colonies grows are restricted often heaped up, club shaped with a very thin white of aerial spores reverse colourless.  **Geomyces pannorus**	Spores hyaline, barrel shaped oval to pear shaped smooth to rough; the conidia are small laterally formed on short pedicels. Conidiophores are present hyaline, branched acutely at the apex with conidial cells
Ojota	Growth, colonies grows rapidly spreading on agar plate within 2-3 days, smooth, velvety, dull yellowish green with reverse cream white.  **Penicillum digitatum**	Penicillin, simple, but with all parts large stipes short bearing metulae and phialides few in the vertical conidia are oval, smooth, large in axis.
Mushin Ikorodu	Growth, colonies grows moderately and rapidly well within 2-3 days of incubation with dusty yellow at first quickly becoming bright to dark yellow green or greenish yellow fluffy and velvety texture with cream reverse colour.  **Penicillum restriction**	Conidiophores coarsely roughened with conidial heads varying size loosely radiated or splitting or columnar or bi serrate but having some heads with phialides borne directly on the vesicles. Conidia globose occasionally elliptical and also roughened metulae are also present.

Ketu Surulere	Growth, colonies growth in restricted, almost velvety to definitely floccose, rich green to greyer, reverse at first colourless, slowly becoming deep yellows to orange.  **Penicillium rugulosum**	Penicillum mostly typical but frequently irregular, with metulae of different lengths. Conidiophores smooth. Phialiades 10-12 in numbers – conidia elliptical roughened and borne in tangled chains.
Shomolu Ojota Ikeja	Growth, colonies growth slow and matured within 5-6 days. Colonies growth is restricted with rich bluish green colour and no reverse colour.  **Aspergillus flavus**	Septa: hyphae with branched or unbranches. Conidiosphores that have secondary branches known as metulac, on the metulae, arranged in walls are flask-shaped phialiades chain of smooth rough conidia and foot cells usually present.

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