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**CARIBBEAN  
FOOD  
CROPS SOCIETY**

**44**

**Forty Fourth  
Annual Meeting 2008**

**Miami, Florida, USA**

**Vol. XLIV – Number 1  
T-STAR Invasive Species Symposium**

**MEETING HOST:**



**MICROBIAL THREATS TO THE SAFETY OF FOOD PRODUCTS IN TRADE BETWEEN THE LATIN AMERICA-CARIBBEAN REGION, THE USA AND OTHER COUNTRIES**

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**ABSTRACT.** A large amount of data on the microbial threats to the safety of food products in trade originating from the English-speaking Caribbean countries come from public health sources. Many of the countries depend on diagnostics information from Public Health Laboratories or Analytical Laboratories, and the Chemistry Food and Drug Laboratories (in at least two CARICOM states). While the Ministry of Agriculture is the principal Ministry that directs the affairs of the export of food and agricultural products, the technical input regarding inspection and certification of such products for export often lies with inspectors from the Ministry of Health. Should this really matter? How efficient is the inspection process? How effective is the national laboratory in the support of regional and international trade. There is paucity in the information regarding food products to be exported from several CARICOM countries, but there is an equal scarcity of information on imported products from third countries and international trading partners. Some projections are made on addressing the lack of data in CARICOM countries.

Caribbean countries are challenged to deal with microbial threats. But a genuine effort to address the deficiencies could prove valuable to the member countries, working collectively as a single domestic space with many common linkages. Through networks and partnerships, much could be achieved. Networks and partnerships could result in enhanced surveillance and diseases detection, and lead to great achievements in food safety and trade.

**KEYWORDS:** Imports, Exports, Inspection, farm-to-fork concept, HACCP

**INTRODUCTION**

Microbial threats to food safety are linked to numerous microorganisms whether bacteria (Prokaryotes), parasites and fungi (Eukaryotes) or viruses (Fig. 1). Amidst the multitude of microbes there are only a few that are harmful as food-borne pathogens (Fig. 2). Most of these pathogens exert their effect through food consumption, particularly when such foods are not properly cooked or handled before eating. Interestingly, all raw foods contain microorganisms through the ubiquitous nature of such organisms. Therefore, it is essential to evaluate the environment in which such foods are grown, harvested, transported, cleaned or washed, processed, stored, further processed, cooked, sold and consumed. This is the farm-to-fork concept often referred to in food safety circles.

The subject of this presentation is more related to food safety and trade issues. This means that there should be control measures in place at all stages of the food chain to ensure that the food is kept safe. In most cases however, scarce human and financial resources constrain the relevant

authorities, whether public or private, to have the appropriate controls at each stage. One measure of compromise is to apply the concept of the hazard analysis critical control point

Figure 1. Microbial threats to food safety are linked to numerous microorganisms:

- Bacteria (prokaryotes)
  - Parasites and fungi (eukaryotes)
  - Viruses
- 

Figure 2. Only a few microorganisms are harmful as food-borne pathogens

- Linked to improperly cooked food
  - Improperly handled foods before eating
  - Raw foods
  - Essential to evaluate the environment where foods are grown, harvested, transported, cleaned or washed, processed, stored, cooked, sold and consumed
  - Control measures should be in place at all stages of the food chain to ensure that the food is kept safe
- 

(HACCP) methodology and identify the critical points in the food chain where control measures should be mandatory. But even this approach, in countries such as developing states, becomes challenging. For example, when a small island state has a single inspector who is involved in a multiplicity of tasks, it is virtually impossible to have the time to focus on the critical control point, especially when the single individual has to perform the same functions at many different establishments, and all establishments, more or less, operate during the same hours of work.

Furthermore, it is necessary to keep in mind that in dealing with food safety issues, even for trade products, there are numerous stakeholders (farmers, processors, manufacturers, food handlers, consumers) that must be actively involved along the food chain. If all these players are well informed about food borne diseases and seek to apply the control measures, or even become involved in a structured surveillance programme, it will be beneficial to the control of microorganisms in foods. But there still remains an important question: How can these persons identify the many microorganisms that are microscopic? They really cannot, but if they are informed of, and understand the epidemiological factors that embrace disease occurrence, it may prove helpful.

