

# FOOD SAFETY AND FOOD SECURITY: KEY TO HEALTHY LIVING



**Dr. Matthew I. Omoruyi (*MNYA*)**

# Outline

- What is food safety?
- Why is it important to keep food safe and healthy?
- What make our food unsafe
  - Microbiological food safety
  - Chemical food safety
- Food security
- **Possible mistakes mothers make with food**
- Recommendations
- Questions



# What is Food safety

Food safety means **handling**, **storing** and **preparing** food to prevent infection.

Food safety helps make sure our food keeps enough **nutrients** for us to have a **healthy diet**.

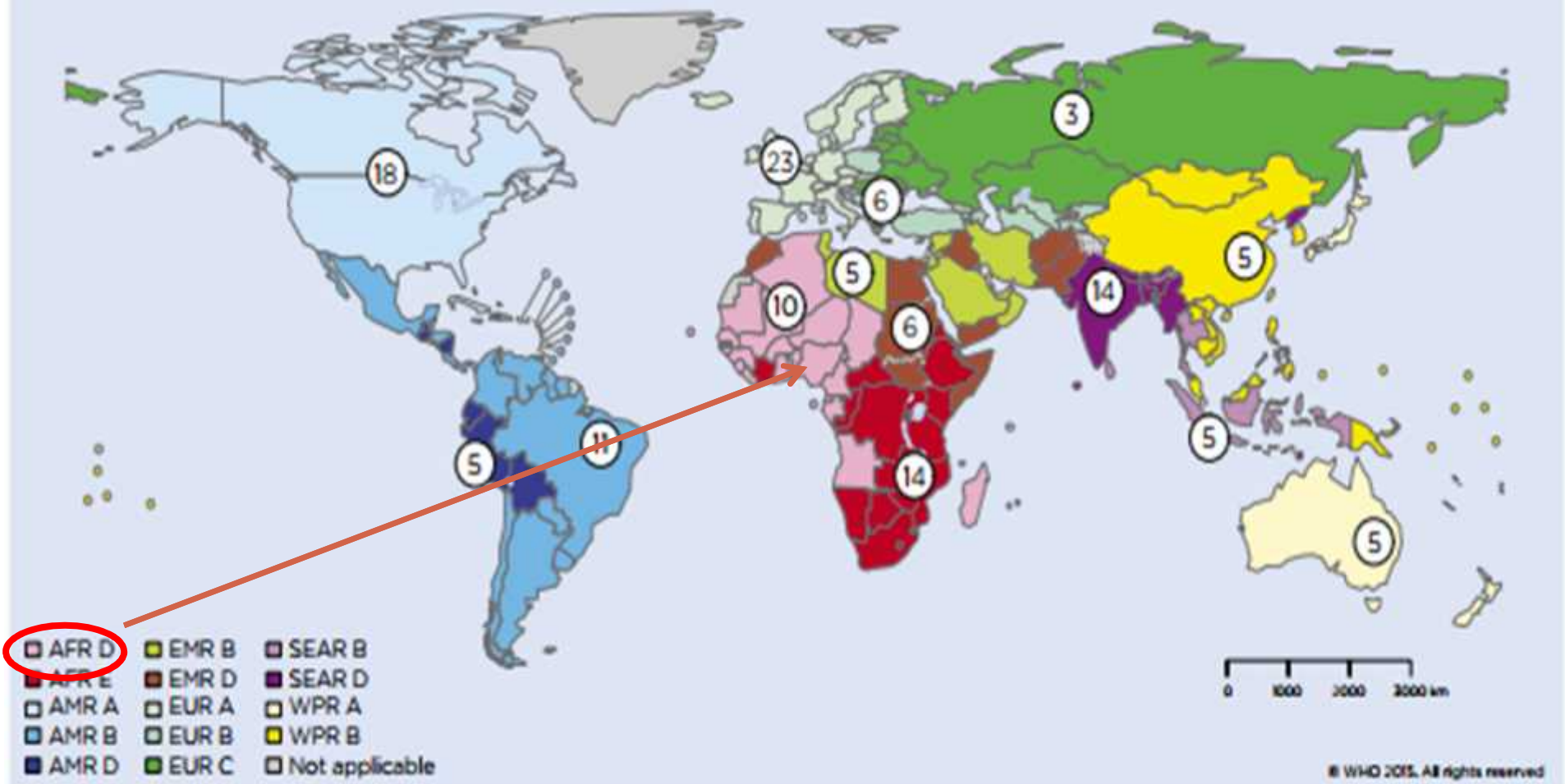


# Why is it important to keep food safe

- Food causes more than 200 diseases, ranging from diarrhea to cancer
- More than **200,000** persons die annually in Nigeria from consumption of contaminated food alone (World Health Organization)
- Approximately 32% of cancers are attributable to dietary factors as a whole (Willet, 1998)
- Substantial increase in cancer incidence in Nigeria in recent years (Jedy-Agba et al., 2012)
- One-hundred thousand new cases of cancer in Nigeria yearly
- Food processing methods/sales of processed food items in Nigeria are poorly—if ever—regulated
- Majority of Nigerians involved in food processing do not have formal training on food safety issues or related techniques (Chukwezi, 2010; Omemu and Adoreju, 2008)



## GLOBAL BURDEN OF FOODBORNE DISEASES (WHO)



Notes: The subregions are defined on the on the basis of child and adult mortality, as described by Ezzati et al. [5]. Stratum A = very low child and adult mortality; Stratum B = low child mortality and very low adult mortality; Stratum C = low child mortality and high adult mortality; Stratum D = high child and adult mortality; and Stratum E = high child mortality and very high adult mortality. The use of the term 'subregion' here and throughout the text does not identify an official grouping of WHO Member States. "subregions" are not related to the six official WHO regions.



