Commentary

iMedPub Journals
http://journals.imedpub.com

Journal of Clinical Immunology and Infectious Diseases

2020
Vol. 4 No. 3

Evaluation of Microbiological Quality in Expired and Non-expired Dairy Canned Food Products Sold from Samaru Market, Zaria, Northwest Nigeria

Taiwo Adekanmi Adesakin*, Kauthar Ibrahim

Department of Biology, Ahmadu Bello University, Zaria, Nigeria

***Corresponding author:** Taiwo Adekanmi Adesakin, Department of Biology, Ahmadu Bello University, Zaria, Nigeria, E-mail: ataiwonelson@gmail.com

Received: 09-11-2020; **Accepted:** 23-11-2020; **Published:** 30-11-2020

Citation: Taiwo A A (2020) Evaluation of Microbiological Quality in Expired and Non-expired Dairy Canned Food Products Sold from Samaru Market, Zaria, Northwest Nigeria. Clin Immunol Infect Dis Volume 4 No.3

Abstract

The aims of this study is to investigate the microbiological quality of expired and non-expired dairy canned foods product and to provide information on human health risk associated with various type of microbes found in canned food and suggest possible method of controlling the risks. Five different types of can foods product were purchase from Samaru market; the samples were collected in labeled sterile plastic bags and transported to the Laboratory for analysis. Twelve fungal species were isolated during the period of study while five fungal species were isolated from expired canned foods product and seven fungal species were isolated from non-expired canned foods product. The isolated fungal species are *Aspergillus flavus, Aspergillus niger, Aspergillus clavatus, Trichophyton rubrum, Microsporum ferrugineum, Rhodotorula spp, Madurella grisea, Sporoboromyces salmonicolor, Penicillium spp, Curvularia spp, Microsporum nanum* and *Coccidioides immitis*. The highest fungal mean density was recorded in baked beans, tomatoes, fish and milk from expired canned foods product compared with non-expired canned food products except for sweet corn with the highest fungal mean density. Fish, tomatoes, sweet corn contributed 25% of the total fungal isolated in expired canned food product followed by milk (14%) and baked beans (11%) while baked beans had 31%, evaporated milk and tinned tomatoes contributed 23% followed by fish 15% and sweet corn (8%). The fungal species identified during this study are foodborne pathogens that are potential health hazards for consumption, cause diseases in humans and animals that may be bloody.

Keywords

Microorganisms; Food-borne; Pathogens; Canned Foods; Health Hazards.

Introduction

Daily increases in the world population has led to the food shortage and demanding for preservation of food items that available from spoilage or prevent wastage, to make food available and edible long after the processing time [1]. Canning is a method in which food items are processed, preserved and sealed in an airtight container such as jars, steel, bottle and tin cans. It extends food shelf life and it typically ranging from one to five years, although under specific circumstances it can be much longer. Several methods are employ in preserving the food from contaminated or spoiled by microbes includes: pasteurization, boiling, refrigeration, freezing, drying, vacuum treatment, antimicrobial agents that are natural to the recipe of the foods being preserved, a sufficient dose of ionizing radiation, submersion in a strong saline solution, acid, base, osmotically extreme and other microbial challenging environments [2]. Good can food product expected to contain high nutrient quality, as well as being free from physical, chemical and biological contamination [3]. The occurrence of microbial populations in canned foods are recognized as a source of potential health hazard to man due to their production of toxins, which are capable of inducing several critical clinical symptoms in man through ingestion or inhalation, even though they differ in their degree and manner of toxicity. The contamination of canned foods by microbes such as bacteria and fungi maybe due to poor handling practices in food supply chain, storage conditions, distribution, marketing practices and transportation [2]. Every food harbors its own microbiota that may be specific and characteristic of a given point in the production process and storage conditions. In processed foods, the microbiota consists of microorganisms from the raw materials that survived the processing, preservation, and storage conditions as well as microorganisms that contaminated the food during handling and processing. In raw foods, their characteristics, handling, and environmental conditions as well as farming practices will dictate the predominating microbiota. Some microorganisms can be considered useful, if the change due to their growth in foods are deemed beneficial e.g. in terms of flavor, texture, and appearance. The spoilage microbiota consists of microorganisms that can grow on a food and causing undesirable changes in it. The potential of microorganisms to spoil food rests on their ability to produce metabolites that are associated with spoilage and lead to rejection

of foods by consumers. In general, many microorganisms in a food are capable of producing undesirable metabolites when they grow above a certain level [4]. The growth of spoilage microorganisms in foods may result in changes in sensory properties, such as color, odor, texture, and appearance. Additionally, some microorganisms pose a health risk, which they are consider pathogenic and the characteristic of the disease will depend on a number of factors inherent to the food, pathogenic microorganism, and affected individual. Can foods spoilage microorganism are of two types but our concern is on fungal spoilage due to the few baseline information on impact of fungal spoilage and the health hazard associated with it.

