FEBRUARY 01, 2021 VOL. 2

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FOOD SAFETY NEWSLETTER

IN THIS ISSUE

A letter from the editor

by Dr Andrea Goldson-Barnaby

2020 was a year with severe challenges ranging from the novel corona virus to sub Saharan dust particles. Initially, Jamaica appeared to be doing well in controlling the spread of the coronavirus. The reopening of our borders in the summer, however resulted in a soar in the number of persons infected with the virus. There was news of community spread and the inability to contact trace cases. The University of the West Indies, Jamaica, made the decision to continue offering classes virtually with limited face to face contact with students. The opening of some primary and secondary schools was suspended until the first week of October. As we start the new year, some schools have taken the decision to resume face to face classes here in Jamaica. Around the globe there have been further lockdowns in countries such as the United Kingdom and Canada due to the emergence of a more contagious strain of the virus.

Vaccines have been developed in record time by the pharmaceutical companies Pfizer and Moderna to combat the virus. Some are skeptical about taking the vaccine due to possible side effects. These vaccines are different from those developed in the past and are referred to as mRNA vaccines. There are concerns as to whether the current vaccines are also effective against the new contagious strain of the coronavirus.

Another applicable question has to do with how soon will the vaccine be available for use in developing countries. Smaller Caribbean countries such as the Cayman Islands and Turks and Caicos which are still under colonial rule by Britain already have access to the vaccine than larger Caribbean countries that are independent. In India, plans are currently underway to inoculate 300 million people by July with the vaccines Oxford University and AstraZeneca's Covishield. The country is hoping to achieve herd immunity which occurs when a sufficient percentage of a population has become immune to an infection, whether through vaccination or previous infections.

Other than taking the vaccine, what measures can we take to protect ourselves from the virus? Several recommendations have been made. These include staying at home, working from home, social distancing and the wearing of masks. We can also eat foods that boost our immune system. Fruits and vegetables are rich sources of antioxidants which boost immune health. Spices such as ginger (*Zingiber officinale*) and garlic (*Allium sativum*) are rich sources of antioxidants.

Ginger

Garlic

In traditional medicine, concoctions of ginger, garlic, honey, lime and cayenne pepper are mixed together and used for the treatment of colds and flu symptoms. Jamaican ginger has high potency and is used as a standard against which other gingers are judged. Active components present within this rhizome include gingerols, paradols, shogaols and zingerones.

Vitamins boosting immune health include vitamin C (ascorbic acid) and vitamin D3 (cholecalciferol). Good sources of vitamin C include citrus fruits, Jamaican cherry (*Muntingia calabura*), guavas (*Psidium guajava*), mangoes (*Mangifera indica*) and green leafy vegetables.

Guava

Mangoes

Sardines, liver and egg yolks are natural sources of Vitamin D3. Zinc, an essential mineral, boosts immune health.

Vitamin D capsules

Probiotics such as Bifidobacteria and Lactobacillus are beneficial microorganisms that promote gut health. Sources of probiotics include fermented products such as yoghurt and sauerkraut. Prebiotics promote the growth of probiotics. Natural sources of prebiotics include onions, garlic, chicory root, Jerusalem artichoke and wheat bran. Fructo-oligosaccahrides are naturally found in these foods. By improving our diets we can improve our immunity and health.

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Food Safety – Aspects for closer examination

by Ms L. Hope Kerr

Since the launch of the Food Safety Modernization Act (FSMA) in January 2011, the focus on Food Safety in the industry has been steadily growing and since the advent of the COVID-19 pandemic (March 2019), a new dimension has been added to food safety. The working environment is under closer scrutiny and the need for stricter adherence to personal and environmental hygiene is critical to the safe production of food.

Three aspects of food safety will be considered here, that may not readily come to mind especially in the Jamaican context of food production. What comes to mind when you hear "Food Defense, Biovigilance and Bioterrorism?" These are listed among the initial 15 Prerequisite Programmes that must be taken into account when establishing a food safety system for any food manufacturing operation.

Food defense is the protection of the food products from contamination or adulteration intended to cause public health harm or economic disruption. The Food Safety and Inspection Services (FSIS) in the United States of America, is involved in a programme that ensures such attacks are prevented, prepared for and also recovered from. Any threat that has the potential to affect the food or the agricultural sector is taken into consideration.

Emergency Response planning helps manage incidents reports (IR) during natural or man-made disasters such as hurricanes, earthquakes, fires or floods. These may also include chemical spills, unintentional product contamination or human pandemic as the world is currently experiencing.

Biovigilance is the systematic monitoring of serious adverse reactions in the transplantation chain of substances of human origin, with the objective of making the application of tissues, cells and organs safer and more effective.