Figure 12. The global burden of foodborne disease (DALYS per 100 000 population) by hazard groups and by subregion, 2010.

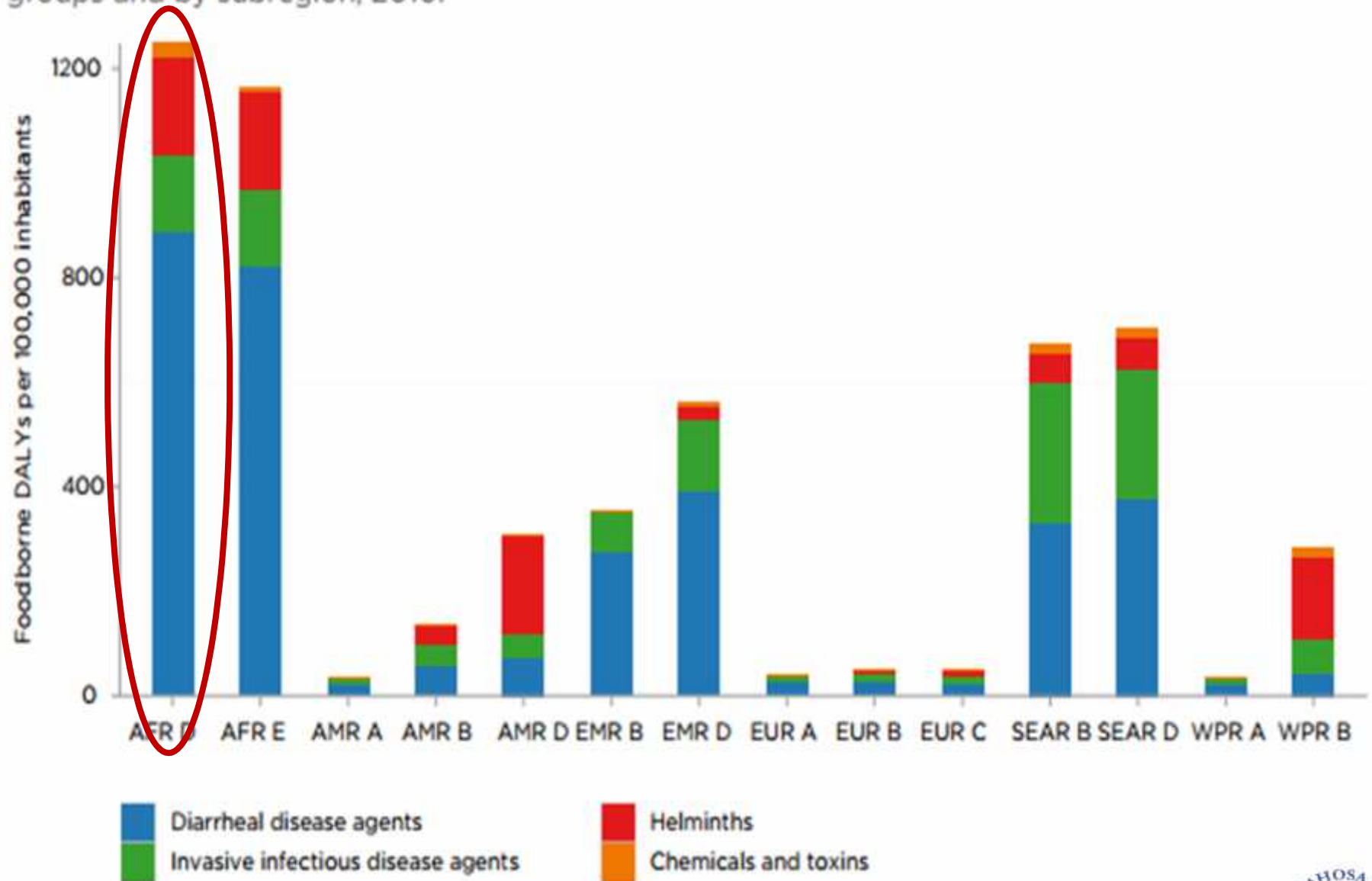
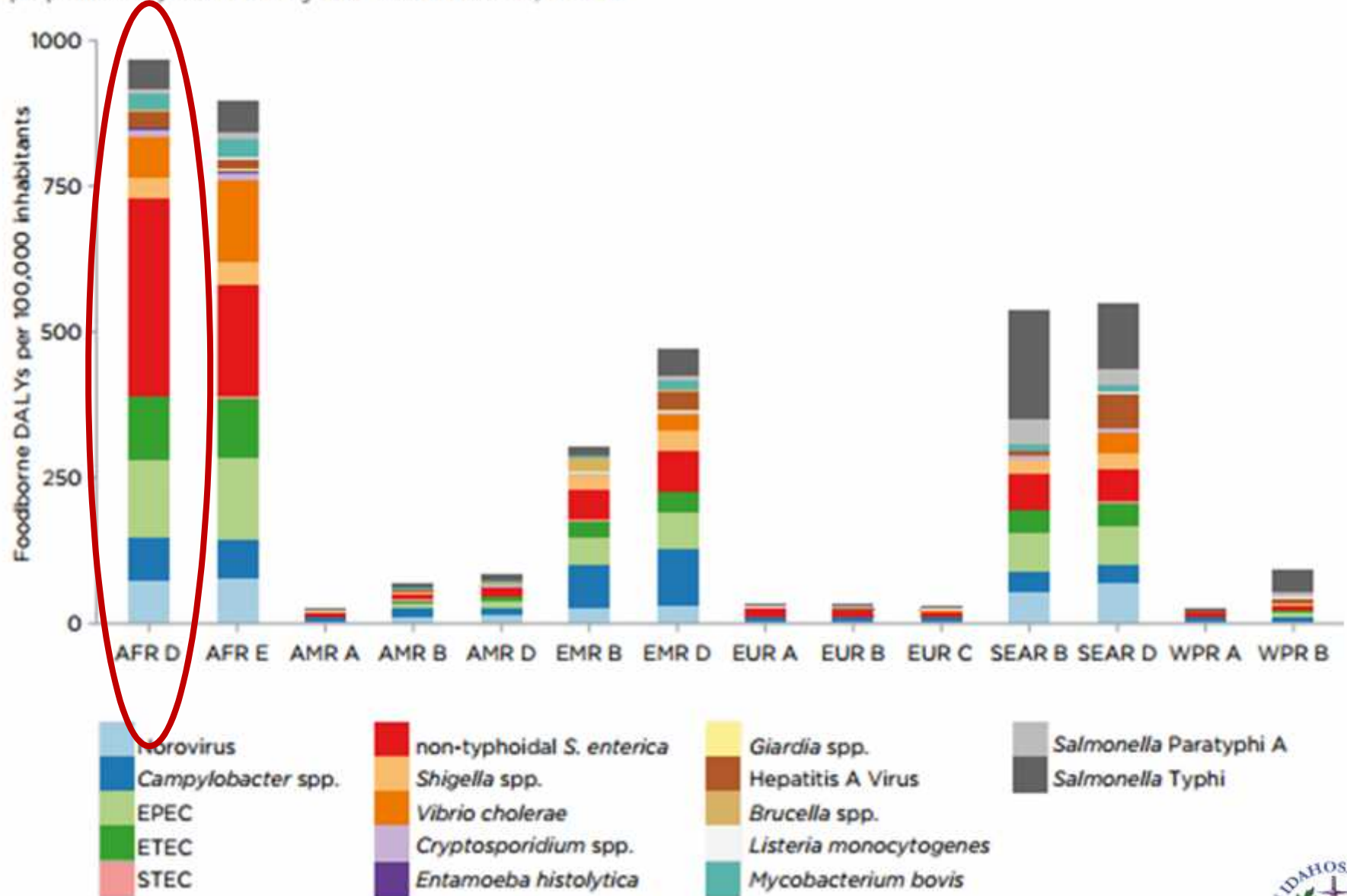