Bacterial spoilage of foods: Many bacteria can grow on foods while few groups are responsible for their spoilage but factors such as storage temperature, oxygen availability, food composition, pH, thermal treatment, competing microbiota and others affect the survival, growth, and occurrence of these microorganisms in foods. Spoilage caused by bacterial occurs faster and more evidently in high-protein foods such as meat, milk, fish, and dairy products because they are rich in nutrients and have high water activity as well as pH values close to 7.0 while the occurrence of certain microorganisms in these foods are mainly promote by temperature and atmosphere [5]. Thermal treatment preservation is safety for some types of food but it also allows specific spoilage microorganisms to prevail in the treated food. Alicyclobacillus spp. and Propioni-bacterium cyclohexanicum are the main microorganisms associated with the spoilage of fruit juices that survive thermal treatment and may cause off-flavors, off-odors, discoloration, and turbidity [6,7]. Canned foods submit to industrial sterilization methods are spoiled exclusively by facultative or strictly anaerobic spore-forming bacteria such as Geobacillus stearopthermophilus, Clostridium sporogenes, and Desulfotomaculuns nigrificans, among others [8].

Yeasts are very important unicellular eukaryotic microorganisms involved in the production and spoilage of food and beverage [9]. These microorganisms spoil foods with high sugar or salt contents, low pH, or other characteristics that give them a competitive advantage over bacteria [10,11]. Most yeasts produce extracellular enzymes such as proteases, lipases, amylases, and pectinases, volatile and non-volatile metabolites that affect the sensory characteristics of food, especially flavor and texture. The main genera associated with food spoilage are Saccharomyces, Candida, Zygosaccharomyces, Debaryomyces, *Rhodotorula*, and Pichia. Yeasts play a small part in the spoilage of meats and despite the competition with bacteria, some yeasts manage to grow on the surface of fresh meats [12]. They inhibit bacterial growth by intrinsic and extrinsic factors changes and play important role in the dairy industry, especially for the production of some fermented products, maturation of some cheeses, and whey fermentation for bioactive compound production [13-15].

Filamentous fungi are capable of growing on many different raw foods, such as grains, meats, milk, fruits, vegetables, seeds, and high-fat products. They are an important group of food spoilage organisms that cause significant economic loss in agriculture and the food industry [16]. Spoilage caused by filamentous fungi may manifest as discoloration, off-flavors, loss of structure, loss of texture, formation of visible mycelium, production of volatile compounds in which these affect the quality of foods and beverages [17]. These obligate aerobic microorganisms are capable of growing in wide ranges of pH, temperature, and water activity and of using a great variety of substrates as food [18]. Filamentous fungi grow more commonly in products with low pH, water activity and located mainly on the surface of the food because they dependent on availability of oxygen. The food spoilage fungi are Penicillium, Aspergillus, Rhizopus, Mucor, Geotrichum, Fusarium, Alternaria, Cladosporium, Eurotium, and Byssochlamys. Some of these species known for their ability to synthesize secondary toxic metabolites called mycotoxins, constituting a problem for agribusiness and the food industry. Filamentous fungi can grow in foods and cause chronic disease in humans and animals because of their mycotoxins. Mycotoxins are secondary metabolites that may cause a variety of adverse effects in human beings, such as intestinal symptoms, allergic responses, immunosuppression, mutagenesis, inhibition of protein synthesis and essential metabolic pathways, and cancer [19,20]. Mycotoxins may be produced before harvest or during storage, and filamentous fungi need favorable water activity, atmosphere (oxygen), substrates, and temperatures to grow. The main filamentous fungal genera associated with the production of mycotoxins in foods are Aspergillus spp., Penicillium spp., and Fusarium spp. Standard microbiological practices could help contain the proliferation of microorganisms in food products at the cannery. Therefore, there is need for assessing the microbiological quality of dairy canned foods product because most people make use of it or consumed can food products directly without check it validity date and many sellers alter the validity date after been expired or erased it in developing/or underdeveloped countries. However, public health significance of spoilage microorganisms prior to their negative impact on human lives call for serious concern. This study will provide necessary information on the type of microbe associated with canned foods; health risk associated with it and suggests possible method of controlling the risks.

Materials and Methods

Study area

Samaru market is located within Samaru, Sabon Gari Local Government, Zaria, Kaduna state with latitude 11º 11'N, longitude 007º 38'E and altitude 660 m above sea level. Zaria lies within the Sudan Savanna on latitude of 11°9' N and longitude 007°41'E with the population of over 1 million people. Samaru market is one of the major market in Sabon Gari Local Government, Zaria and it serve Ahmadu Bello University community and other communities within that locality by providing access to easy purchase of consumable and non-consumable goods.