Bioterrorism is terrorism involving the intentional release or spread of biological agents such as bacteria, viruses, insects, fungi, toxins that may be in a naturally occurring or a human-modified form, that may cause people to become ill.

For food businesses based in the U.S. and for entities exporting foods to the US, the FSMA Mitigation Strategy to Protect Food against Intentional Adulteration rule, came into effect from July 26, 2019 for businesses not classified as small or very small. The rule aims to regulate food facilities to identify potential risks and implement suitable mitigation strategies to prevent potential attacks. Since that announcement, COVID-19 has forced the Food and Drug Administration (FDA) to postpone routine inspections, including those of large businesses under the IA rule, because travel restrictions, physical distancing and other public health measures have made inspections impractical to conduct.

Under the IA rule, acts of terrorism, with the intent to cause public health harm will also be addressed to ensure food safety. Operators of food businesses will be expected to have food defense plans in place and these will be inspected by the regulators as food safety plant inspections are conducted. Updates for these plans plus educational material are available through the FDA and the Center for Food Safety and Applied Nutrition.

In July 2020 FDA had proposed that routine inspections of small businesses to verify compliance with the FDA Food Safety Modernization would resume in March 2021. Under the current escalation of COVID-19 crisis, this is not likely to occur.

The current pandemic has created more uncertainty as we move into 2021 and it can be anticipated that “business as usual” will morph into a new normal as all stakeholders become busy working with the guidelines and assistance provided by the regulators to address the areas of concern to the industry. Since many of our local food operations export agricultural produce and finished products to the United States, we have even greater reason to pay careful attention to Food Defense, Biovigilance and Bioterrorism to ensure that our food export businesses will not suffer undue setbacks.

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Cyanide in cassava products

by Mrs Samantha Joseph

Cassava (*Manihot esculenta*) a member of the family Euphorbiacae, is a tuberous edible root that is grown in tropical regions of the world (1). It is also known as yucca, tapioca, mandioca, Brazilian arrowroot and manioc. This dicotyledonous plant is characterized by lobed leaves (usually 3-9) and large root tubers which are a major source of carbohydrates. The plant is propagated primarily by stem cuttings.

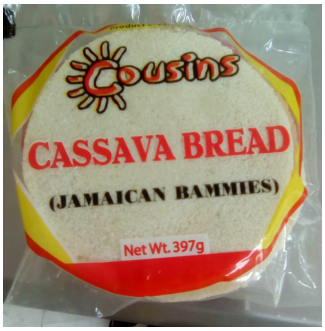
The root is a rich source of energy and contains appreciable levels of vitamin C and calcium but is low in protein, fats and most other vitamins and minerals (2). It is however known to contain many anti-nutritional elements, notably cyanogenic glycosides. When adequately processed the majority of these compounds are removed but residual levels can still remain in products made from this root; including but not limited to starch, flour, chips, bammy, bread and beverages.

The World Health Organisation (WHO) has indicated that the maximum level of cyanide in food for human consumption should be 10 mg/kg by dry weight (dw) (3). The Codex standard also uses 10 mg/kg dw as the maximum total cyanide limit for cassava flour and gari but there isn't a stipulated limit for any other processed cassava product. Consumption of inadequately processed cassava products has been associated with the development of visual defects (4), konzo (5), thyroid disease and neuromuscular illnesses (6).

In Latin America and the Caribbean there has been an increase in cassava cultivation during the period 1980 - 2011, with the average growth since 2000 being twice the amount recorded for the two previous decades (7).

In Jamaica, there has been a 40 % increase in cassava production over the period 2005 - 2010 (8). Increased interest in cassava as an economically viable crop has been evident in Jamaica as seen in the decision by Red Stripe Jamaica (a local beer manufacturer) to substitute imported high maltose corn syrup (HMCS) with cassava starch in their brewery process; the establishment of a cassava processing plant under the partnership of The University of the West Indies, Mona and the Columbian Government; and the subsequent production of bread containing cassava flour by Continental Bakery Company. All three of these initiatives have the potential to significantly reduce import expenditure and thus increase foreign currency holdings.

The most common processed cassava product in Jamaica however is bammy with cassava chips, flour and more recently bread also being available. Bammy is prepared by grating the cassava root, pressing the grated pulp to remove as much fluid as possible, seasoning the dried pulp with salt and forming it into circular discs with a thickness of approximately 1 cm; which is subsequently baked.