Figure 16. The global burden of foodborne disease by subregion (DALYS per 100 000 population) caused by enteric hazards, 2010.



# Food poisoning cases in Nigeria

## 10 Teachers Died Of Food poisoning in Katsina

↑ Talk / General Discussion / Naijapals Base (Metro life)

[1] 2 3 4 5

frayobkk (5119) | **africanews.** EN NEWS

NEWS BUSINESS SPORT CULTURE SCIENCE & TECHNOLOGY NO COMMENT

Ten second several ot Investigat weekend a teachers a



### 13 die of food poisoning in Nigeria

**DAILY POST** HOME NEWS POLITICS METRO ENTERTAINMENT SPORT MUSIC JOBS

NNPC MONTHLY OIL & GAS REPORT- JUNE 2017

**METRO**

## Food poisoning: 71 school girls hospitalised in Kebbi

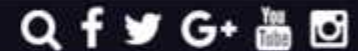
Published on March 14, 2016  
By Danielle Ogbeche







Note: A number (50%) of food poisoning cases especially in the rural part of Nigeria go unreported



### Epidemic Breakdown

Sixteen students have been admitted to hospital with



by Sahara Reporters, New York

A recent laboratory report has shown that the students have a fever, vomiting and diarrhea.

Sixteen students have been admitted to hospital with



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# Mass bacterial infection in Queens College; Lagos govt wants school shut down

March 17, 2017 Ben Ezeamalu



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## Microbiological food safety

- Food containing harmful microorganisms (bacteria, viruses, parasites) or chemical substances is responsible for more than 200 diseases, ranging from diarrhoea to cancers
- Publications exist on the isolation of pathogenic microorganisms from ready-to-eat food and drinking water in different parts of Nigeria.



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[Niger Postgrad Med J](#), 2005 Jun;12(2):93-6.

## An assessment of food hygiene among food handlers in a Nigerian university campus.

[Okolie OH<sup>1</sup>](#), [Wagbatsoma VA](#), [Ighorode AD](#).

[Author information](#)

### Abstract

**INTRODUCTION:** Food handlers play a major role in ensuring food safety throughout the chain of producing, processing, storage and preparation. Mishandling and disregard for hygiene measures on their part may result in food contamination and its attendant consequences.

**OBJECTIVES:** This study was designed to assess the knowledge and practice of food hygiene by food handlers in a Nigerian University Campus.

**METHODOLOGY:** A descriptive, cross-sectional study was carried out on randomly selected food handlers operating on the campus. A total of 102 respondents were interviewed and inspected using a structural questionnaire administered by researchers.

**RESULTS:** Ninety (88.2%) of the respondents were female, and there was a predominantly poor level knowledge of food hygiene. The practice of storing and reheating leftovers was low and agreed to by 15 (14.7%) of the respondents; there was a very low frequency of hand washing. Inspection of food handlers showed a low level of personal hygiene. Only 31 (30.4%) had had pre employment medical examination and only 49 (48%) had received any form of health education.

**CONCLUSION:** This study has revealed a poor knowledge and practice of food hygiene among food handlers providing food for undergraduates in a Nigerian University. It is recommended that a massive health education campaign directed at both the public and food handlers be embarked on, to enable people take necessary steps to prevent food borne diseases.