Sample collection

Five different types of can foods product were purchase from Samaru market includes Evaporated milk, fish (sardine), tinned tomatoes paste, sweet corn and baked beans. Two samples from each can food were purchased, from different seller making it a total number of ten samples which include five expired and five unexpired (still valid for ingestion) can food product. The samples were collected in labeled sterile plastic bags and transported to the Laboratory for further analysis.

Media preparation

Potato Dextrose Agar (PDA): 39 grams of PDA was suspended in 1000 ml distilled water in a conical flask. It was heat to boiling point so that medium can completely dissolved. A pinch of streptomycin was added into PDA to inhibit bacterial growth and then sterilized by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

Isolation of microorganisms

Serial Dilution: Ten (10) gram of each can food samples was added to 90 ml of distilled water and allowed to soak for some minute. One (1) ml was taken from the stock solution and was suspended into 9 ml of distilled water to give an appropriate dilution of 10-1, 10-2 and 10-3. 1.0 ml of serially diluted sample (10-2, 10-3) was placed in a

sterile petri dish using a 2 ml syringe containing 20 ml of the cooled PDA and was spread all through the ager surface using a flamed bent glass rod into the petri dish (spread plate method). The petri dishes were inverted and incubated at room temperature (25°C) for 7 days. The fungal colonies formed were subjected to counting using a colony counter and expressed as colony forming unit/gram (Cfu/g).

Characterization and identification of fungi

Gram staining method for yeast identification

A thin smear of yeast isolates were made on different slides with the aid of wire loop and left to dry. The slides were heat then fixed by passing through flame thrice and allowed to cool. The different smears were covered with crystal violet stain for 60 seconds and rapidly wash off with distilled water then thereafter it was covered with gram's iodine for 60 seconds and rapidly washed off with distilled water. The smears were decolorized rapidly with acetone and wash off immediately with distilled water and then covered with Saffranin for 60 seconds and washed off with distilled water. The stained slides were then allowed to air-dry then after drying, a drop of oil immersion was dropped on the stained smears and viewed with the aid of a microscope (x 100 oil objective lens) to check for the microscopic properties of the organisms like gram reaction and morphology.

Lactophenol cotton blue stain method for identification of molds

For mold identification, a drop of Lactophenol cotton blue stain was placed on a clean grease-free glass slide and a small fragment of cottony, woolly or powdery colony was picked at mid-point of culture using a sterile straight wire and teased in the stain until a homogenous blue mixture of stain and culture was obtained. A clean cover slip was placed on the glass slide to avoid air bubbles. Excess stain was removed with blotting paper and the preparation was examined under x 40 and x 10 objectives of microscope respectively.

Statistical analysis

The data obtained were subjected to appropriate statistical analysis. All values are stated as MEAN ± SEM unless otherwise indicated and student t-test was used to compare isolates identified in expired and non-expired canned foods product using SPSS version 24.

Results

A total number of twelve (12) fungal species were identified from five different dairy canned food products while five (5) fungal species were isolated from expired canned foods product and seven (7) fungal species were isolated from non-expired canned foods product sold in Samaru markets, belonging to six (6) classes namely: *Eurotiomycetes, Dothideomycetes, Sordariomycetes, Euascomycetes, Urediniomycetes and Microbotromycetes* (Table 1). *The isolated fungal species are Aspergillus flavus, Aspergillus niger, Aspergillus clavatus, Trichophyton rubrum, Microsporum ferrugineum, Rhodotorula spp, Madurella grisea, Sporoboromyces salmonicolor, Penicillium spp, Curvularia spp, Microsporum nanum and Coccidioides immitis.* The fungal flora isolated was characterized based on microscopic appearances, colonial morphology and compared with species described by Davies (2002) as shown in (Table 1). *Trichophyton rubrum* was present in the all samples examined for non-expired canned foods except in fish and milk while similar trend was observed for expired canned foods were *Trichophyton rubrum* is absent in fish and baked beans can product. *Trichophyton rubrum* record the highest percentage among the fungal species recorded for both expired and non-expired canned foods with 21.42%, followed by *Rhodotorula spp* with 11.90% while *Coccidioides immities* have the least percentage occurrence of 2.38% (Table 2). *Trichophyton rubrum* had highest occurrence among the fungal species isolated recorded from plants product (sweet corn and tomatoes samples) while *Sporoboromyces salmonicolor* had highest counts the fungal species isolated recorded from animals product (milk sample) in dairy non-expired can foods (Table 3). The highest occurrence of *Rhodotorula spp* was recorded in baked beans, *Aspergillus flavus* (sweet corn), and *Aspergillus clavatus* (milk) while Aspergillus niger in fish product (Table 3). The highest fungal mean density was recorded in expired baked beans 7 x 105 (233333.3 ± 88191.71) Cfu/g) compared with fungal mean density observed from non-expired baked beans product 3 x 105 (100000 ± 100000) Cfu/g as presented in (Table 4). Significantly, the mean density of fungal recorded form non-expired sweet corn higher than fungal mean density of expired sweet corn. The highest fungal density was recorded in expired fish and tomatoes canned samples (Table 4). Highest fungal mean density was observed in expired milk canned product (150000 ± 50000 Cfu/g) compared with the non-expired milk sample (33333.33 ± 8333.33 Cfu/g) but there were significant differences ($p<0.05$) between the two products. (Figures 1 and 2) revealed the percentage distribution pattern of fungal isolated recorded from expired and non-expired dairy canned foods product. The baked beans (31%) had the highest percentage followed by tin milk and tomatoes (23%) while the least was observed in sweet corn from non-expired canned product. The highest fungal percentage were recorded in fish, sweet corn and tomatoes (25%) while baked beans had the least percentage of 11% among expired canned food products.