## **SOURCES OF FOOD-BORNE PATHOGENS**

It is well known that meats, milk, vegetables, rice, potatoes, and fish are common sources of food-borne *Bacillus cereus*. *Brucella* spp are found in raw or improperly processed foods of milk origin (including cheese) (Figs. 3, 4, 5 and 6). *Salmonella* spp are found in raw meats, milk, poultry and poultry products, eggs, fish, shrimp, and even in coconut, sauces and salad dressings. *Shigella* spp are found in salads generally and sandwich fillings, milk, dairy products and poultry products. In still other cases, microorganisms such as *Staphylococcus* spp and *Escherichia coli*

0157:H7 are prevalent in meat and meat products, poultry products and salads, while *Campylobacter jejuni* is found in raw chicken, beef, raw milk and shellfish, to name a few (Fig. 7). This could mean that when these products are traded, the microorganisms unless destroyed prior to shipping, also may accompany the products, whether raw or cooked. An informed farmer, processor, food handler that undertakes agricultural practices, good handling practices or good manufacturing practices, can greatly assist other persons along the food chain.

Figure 3. Animals serve as a major cause of microbial diseases

- Co-habitation
  - Animal handling practices
  - Trade
  - Companion animals (pets)
  - Transboundary introduction
  - There are a number of very dangerous emerging and re-emerging diseases
    - Animals and humans
- 

Figure 4. Incidence of food borne illnesses

- Only small numbers of food borne disease cases (FBDs) are known and reported
  - Actual Incidence: 300-350 times greater than reported
  - About 3.3 million to 12.3 million infections occur annually in the USA alone
  - WHO estimated that 70% of 1.5 billion episodes of diarrhea that occur globally each year are directly caused by chemical/biological contamination of foods
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## **CHALLENGES IN INTERNATIONAL TRADE IN FOODS**

Caribbean countries are net importers of food and food products (both raw and processed). In many cases, countries seek to outsource foods from all over the world. But not all countries have the same standards for preparing or processing and shipping foods, and this puts the recipient country at risk for receiving foods that may well be contaminated and serve as a source of disease transmission. This risk applies to any country that is involved in trade on the international market. But the major concern is that when the recipient country lacks the capacity and capability to detect contaminants or hazards (biological, physical or chemical), the risk is even greater. Such is the case of Caribbean countries in which diagnostic laboratories are either inadequate or absent; where surveillance at the port is inadequate and sometimes even ineffective; where a recognized sampling plan is not in place; and where due to financial constraints, countries are often not able to visit exporters to observe the operation and food handling practices in the country of export.

Consequently, in some countries, food imports are often examined at the points of entry by Public Health officials from Ministries of Health, Such is the case in several Caribbean island states. Fortunately, most of the imported foods are usually processed foods which may pose a lower food safety risk. The greater challenge though, is with the inspection of raw foods which may not always have the expert attention of veterinary inspectors at points of entry (Fig. 8). This

is further complicated when at such points of entry a proper refrigeration system is not in place. It is not unusual to have two agencies inspecting different types of foods at entry points. For example, in the USA, foods are inspected at points of entry by the US Department of Agriculture (USDA) as well as by the US Food and Drugs Administration (USFDA). The distinction is that in the USA scenario, there is usually a continuous presence of staff from both departments and the definition of the food (e.g. meat) is clear.

In the Caribbean, a veterinary presence is often lacking at ports, and response by the officers themselves to inspect in-coming food products of animal origin may be compromised if the responsible officer is engaged in another emergency at the time the product is to be inspected. It means therefore, that a large amount of data on the microbial threats to the safety of food products in trade originating from the English-speaking Caribbean countries come from public health sources. Such foods are usually the exotic foods (patties, pies, shark and bake, doubles, etc) and are usually internal trade among nationals, with products sold on the streets, or in parks, or at work sites. They are often prepared at home and brought to the site for sale. This practice is in itself risky, but the details will not be mentioned in this presentation.