- 15% agreed to storing and reheating leftover food for customers
- Hand washing was poor among food handlers
- Most of them had poor personal hygiene
- 70% of those interviewed had no medical examination before employment
- 52% had no knowledge of basic health education



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Public Health. 2010 Aug;124(8):467-71. doi: 10.1016/j.puhe.2010.03.028. Epub 2010 Jul 13.

## Food contamination in fast food restaurants in Benin City, Edo State, Nigeria: Implications for food hygiene and safety.

Isara AR<sup>1</sup>, Isah EC, Lofor PV, Ojide CK.

⊕ Author information

### Abstract

**OBJECTIVE:** To determine the prevalence of food contamination in the fast food restaurants operating in Benin City, Edo State, Nigeria.

**METHODS:** Three hundred and fifty food handlers were selected by means of a systematic sampling method and interviewed using a semi-structured researcher-administered questionnaire. One hundred and sixty-eight samples of ready-to-eat food and 45 stool samples were collected and analysed in the laboratory for the presence of bacteria (excluding anaerobic bacteria).

**RESULTS:** More than half of the respondents (n=184, 52.6%) had no training in food hygiene and safety. Only 149 (42.6%) respondents knew that micro-organisms can contaminate food. The prevalence of food contamination in the fast food restaurants was found to be 37.5%. *Bacillus cereus* and *Staphylococcus aureus* were the most commonly isolated bacteria, while salad, meat pie and fried rice were the most commonly contaminated foods.

**CONCLUSION:** There is need for the relevant local authorities to ensure that the food sold to consumers in fast food restaurants is safe, wholesome and fit for human consumption in order to prevent outbreaks of food-borne illnesses. Also, there should be regular training/retraining and health education of these food handlers in all aspects of food hygiene and safety.

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- 53% of respondents had no training in food hygiene and safety
- 57% did not know that microorganisms could contaminate food
- *Bacillus cereus* and *Staphylococcus aureus* were the most isolated bacteria
- Salad, meat pie and fried rice were the most contaminated





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## Physico-Chemical and Bacteriological Quality of Borehole Water in Eyaen Community Area of Edo State, Nigeria

G. Ehiowemwenguan<sup>1</sup>; A. O. Iloma<sup>2</sup>; J. O. Adetuwo<sup>3</sup>

<sup>1</sup>Department of Microbiology, University of Benin, P.M.B. 1154, Benin City, Nigeria  
[chisgoodluck@gamil.com](mailto:chisgoodluck@gamil.com)

<sup>2</sup>Department of Microbiology, University of Benin, P.M.B. 1154, Benin City, Nigeria  
[okoloangie@yahoo.com](mailto:okoloangie@yahoo.com)

<sup>3</sup>Department of Microbiology, University of Benin, P.M.B. 1154, Benin City, Nigeria  
[adetuwoolagunju@gmail.com](mailto:adetuwoolagunju@gmail.com)

**Abstract** –*The bacteriological, physicochemical, and mineral analyses were carried out on borehole water used for drinking in four areas of Eyaen community in Edo State, Nigeria. The mean of the result obtained were compared with EPA and WHO standards for drinking water. The physicochemical analyses (odour, color, total dissolved solids, total solids, conductivity, chlorine and total alkalinity) were in compliance with the EPA and WHO standards. The result of the mineral analyses revealed that the Mg, Zn, and Cu were within the standards while Fe and As were above the limits. The pH of the water samples ranged from 6.8 to 7.3 while the turbidity of water samples also ranged from 2.5 – 7.0 NTU for all the water samples. Conductivity measured at (us/cm) also ranged from 468 810(us/cm). The bacteria isolated from water samples in this work included Escherichia coli, Enterobacteraerogenes, Pseudomonas spp, Staphylococcus aureus, Salmonella typhi, Shigellaspp, Vibrio cholerae, Proteus spp, Klebsiella spp. Treatment of these water sources is essential for the water to be safe for drinking.*



# Food handling

- Chopping board
- Water for cooking and dish washing
- Eggs
- Fruits and vegetables
- Meat processing
- Suya
- Edible worm/Snail



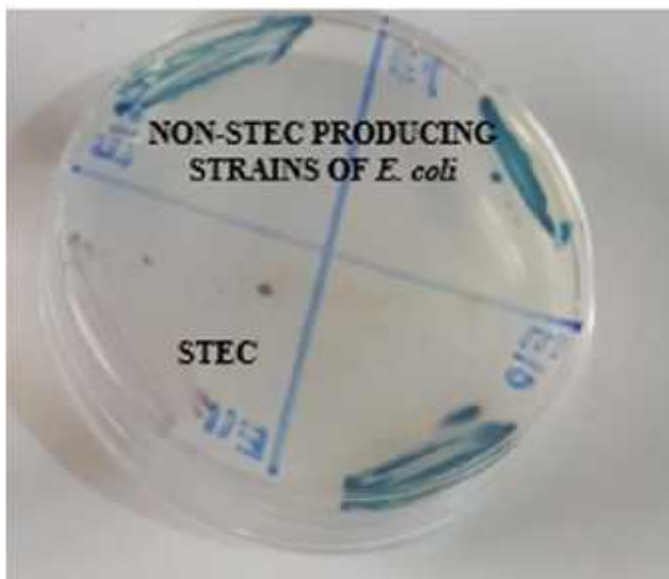
# Food storage

- Soup
- Tin tomatoes
- Salad



# Escherichia coli

- Bacterium
- Normal flora



International Journal of Biological Research, 4 (2) (2016) 211-214

International Journal of Biological Research

Website: [www.sciencepubco.com/index.php/IJBR](http://www.sciencepubco.com/index.php/IJBR)  
doi: 10.14419/ijbr.v4i2.6510  
Research paper