Table 1 Microscopic and morphological characterization of fungal species isolated from dairy canned food products from Samaru Market, Zaria.

S/N	Microscopic Characteristics	Colony morphology	Fungi species Identified
1	Thick septate hyphae, chain of conidia on sterigmata	Velvety yellow to green or brown	*Aspergillus flavus*
2	Hyphae is septate and is small in size	Blue –green	*Aspergillus clavatus*
3	Green conidiospores with septate hyphae	Woolly, at first white to yellow then turns black.	*Aspergillus niger*
4	Hyphae are septate and dark, conidiophores are simple or branched and bent or knobby	Dark olive-green to brown colony with a woolly surface	*Curvularia spp*
5	Septate hyphae, tear-shaped microconidia	Granular or fluffy surface	*Trichophyton rubrum*

6	Hyphae are septate, long and straight	Yellow to rusty orange, heaped, smooth and waxy surface.	*Microsporum ferrugineum*
7	Septate hyphae with rough thin walled conidia	White then yellowish, powdery with fringe egeded surface	*Microsporum nanum*
8	A few rudimentary pseudohyphae and round budding cells	Orange yeast like-colony which is soft, smooth and moist surface	*Rhodotorula spp*
9	Septate wide dark and branched hyphae	Short gray hyphae covers a dark gray mycelial mat	*Madurella grisea*
10	Oval yeast-like cells	Salmon pink slightly rough surfaced colonies	*Sporobolomyces salmonicolor*
11	Septate hyphae with branched or unbranched conidiophores that have secondary branches known as matulae	A white powdry surface	*Penicillium spp*
12	Septate branched hyphae that produce thick-walled conidia	A white cottony ariel mycelieum	*Coccidioides imminites*

Table 2 Prevalence of fungal species isolated from selected canned foods vended in samaru market, Zaria.

Class	Species	Frequency (n)	Percentage contribution by species (%)	Percentage contribution by class (%)
Eurotiomycetes	*Aspergillus clavatus*	3	7.32	48.8
	Aspergillus flavus	4	9.76	
	Aspergillus niger	3	7.32	
	Coccidioides immitis	2	4.88	
	Microsporum ferrugineum	4	9.76	
	Microsporum nanum	3	7.32	
	Trichophyton rubrum	1	2.44	
Dothideomycetes	*Curvularia spp*	3	7.32	7.32
Sordariomycetes	*Madurella grisea*	2	4.88	4.88
Euascomycetes	*Penicillium spp*	2	4.88	4.88
Urediniomycetes	*Rhodotorula spp*	5	12.2	12.2
Microbotromycetes	*Sporobolomyces salmonicolor*	9	21.95	21.95
	Total	41	100	100

Table 3 The occurrences of fungal species isolated from dairy products of non-expired and expired canned foods.

Dairy products	Canned foods	Class	Occurrences		
			species isolated	Non-expired	Expired
Plants	Baked beans	Eurotiomycetes	*Aspergillus flavus*	1	0
			Trichophyton rubrum	1	0
			Microsporum ferrugineum		0
		Dothideomycetes	*Curvularia spp*	1	0
		Urediniomycetes	*Rhodotorula spp*	0	3
	Total			4	3