Intoxication by the consumption of inadequately processed cassava products can occur both by an isolated consumption of a single meal or by consumption of smaller levels of cyanide overtime. The latter is more of a major concern which can be easily mitigated by informing consumers and manufacturers of the associated risks of consuming cassava products and regulating the manufacturers of processed cassava products. If foods are not adequately processed, cyanide levels may be high and this can lead to the development of serious health issues and possibly death. As stakeholders gain a better insight about the raw material, they will be better able to develop other food products and/or substitute ingredients for cassava based alternatives. This will both increase the diversity of cassava products available and stimulate economic growth in the sector.

Even as the economic potential of this food crop is promoted by governments and international agencies, due care must be taken to ensure that economic growth is not gained at the expense of the safety of the consumer. Additionally processed cassava products that are within the maximum limit as specified by WHO/FAO and Codex could be traded internationally and regionally. Manufacturers must ensure that their products have total cyanide levels within the 10 mg/kg dw maximum limit stipulated by the WHO.

Many analytical techniques have been used to quantify the total cyanide content in cassava and its processed products. They all involve three main stages: extraction of cyanogenic glycosides, hydrolysis of cyanogenic glycosides to acetone cyanohydrins and then to hydrogen cyanide and finally quantification of the hydrogen cyanide evolved. It is usually in this final stage that differences between the analytical methods become apparent.

Some techniques used for quantification at this stage include differential pulse polarography, mass spectrometry, colorimetry, gas chromatography and titrimetry. Most of these methods utilize equipment that are costly and require specialized training for use. The picrate method and titration methods are however very simple techniques that can be used where costly analytical equipment is not available. The simplicity of these two methods in no way subtracts from the reliability of the results that are obtained when they are used.

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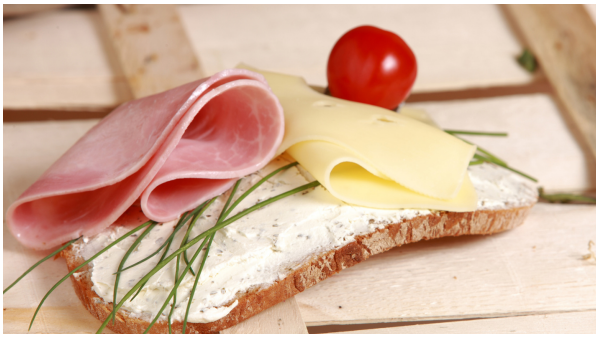
Nitrites in processed meats

by Ms Marielle Coley



Clostridium botulinum is an anaerobic, spore forming bacteria that produces a neurotoxin. The bacteria can exist as a vegetative cell or a spore and is responsible for the disease botulism. Botulism results from the ingestion of the potent neurotoxin produced during the growth of *C. botulinum* which can cause illness and even death. Minute amounts of the neurotoxin can have an effect on the body (1). *C. botulinum* is a major concern in the processing of meats, particularly cured meats. Most salts lack the ability to prevent the growth of this bacterium and its spores with the exception of salt peter, which is made from sodium nitrate or potassium nitrate. Salt peter (potassium nitrate) was found to inhibit the growth of not only *C. botulinum* and its spores, but also *Escherichia coli*, Salmonella and Campylobacter if added amounts were adequate. This discovery was instrumental in the process of curing meats.

Curing is achieved through the addition of a combination of salts, sugar, nitrite and/or nitrate. In addition to preservation, the use of sodium nitrate and/or sodium nitrite adds a unique colour and flavour to meat and poultry (2). Sodium nitrite also plays an important role in the curing process. It greatly delays the development of the toxin produced by *C. botulinum*, develops the characteristic pink colour and "cured" flavour in cured meats, impedes the development of rancidity, off-odours and off-flavours during storage, and preserves the smoke flavour (3).

Although sodium nitrate and sodium nitrite are different compounds, their use in the meat and poultry industry are quite similar since sodium nitrate is reduced to sodium nitrite which is the primary compound used in other reactions exploited by the industry. Sodium nitrite is an inorganic, hygroscopic, white to slightly yellowish crystalline powder that is very soluble in water. It is used to give the characteristic pink colour and unique cured flavour to meats as well as to control the growth of *C. botulinum*. Outside of its use in the food industry, it is a useful precursor to a variety of organic compounds such as pharmaceuticals, dyes, and pesticides. Sodium nitrate on the other hand is a white, water soluble solid. Sodium nitrate is used as a preservative and a colour fixative in meats and poultry. Various agencies have set limits for the consumption or exposure to nitrates. The WHO Average Daily Intake for nitrate (0–3.7 mg/kg) translates into an equivalent of 222 mg nitrate for a 60-kg adult. The European Union has limited the concentration of nitrate in drinking water to 50 mg nitrate/L. In the United States, this limit is 44 mg/L. These values are in accordance with recommendations set by the World Health Organization established first in 1970 and confirmed in 2004.