## Shiga-toxin producing *Escherichia coli* (STEC) and other enterobacteriaceae associated with ready-to-eat salad

Iyekhoetin Matthew Omoruyi\*, Ufuoma Akpezi Oriero

Department of Basic Sciences (Microbiology option), Faculty of Basic and Applied Sciences,  
Benison Idahosa University, P.M.B. 1100, Benin City, Edo State, Nigeria

\*Corresponding author E-mail: [imoruyi@bnu.edu.ng](mailto:imoruyi@bnu.edu.ng)

### Abstract

Ready-to-eat (RTE) salads sold in Nigeria are poorly delineated sources of human exposure to pathogenic microorganisms. In this study, we investigated the current situation in Benin City, Edo state, Nigeria. Twenty-four samples of RTE salad were obtained from different open markets, and the presence of Shiga toxin-producing *Escherichia coli* (STEC) and other enterobacteriaceae were determined by established methods using both selective and chromogenic agars. All RTE salad samples were found to harbour *Escherichia coli* while 16.7% were further confirmed for the presence of STEC. Other Enterobacteriaceae present included *Klebsiella* spp., *Proteus* spp., *Enterobacter* spp., *Serratia* spp and *Salmonella* spp. The antibiogram profile revealed that all bacterial isolates obtained were resistant to augmentin and amoxicillin while only 11.1% were resistant to ciprofloxacin and ofloxacin. The percentage resistance for the Shiga-toxin producing strains of *E. coli* was 60% while *Serratia* showed resistance to all the antibiotics used. The results of this study showed that RTE salad sold in Benin City, Edo State, Nigeria could be a source of public health concern, and effort should be made to avert possible outbreak.

**Keywords:** Salad; Outbreak; Shiga Toxin-Producing *E. coli*; Enterobacteriaceae; Public Health.

**Table 1: Mean Coliform Counts (MCCs) and Mean Enterobacteriaceae Counts (MECs) Of Ready-To-Eat Salad**

SALAD SAMPLES	Oba Market ( $\times 10^6$ cfu/ml)		Eki-Osa Market ( $\times 10^6$ cfu/ml)	
	MCCs	MECs	MCCs	MECs
1	5.2	2.5	5.6	2.6
2	3.9	2.4	2.9	4.5
3	7.1	9.2	4.5	3.2
4	6.3	2.8	2.1	4.1
5	5.8	7.6	0.9	1.4
6	2.0	0.2	1.8	1.9
7	5.0	1.5	2.6	3.2
8	1.7	12.2	3.4	4.8
9	3.4	6.1	2.8	0.6
10	1.3	4.3	2.4	9.4
11	1.8	2.1	2.0	2.0
12	2.4	3.0	3.1	1.6



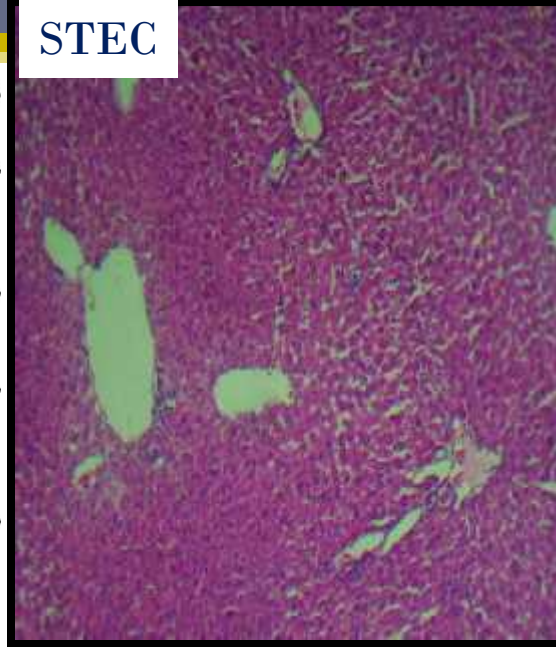


Compound	ALT level (IU/L)
STEC	78 ± 22.6
Control	4 ± 1.2

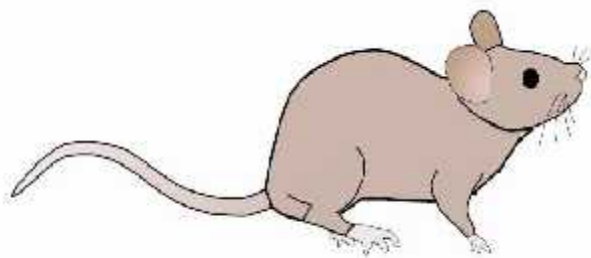
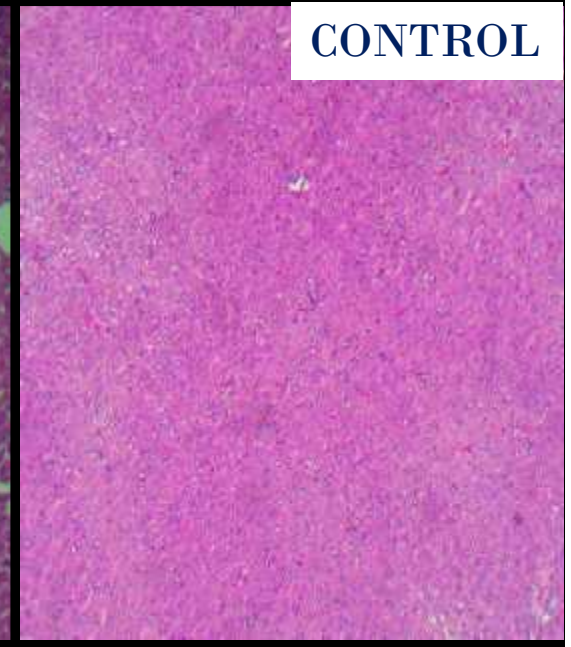
  