	Sweet corn	Eurotiomycetes	*Trichophyton rubrum*	1	2
			Aspergillus flavus	0	3
		Euascomycetes	*Penicillium spp*	0	2
	Total			1	7
	Tinned tomatoes	Urediniomycetes	*Rhodotorula spp*	1	1
		Sordariomycetes	*Madurella grisea*	0	2
		Eurotiomycetes	*Trichophyton rubrum*	2	2
		Eurotiomycetes	*Microsporum nanum*	0	2
	Total			3	7
Animals	Can Fish	Eurotiomycetes	*Microsporum ferrugineum*	1	2
			Aspergillus niger	0	3
			Coccidioides iminities	0	1
		Dothideomycetes	*Curvularia spp*	1	1
	Total			2	7
	Evaporated Milk	Eurotiomycetes	*Aspregillus clavatus*	0	3
			Trichophyton rubrum	0	1
		Microbotromycetes	*Sporobolomyces salmonicolor*	3	0
	Total			3	4
Total plants				8	17
Total animals				5	11

Table 4 Enumeration of fungal load (Cfu/g) in Non-expired and expired canned foods vended in Zaria markets.

Dairy products	**Canned foods**	**Expired**	**Non-expired**	**T-test**	
			Total (Mean± Sem)	**t**	**p-value**
Plants	Baked beans	7x105 (233333.3± 88191.71)	3x105 (100000 ± 100000)	1.61	0.27
	Sweet corn	2x105 (66666.67± 16666.67)	3x105 (16666.67 ± 33333.33)	7.27	0.04*
	Tinned tomatoes	6x105 (200000± 57735.03)	6x106 (2000000 ± 1000000)	0.00	1.00
Animals	Can Fish	4x105 (133333.3± 333333.33)	1x106 (33333.33 ± 83333.33)	4.97	0.09
	Evaporated Milk	3x105 (150000± 50000)	1x105 (33333.33 ± 8333.33)	9.05	0.04*

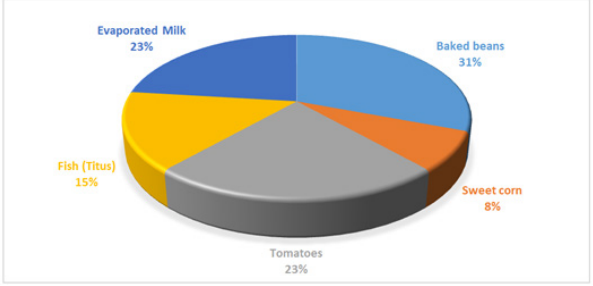

Figure 1 Percentage distribution of fungal isolate in various expired dairy canned food products sold in Samaru market, Zaria Northwest Nigeria

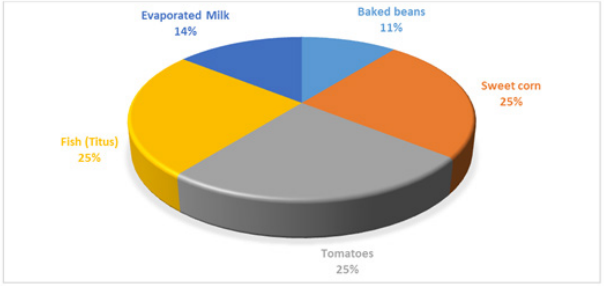

Figure 2 Percentage distribution of fungal isolate in various non-expired dairy canned food products sold in Samaru market, Zaria Northwest Nigeria