### **NEED FOR DIAGNOSTIC LABORATORIES**

Many of the countries lack functional Veterinary Diagnostic Laboratories at which representative samples could be tested. Thus, not much sampling, if any, is done on food imports and exports, and to a large extent, where inspection is done at the port, it may be subjected to organoleptic evaluation. The Ministry of Agriculture remains however, the principal Ministry that directs the affairs of the export of food and agricultural products, but the technical input regarding inspection and certification of such products for export sometimes rests with inspectors from the Ministry of Health. Several countries therefore, depend on Public Health Laboratories or Analytical Laboratories, and the Chemistry Food and Drug Laboratories (in at least two CARICOM states) to get diagnostic information. From personal knowledge, although laboratory technicians may often have similar training and diagnostic skills, there is generally reluctance for persons in food laboratories to conduct tests on animal products, except in unusual circumstances. The reciprocating action also takes place among technicians in Veterinary Diagnostic Laboratories. This is a signal for concern when raw food products of animal origin are to be tested in Analytical Laboratories.

Laboratory services are key factors in food monitoring for microbial agents (Fig. 9). Therefore, any program that is unable to sustain a proper diagnostic laboratory in support of routine sampling of foods, will be compromised. It is well known that laboratory planning should be done taking into account the type of sampling to be done and the volume of samples to be processed. It is not critically important to have all foods tested using a single laboratory, but it is most important to ensure that food standards and protocols are closely followed, and that the laboratories are equipped with capable workers and appropriate facilities, supplies and equipment and effective methods of analysis. The laboratory then can be the critical factor in obtaining information on food-borne disease trends, the identification of food hazards and observing the association with identified agents and contact with affected persons.

At a time when globally, emerging and re-emerging infectious diseases are threatening the health of the peoples of the world and affecting trade internationally, it is imperative to put measures in place to reduce the incidence of such infectious diseases. Strong inspection and surveillance programs, driven by modern diagnostics would greatly minimize the risks from exposure to such diseases. In a community such as the CARICOM Community that is devoid of organized integrated surveillance programs and inadequate laboratory support, it will definitely compromise an already unacceptable situation in which human resources are scarce. At the same time, the emerging diseases demand that countries prepare to prevent the introduction of such diseases through early disease detection, and prompt response and containment. The introduction of infectious agents, automatically compromises trade in imports into, as well as exports from, the affected country/countries.

As just stated, a proper inspection program and good surveillance protocols can greatly reduce the serious impact of trans-boundary infectious agents/diseases. National laboratories must however, be strengthened to support both programs and in the long term, facilitate regional and international trade.

## **CONCLUSIONS**

Caribbean countries are challenged to deal with microbial threats (Fig. 10). But a genuine effort to address the deficiencies could prove valuable to the member countries, working collectively as a single domestic space with many common linkages. Through networks and partnerships, much could be achieved.

Figure 5. Reported cases of food born illnesses in the Caribbean countries, 1981 – 2000 . Actual Incidence appears to be 300-350 times greater than reported