Compound	AST level (IU/L)
STEC	50 ± 3.5
Control	21 ± 2.8

STEC



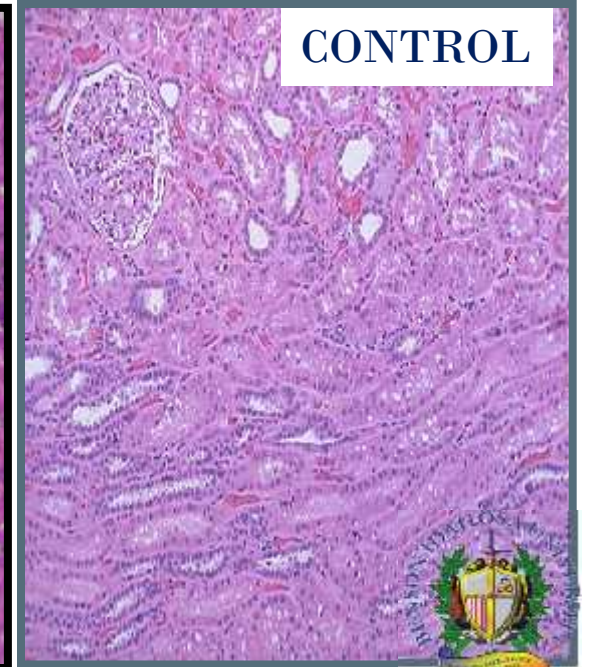
CONTROL



STEC



CONTROL



Source: Omoruyi et al. (2017)

# *Bacillus cereus*

## Patient with diarrhoea

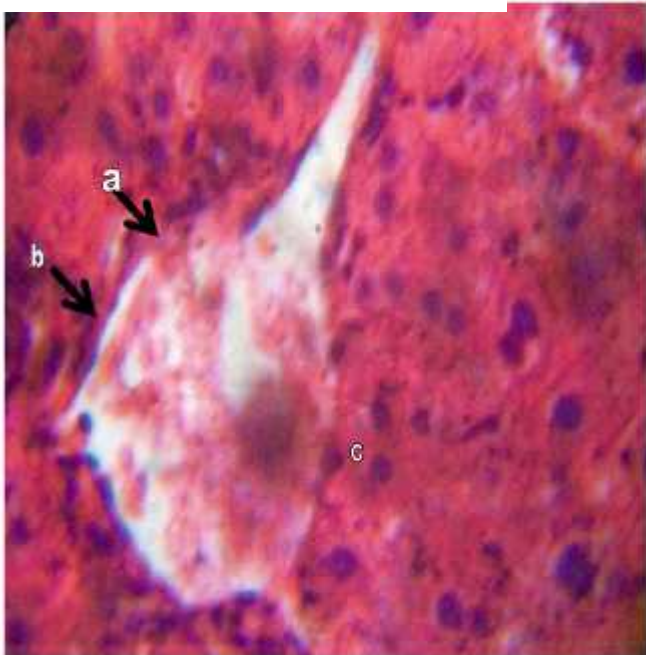


Fig.1 Liver section (a, b) shows distention of the central vein with moderate congestion with eosinophilic material. (source of organism from diarrhoeal stool)

## Bean flour (Okpa cake)

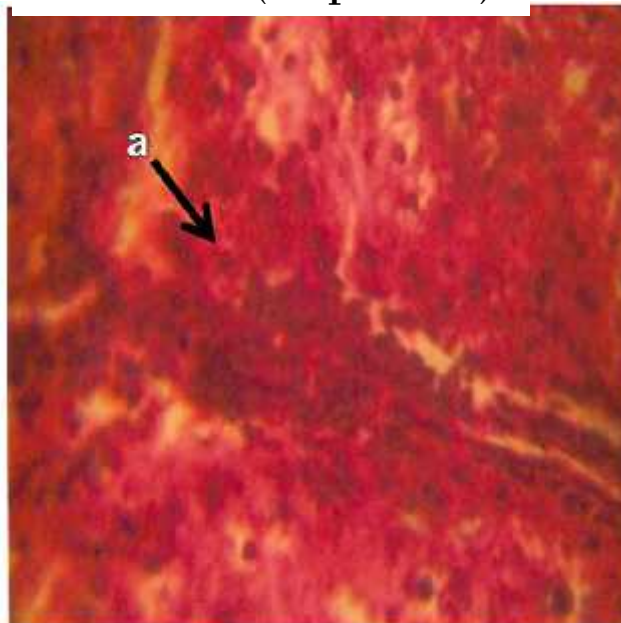


Fig.3 Liver section showing evidence of moderate necrosis and hepatocyte degeneration with concentration of mononuclear cells within and around the portal tract. (b). There is also moderate distention of the sinusoids. Source of organism-Bean flour (Okpa cake).