Discussion

In this study, there was a vast array of fungi isolated from different consumed canned foods that contradict the work of previous researcher's that report there are completely eliminated of microorganisms during canning process. The assumption that the heat sterilization killed all bacteria in canned foods that might be present, regardless of kind or number, must be modified since certain types of organisms are very resistant to heat; the presence of any considerable number of such organisms renders successful processing very difficult [21]. Certain types of equipment, or lack of proper control measures, may permit organisms to multiply and become a spoilage hazard. The fungal load was higher in the expired canned food compared with the non-expired canned food maybe because expired canned food has exceeded its stipulated time for consumption and prone to microbial infestation that leads to spoilage. If such foods ingested or/consumed may cause serious health hazards such as food poisoning and other foodborne diseases in humans and animals such as intestinal symptoms, allergic responses, immunosuppression, mutagenesis, cancer, typhoid fever, aflatoxicosis, food poisoning, bacillary dysentery, food-intoxication and gastroenteritis, with symptoms of nausea, cramps, vomiting and diarrhea that may be bloody. The absence of blown and leaky cans could suggests that all the non-expired canned food products samples analyzed were within expiry date from manufacture and acceptable quality for consumption before spoilage. The high microbial counts recorded in some non-expired canned foods samples (baked beans, tinned tomatoes paste and milk) could be due to the reflection of the processing stages at the cannery could be via the raw materials used, under processing, pre-process contamination and to the level of stringency in their production [22-25]. The canned organisms could be survive in several days by the fact that shelf stable canned foods packed in hermetically sealed containers are not absolutely sterile and thus contain injured and suppressed micro-organisms that could proliferate if storage conditions and integrity of the container is compromised [26]. The effects of high temperature treatment, pH, preservatives and anaerobic condition of canning could have been responsible for the low microbial loads from non-expired canned foods. Canned foods are sterilized before being placed on the grocery shelf but if the sterilization has been unsuccessful, contamination or food spoilage may occur [27]. The total viable counts form non-expired canned foods examined had low microbial loads lesser than the recommendation of the International Commission on the Microbiological Specifications for Food [28] maximum limit of 1.0 x 106 CFU/g recommended for food acceptability in international trade compared with expired canned foods. If this expired canned food were consumed, there is a high tendency of food poisoning, which could lead to fatal health hazards such as diarrhea, dysentery and others. The high fungal species occurrence such as *Trichophyton rubrum* was recorded in tinned tomatoes sample from non-expired canned food among the dairy plant maybe due to poor handling during the canning operation that make the organisms gain entrance into the food either from the raw materials or ingredients, soil and equipment used. Sporobolomyces salmonicolo was high in the milk sampled among the animal dairy products from non-expired canned food could be due to the nutrient richness that support the growth of microorganisms [29]. High occurrence of *Rhodotorula spp* was observed from baked beans sample while *Aspergillus flavus, Penicillum spp, Madurella grisea, Trichophyton rubrum* and *Microsporum nanum* from sweetcorn. *Aspergillus niger, Microsporum ferrugineum* and *Aspergillus clavatus* have high occurrence from fish sample among expired canned food maybe due to leakage, a swelling of container, or an abnormal thermostable toxin which will not be significantly affected by thermal process. These fungal species are considered as airborne allergenic fungi most significant which adverse effects on human and animal health and can also cause food poisoning [30,31]. The presence of *Aspergillus niger* in the fish sample indicated a potential health hazards for consumption which can produces potent mycotoxins called ochratoxins that can be harmful to humans causing cancerogenic, immunotoxic, teratogenic, neurotoxic, nephrotoxic and hepatotoxic effects as reported by [32]. Most of the fungal organisms identified by microscopy included *Penicillium sp.* and *Aspergillus niger* are able to produce toxic compounds that affects humans and this in conformity with the work of Ogofure et al., [33] that showed the presence of *Aspergillus* occurrences in some sample indicated variable fermentation. *Aspergillus clavatus* is a pathogenic species of fungi that produces mycotoxins that cause severe pulmonary disease, an allergic reaction commonly known as malt's worker's lung. Besides the production of poisonous mycotoxins that can cause serious illnesses in humans and produce antimicrobial metabolites that used in pharmaceutical industries. They grow in environment between minimum temperatures of up to 5°C and a maximum of at least 42°C. They causes diseases in persons who have mold allergies, they can cause hypersensitivity and in persons with a weakened immune system, they can cause severe pulmonary infections, such as cancer chemotherapy patients, HIV/AIDS patients, Leukemic, organ transplant, and persons with underlying conditions such as Chronic Obstructive Pulmonary Disease (COPD), and Tuberculosis. *Aspergillus Niger* is not considered to be dangerous to human expect in individuals with severe immune deficiency, such as HIV and leukemia patients could be seriously affected by this fungus or a history of severe illness such as lung infections. It is a food spoilage organism and can be found on practically any stored food, particularly in warmer climates [34,35]. *Aspergillus Niger* is highly thermos-tolerant meaning it can survive in extreme conditions such as freezing weather or heat waves, this asexual saprophyte is not picky when deciding what to contaminate, so it can be found almost anywhere. An opportunistic fungus will grow on anything if the conditions are favorable. *Trichophyton* and *Microsporum* are dermatophyte species belonging to the genera are capable of producing tinea corporis causes infection in dead keratinized tissues such as skin, hair, and nails [35]. Microsporum nanum grows optimally at 25°C but is capable of growth at temperatures up to 37°C and does not require vitamin supplementation for its growth. Unlike many other dermatophytes, M. nanum is tolerant of the antifungal agent cycloheximide and exhibits soil association characters such as urease activity and the formation of perforating organ on hair shafts [36]. Penicillium spp. are occasional causes of infection in humans which resulting to disease known generically as penicilliosis. *Rhodotorula* is a yeast found in air, soil, lakes, ocean water, and dairy products. It been considered as a common contaminant and causes common infection is fungemia, which accounts for 73% of all *Rhodotorula* species infections. It frequently presents as fever of unknown etiology unresponsive to antibacterial treatment and can be associated with sepsis and other life-threatening complications. *Rhodotorula* species have a clear tendency to produce central nervous system (CNS) infection while *Sporobolomyces salmonicolor* can pose a respiratory hazard. The isolated microorganisms pose public health concern since they are major foodborne pathogens endowed with virulence factors, including toxins, that enable them caused foodborne diseases [37,38]. The fungi *Aspergillus flavus* caused *aflatoxicosis*, hepatitis and cancer of the liver while Penicillium spp causes renal damage, and necrosis of the kidney. Fusarium species produce mycotoxins including fumonisins and trichothecenes responsible for a range of opportunistic infections in humans [39]. The report of Oyelese and Fatunmbi, [22] was similar to the results of this present study who isolated 3 fungi species