## REPORTED CASES OF FOODBORNE ILLNESS IN CARIBBEAN COUNTRIES 1981 - 2002

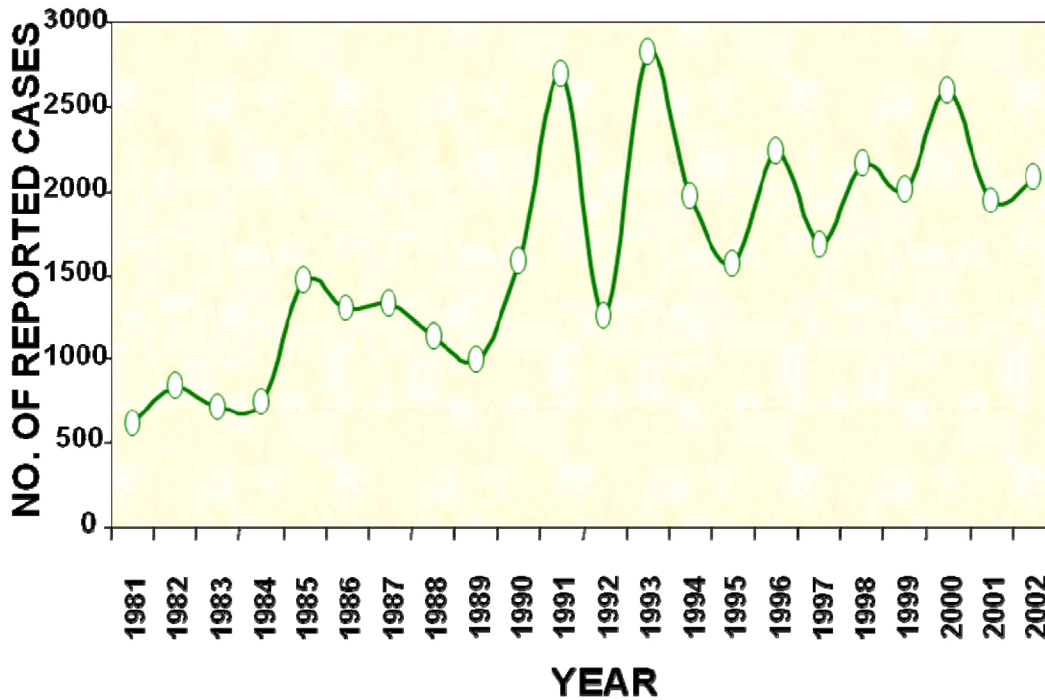




Figure 6. Food-borne pathogens

<ul style="list-style-type: none"> <li>■ Bacterial:             <ul style="list-style-type: none"> <li>▪ Bacillus cereus</li> <li>▪ Brucella</li> <li>▪ Campylobacter*</li> <li>▪ Clostridium botulinum</li> <li>▪ Clostridium perfringens</li> <li>▪ E. coli O157:H7*</li> <li>▪ Listeria monocytogenes*</li> <li>▪ Salmonella non-typhoidal</li> <li>▪ Shigella</li> <li>▪ Staphylococcus</li> <li>▪ Streptococcus</li> <li>▪ Yersinia enterocolitica</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Parasitic:             <ul style="list-style-type: none"> <li>▪ Cryptosporidium*</li> <li>▪ Cyclospora*</li> <li>▪ Giardia*</li> <li>▪ Toxoplasma*</li> <li>▪ Trichinella</li> </ul> </li> <li>■ Viral:             <ul style="list-style-type: none"> <li>▪ Norwalk-like viruses*</li> <li>▪ Rotavirus*</li> <li>▪ Astrovirus*</li> <li>▪ Hepatitis A</li> </ul> </li> </ul>
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Figure 7. Principal sources of pathogens

<u>Pathogens</u>	<u>Sources</u>
Brucella spp	Raw milk and cheese
Campylobacter	<u>Raw</u> chicken, beef, raw milk and shellfish
E. coli O157:H7	Meat and meat products, poultry products and salads
Salmonella	Poultry, cattle, pig, produce, raw meats, milk, poultry, eggs, fish, shrimp, coconut, sauces and salad dressings
Shigella spp	Salads generally and sandwich fillings, milk, dairy products and poultry products
Staphylococcus Spp	Meat and meat products, poultry products and salads

Note: Caribbean countries are net importers of food and food products (both raw and processed)

Figure 8. Challenges in safeguarding the Caribbean Region against food-borne pathogens

- Fragmentation of programmes
- Inspection of raw foods which may not always have the expert attention of veterinary and plant inspectors at points of entry
- Veterinary presence often lacking at ports of entry
- Lack of functional Veterinary Diagnostic Laboratories
  - Mainly organoleptic evaluations

Figure 9. Infrastructure needs to assure microbial safety of foods

- Laboratory Facilities
  - ◆ Key factors in food monitoring for microbial agents
- Diagnostic Methods
- Disease detection and response
- Disease containment and eradication
- Surveillance Systems
- Competent, trained human resources

Figure 10. Conclusions

- Caribbean countries are challenged to deal with microbial threats
  - A genuine effort to address the deficiencies could prove valuable to the member countries, working collectively as a single domestic space with many common linkages
  - Networks and partnerships could result in enhanced surveillance and diseases detection, and lead to great achievements in food safety and trade
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