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Honey

by Ms Terri-Lee Patterson

Honey is a natural sweet substance that is produced by honey bees from the nectar of flowering plants (blossom/nectar honey). It is also produced from secretions of living parts of plants or excretions of plant sucking insects on the living parts of plants (honeydew honey) which honey bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in the honey comb to ripen and mature. Honey is produced by the bees as a secondary source of food in times of harsh weather conditions or food scarcity (1,2).

Jamaican honey is said to have a unique taste which places high foreign demand on the product. It is the main commercial hive product sold locally and is reasonably the cheapest. Other hive products such as pollen, propolis, royal jelly, queen bees and bee stock have recently been receiving increased interest by local bee keepers and first time entrepreneurs. Outside of the food industry there is a small scale production of hair oils, candle, wax ornaments and soaps (3).

Honey is composed of a wide variety of sugars (80-85%), predominantly fructose and glucose along with organic acids, water (15-17%), protein (0.1-0.4%), 0.2% ash, solid particles derived from honey collection and minor quantities of enzymes, amino acids, vitamins and other chemical substances like antioxidants (4-7). The colouration of honey ranges from near colourless to dark brown. The flavour and aroma of honey varies depending on the origin of the plant. The consistency of honey can be fluid, viscous or partly to entirely crystallised (1). Apiarian products are naturally rich in antioxidants (enzymatic and nonenzymatic), minerals, and simple sugars. This ripened/mature honey is a sought after delicacy from nature.

Recent studies have shown that the honey bee population has experienced a notable decline which has led to an increased demand for pollination services. Knowledge of the causative factor for this decline is non-existent however several stressors have been identified as having a negative effect on honey bee health. Common stressors include biological agents such as viruses, mites, microsporidia (8) and chemical agents like pesticides (9). Beekeepers actively apply control strategies to reduce the prevalence of mite within their honeybee colonies involving pesticide-based treatments, for example Apistan to control Varroa mites. As these chemicals are used inside beehives the probability of bee and bee product contamination is very high.

In serious cases, bees are killed by the use of pesticides which subsequently decreases bee population. These chemicals have the potential to find their way into honey and other apiarian by-products such as wax, royal jelly and propolis and pose a risk to consumers. Consequently, it is of great importance that these products are monitored for the presence of pesticide residues in order to determine if the expected characteristics of this nutraceutical are preserved for consumer health protection, international commercial competition and better product quality (10).

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Probiotics

by Ms Ronamea Bradford

Probiotics are living microorganisms, usually from the Lactobacillus and Bifidobacterium species, which when consumed in sufficient quantities confer a health benefit to the host (1). They are usually found in raw and fermented milk products such as yogurt, and promote good digestive and immune health. Health benefits associated with probiotic consumption include relief of symptoms of lactose intolerance, diarrhea, treatment of Irritable Bowel Syndrome, cancer suppression, reduction of serum cholesterol, anti-mutagenic and anti-infection properties, improved digestion and stimulation of gastrointestinal immunity (2, 3). L. *plantarum* is one species of a commonly used probiotic. It displays moderate acid tolerance, homofermentative metabolism and is generally regarded as safe (4). The probiotic should be able to maintain its viability during storage and gastrointestinal transit, in order to colonize in the colon (5).

A reduction in viability of probiotics subsequent to gastrointestinal transit has prompted researchers to find ways to improve their viability. Immobilization and microencapsulation of probiotics has been shown to offer some improvement in bacterial viability after gastrointestinal transit. Immobilization is the process where viable microbial cells are physically confined to a defined region of space in order to limit their free migration while retaining their catalytic activity (6).

Prebiotics have been gaining popularity as immobilization materials as they are fermentable fibers which are not hydrolyzed in the upper digestive tract, and act as a substrate for the fermentation of probiotics in the colon (7). Hi-maizeTM starch, which is a carbohydrate, can also be used to immobilize probiotics. Hi-MaizeTM is a resistant starch that has been shown to behave similarly to fiber, as it is not hydrolyzed in the upper digestive tract (8).Hi-maizeTM has been found to improve the encapsulation of viable probiotic. Another study showed that Hi-maizeTM offers more protection to capsules with *Lactobacillus* spp. than Raftilose® & Raftiline®. Immobilization has been utilized in order to develop food products that are able to deliver probiotics to support digestive health. To date, many products have been designed to carry probiotics including fermented and non-fermented dairy products, ice cream, juices, cereals and cheeses (1). Food and Agriculture Organization and World Health Organization reports indicate that “probiotics play an important role in immunological, digestive and respiratory functions and could have a positive effect in alleviating infectious disease in children” (9).

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