includes: *Aspergillus*, *Penicillium* and *Fusarium* from cans geisha brand of mackerel (*Scomberomerus spp.*) in tomato sauce under ambient storage temperature. The results are in agreement with the reports of other researchers [40,41]. Solomon and Ibe, [42] who recorded high bacteriological counts on fish and other food products prior to improper exposure, unhygienic practices and poor handling that resulted to contamination. The findings of Adebayo-Tayo et al., [43] have shown that seafood and other food related problems are due to recontamination time and temperature abuse during holding.

Conclusions

The overall viable counts for fungal species isolated from dairy canned foods product examined during this study show high contamination level of microorganism that are harmful for human consumption especially the expired canned food products. The predominance of several species of the genus Trichophyton causes tinea including ringworm, athlete's foot etc. *Rhodotorula* cause familial genetic diseases, *fungemia, meningitis, endocarditis*, *skin lesion, eye infection, onychomycosis* and *peritonitis* while *Aspergillus* raises major concern, as consumers are more vulnerable to *Aspergillosis*. The contamination maybe because of environmental process or through equipment surfaces and personnel hands that can influence some risks to certain gastro-intestinal tract disorders and other vast arrays of clinical symptoms in consumers.

References

1. Shajahan AB, John SN (2016) Occurrence of the microbial pollutans in contaminated canned food. world J Pharma Res 5(4):1051-1058
2. Effiuvwevwere BJO (2000) Microbial spoilage agents of Tropical and assorted fruits and Vegetables (An Illustrated References Book). Paragraphics Publishing Company, Port Harcourt.
3. Nader YM, Mohamed SA, Khalifa EM (2016) Microbial quality of some canned meat and fish, Global Veterinaria 16(16): 565-569.
4. Gram L, Dalgaard P (2002) Fish spoilage bacteria Problems and solutions. Current Opinion in Biotechnology. 13:262-266.
5. Huis in'tVeld JH (1996) Microbial and biochemical spoilage of foods: An overview. International J Food Microbiology 33:1-18.
6. Walker M, Phillips CA (2007) The growth of Propioni bacterium cyclo hexanicum in fruit juices and its survival following elevated temperature treatments. Food Microbiology 24:313-318.
7. Smit Y, Cameron M, Venter P, Witthuhn RC (2011) Alicyclobacillus spoilage and isolation. A review. Food Microbiology. 28:331-349.
8. Evancho G, Tortorelli S, Scott V (2010) Microbiological spoilage of canned foods. In: Sperber WH, Doyle MP(Eds.), Compendium of the Microbiological Spoilage of Foods and Beverages. New York, NY: Springer, 185-221.
9. Querol A, Fleet GH (2006). The Yeast Hand book. Berlin: Springer-Ver lag.
10. Smits GJ, Brul S (2005) Stress tolerance in fungi-To kill an spoilage yeast, Current opinion in Biotechnology 16:225-230.
11. Kurtzman CP (2006) Detection, Identification, and Enumeration methods for spoilage yeasts. In Black burn CDW (Ed.), Food Spoilage Microorganisms. Boca Raton, FL: CRC Press LLC, 28-54.
12. Nielsen DS, Jacobsen T, Jespersen L, Koch AG, Arneborg N (2008) Occurrence and growth of yeasts in processed meat products Implications for potential spoilage.
13. Marth EH (1987) Dairy products. In: Beuchat, LR (Ed.), Food and Beverage Mycology. New York, NY: Van Nostrand, 175-209.
14. Fleet G (1992) Spoilage yeasts. Critical Reviews in Biotechnology 12:1-44.
15. Osei Abunyewa AA, Laing E, Hugo A, Viljoen BC (2000) The population change of yeasts in commercial Salami. Food Microbiology 17:429-438.
16. Gerez CL, Torres MJ, FontdeValdez G, Rollán G (2013) Control of spoilage fungi by lactic acid bacteria. Biological Control 64:231-237.
17. Alvo P, Raghavan GSV (1993) Cereal grains Mycotoxins, fungi and quality in drying and storage. Drying Technology 11:411-412.
18. Dao T, Dantigny P (2011) Control of food spoilage fungi by ethanol. Food Control 22:360-368.
19. Bennett JW, Klich M (2003) Clincal microbiology reviews. American Society for Microbiology,
20. 16(3):497-516.
21. Davise H, Larone (2002) Medically Important Fungi: A Guide to Identification. 4th ed. ISBN
22. 1-55581-172-8.
23. Oranusi US, Braide W, Osigwe GA (2012) Investigation on the microbial profile of canned foods. J Bio Food Sci Res (1):15-18.
24. Oyelese OA, Fatunmbi AF (2006) Exposure time on bacteria flora/count and shelf-life of canned mackerel (Scomberomerus sp.) under ambient and cold storage conditions. J fisheries int 1(2-4):118-126.
25. Oranusi S, Galadima M, Umoh VJ, Nwanze PI (2007). Food Safety Evaluation in boarding schools in Zaria, Nigeria, using the HACCP System. Scientific Res. Essays 2 (10): 426-433.
26. Oranusi S, Braide W, Osigwe GA (2012) Investigation on the microbial profile of canned foods. J Biology and Food Sci Res 1(1):15-18.
27. Hozan J, Hamasalim K (2012) Quality assessment of the imported canned beef sold in Sulaimani markets, Kahramanmaras Sutcu Imam University. J Natural Sci 15(4).
28. Vignesh S, Dahms HU, Emmanuel KV, Gokul MS, Muthukumar K, et al. (2014) Physicochemical parameters aid microbial community? A case study from marine recreational beaches, Southern India. Environmental Monitoring and Assessment 186(3):1875-1887.
29. Desrosier NW, Desrosier JN (2004). The Technology of Foods Preservation, 4th Ed. CBS publisher of Distributors, pvt. L.td.
30. ICMSF (International Commission on Microbiological Specification for Foods) (1998) Microorganisms in foods, 6.