## Melon soup (Egusi)

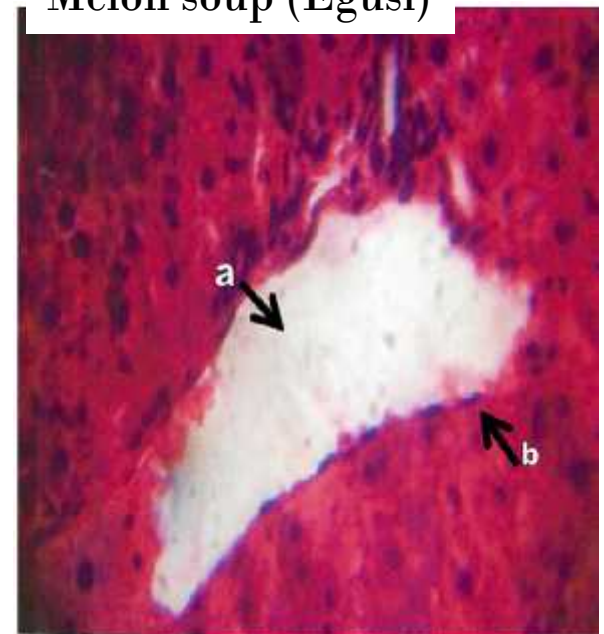


Fig.4 The liver section showing (a) Moderate distention of the central vein with moderate centrilobular necrosis. (b). There is local mononuclear cell infiltrates around the periphery of the distended vein. Source of organism-egusi (melon) soup

Source: Mgbakogu and Eledo (2015)



## Food processing

- Unhygienic environment and personnel
- Undercooked food
- Cooking utensils
- Lifestyle



# Chemical Food Safety

- A number of chemicals used in food are known to cause cancer
- These chemicals are present in our diet either by **deliberate additions, inadvertent contaminants** or compounds formed as a result of food **processing**



# Compounds deliberately added to food

## 1. Potassium bromate (PB):

Strengthen dough and allow higher rising during baking

Under the right conditions (PB) will be completely used up in the baking bread

However, if too much is added, residual amount will remain, which may be harmful if consumed

Carcinogenic (Kurokawa, 1990)

Ban on the use of PB:

Japan (1980)

Europe (1990)

China (2005)

Nigeria (2005)

India (2006)





### Research Article

### Open Access

## Assessment of Bread Safety in Nigeria: One Decade after the Ban on the Use of Potassium Bromate

Emeje OM<sup>1\*</sup>, Iflora BI<sup>1</sup>, Ezenyi CI<sup>1</sup> and Ofoefule SI<sup>2</sup>

<sup>1</sup>National Institute for Pharmaceutical Research and Development, Abuja, Nigeria

<sup>2</sup>Department of Pharmaceutical Technology and Industrial Pharmacy, University of Nigeria, Nsukka, Enugu State, Nigeria

### Abstract

In 2004 the National Agency for Food, Drug Administration and Control (NAFDAC), the agency responsible for regulating drugs, foods and chemicals in Nigeria, banned the use of potassium bromate in bread on account of its deleterious effect and carcinogenicity in humans. Consequently, researchers periodically evaluate the compliance level by the industries and the results have been alarming. In the present evaluation, carried out in the Nigeria's federal capital; the seat of government, twenty-six different brands of breads were sampled from the 6 area councils. Quality assessment shows that, all the brands contained potassium bromate in a quantity that exceeded the minimum recommended by the FDA suggesting that most bread circulating in FCT are unsafe for human consumption. Two of the bread samples which were relatively safe were not even registered by NAFDAC. It is therefore concluded that, urgent steps need to be taken to prevent the looming danger of consuming carcinogenic products circulating in town before its too late.

**Keywords:** Potassium bromate; Carbohydrate; Bread; Vitamins

### Introduction

Like most parts of the globe, bread is a very popular foodstuff in

level for human consumption.

It is exactly ten (10) years after our first report and we went into the Nigerian market to sample all available bread; Bread were obtained from bakeries, fast foods joints, open markets,



## 2. Azo dyes:

Colouring agents in cheese balls, most soft drinks etc.

Most azo dyes have been banned in the US and within the EU but unfortunately, are still heavily used in Nigeria



# Inadvertent contaminants

1. Pesticides:
2. Heavy metals: Lead and mercury
3. Cyanide in cassava meal
4. Endocrine disrupting chemicals: Sachet pure water
5. Polyaromatic hydrocarbon in vegetable oil





Country	Samples	Outcome <sub>(ng/l BPAEQ)</sub>	Source
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Italy	Mineral water	0.03 – 23.1 Mean: 9.5	Pinto & Reali, 2009
	Tap water	Average: 15.0	