Microbial Ecology of food commodities, New York; Blackie Academics and Professional, 617.

31. Fallik E (2014) Microbial quality and safety of fresh produce. Postharvest Handling (3rd Ed.), 313-339.
32. Cooke WB (1996) A taxonomic study in the "Black Yeasts", Mycopathol. Mycology Applicata 117:1-43.
33. Özdilli K, Issever H, Özyildirim BA, Hapçioglub B, Ince N, et al. (2007) Biological hazards in tannery workers. Indoor Built Environment 16:349-357.
34. Pawlowska AM, Zannini E, Coffey A, Arendt EK (2012) Green preservatives: Combating fungi in the food and feed industry by applying antifungal lactic acid bacteria. Adv J Food Nutri and Res, 66:217-238.
35. Ogofure GA, Bello-Osagie OI, Aduba UB, Ighodaro EV, Emoghene OA (2018) Qualitative Detection and Isolation of Bacteria from Surface of canned drinks sold in Ugbor, Benin city. Animal of Sci and Technology 3(2):20-25.
36. Schuster E, Dunn-Coleman N, Frisvad JC, Van Dijck PW (2002) On the safety of *Aspergillus Niger* A review. Appl Microbiol Biotechnol 59(4-5):426-35.
37. Pitt JI, Hocking AD (2009) Aspergillus and Related Teleomorphs. In: Fungi and Food Spoilage. Springer, Boston, MA, 455:469-470
38. Schuster E, Dunn-Coleman N, Frisvad JC, Van Dijck PW (2002) On the safety of *Aspergillus Niger* A review. Appl Microbiol Biotechnol. 59(4-5):426-35.
39. Ibe SN (2008) Microbiological standards for foods: Are they relevant in Nigeria? University of Port Harcourt, Inaugural Lecture Series. 60.
40. Solomon L, Ogugbue CJ, Okpokwasili GC (2013) Antibiotic resistance profiles of bacteria associated with fresh and frozen shrimp (Palaemonetes sp.) and their public health significance. Int J Sci Res in Knowledge 1(10): 448-456.
41. Domsch KH, Gams W, Anderson TH (1993) Compedium of Soil Fungi. Academic Press, London.860.
42. Ibe SN, Wariso BA (2005) Carriage of Staphylococcus aureus on Armpits of Secondary School and University Students in Port Harcourt, Nigeria. African J Applied Zoology and Environmental Biology. 7:125-130.
43. Solomon L, SN Ibe (2012) Comparative study on bacterial quality of fresh and frozen shrimp (Palaemonetes sp) sold in retail markets in Port Harcourt, Rivers State, Nigeria. Nature and Sci,
44. 10 (11):221-224.
45. Solomon L, Ibe SN (2012) Comparative study on bacterial quality of frozen shrimp (Palaemonetes spp.) sold in retail markets in Port Horcourt, River state, Nigeria. Nature and Science 11:221-224.
46. Adebayo-Tayo BC, Odu NN, Esen CU, Okonko IO (2012) Microorganisms associated with spoilage of stored vegetables in uyo metropolis, akwa-ibom state, Nigeria. Nature and Science 10(3):23-31.