Germany	Bottled water	2.64 – 75.2 (60%) Mean: 18.0	Wagner & Oehlmann, 2009
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Spain	Bottled	Table 2. Estradiol (EEQ) and bisphenol A (BPAEQ) equivalent concentrations of positive sachet water samples.	
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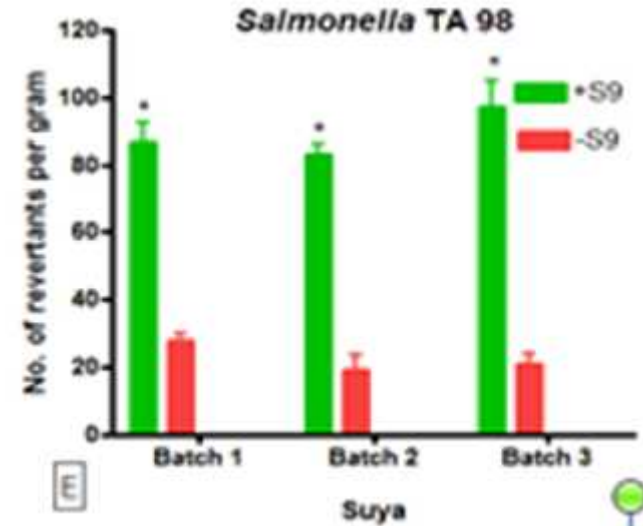
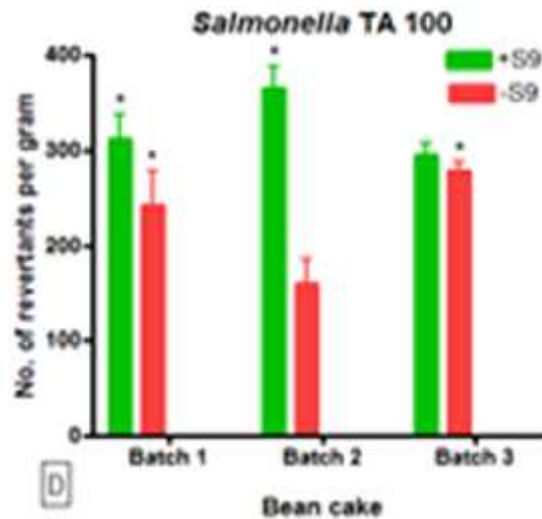
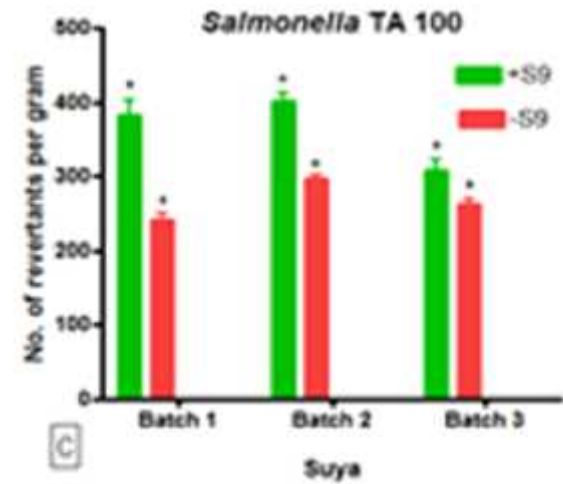
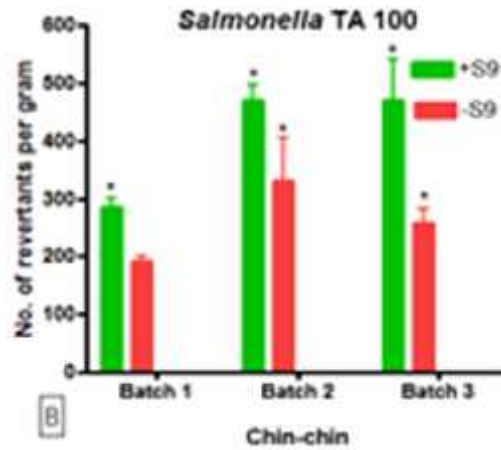
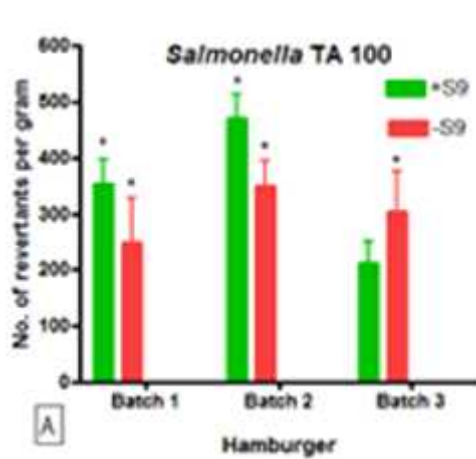
Finland	Bottled Mineral Tap water	Sample Code	Water Samples		Sachet/Packaging Material	
			EEQs (ng/L)	BPAEQs (ng/L)	EEQs (pg/L)	BPAEQ (pg/L)
		W1	0.79	124.2	14.5	224.0
		W2	44.0	1000.8	< LOD	< LOD
		W3	28.0	597.8	10.2	186.1
Nigeria	Sachet	W4	23.0	442.8	< LOD	< LOD
		W5	15.0	269.7	< LOD	< LOD
		Median	23.0	443.0	12.4	205.0
		Average	7.0	152.0	2.0	26.0



## Compounds formed as a result of processing

1. Polyaromatic hydrocarbons  
Suya, dried/roasted meat
2. Milliard reaction  
➤ Browning of bread
3. Cyanide in cassava meal
4. Aflatoxins





70% of food items investigated had chemical compounds that could cause cancer



# Food security

Food security exist when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs

- 170 to 180 million people in Nigeria
- National poverty rate (46 % in 2009)
- Inflation at 16.5 % (as at 2016)
- 70.8 % of Nigerians live on less than one dollar a day
- 92.4 % live on less than two dollars a day (Human Development Report, 2006)



# Is there food security in Nigeria



263 million Nigerians by 2030

# Where do I come in ?

- Shortfall in domestically produced food in Nigeria despite our arable land
- 3.2% increase in growth rate annually
- Growth in food production less than one percent
- Nigeria depends so much on food importation



# Common mistakes mothers make

1. Not taking **enough** responsibility for what their family eat
2. Using the “not too clean water” to wash the dishes and cook their food
3. Pilling eggs for their family
4. Putting cooked and uncooked food together
5. Not maintaining salad at cold temperature before and during serving
6. Using the same chopping board for raw and cooked food
7. Keeping unused tin tomatoes
8. Not knowing when and who to step aside from the kitchen
9. Abandoning the culture of washing hands
10. Abandoning their garden



# Recommendations

... We are equally responsible for what we don't do  
(Jonathan Safran)

Mothers must take responsibility for what their  
family eat in and outside their homes

Own a garden

Wash! Wash!! and Wash!!!





Thank  
you

