

A Survey of Genetically Modified Foods Consumed, Health Implications and Recommendations for Public Health Food Safety in Trinidad

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ABSTRACT: Genetically modified foods provide one of the major challenges facing the food industry in the twenty-first century worldwide. The safety of genetically modified foods are being questioned by scientists, researchers and doctors as it is believed that these foods may pose a serious public health risk, especially for the young, aged, pregnant and immunocompromised persons. The present study investigated the following: (i) consumer awareness of genetically modified foods, (ii) identify genetically modified foods sold in Trinidad, (iii) consumption rates of genetically modified foods and (iv) provided recommendations on the control use of genetically modified foods. The results of the present study revealed that the majority of consumers (90 %) knew very little about genetically modified foods. This was mainly due to lack of information provided by the relevant Government agency. Many consumers were actually consuming genetically modified foods without their knowing. Genetically modified foods that were available on the supermarkets' shelves and sold throughout Trinidad included baby foods, bakery products, confectionery, meat and meat products, fruit drinks and juices, soups, fruits and vegetables. These genetically modified foods were sold to consumers without either their knowledge or consent. Most suppliers (67 %) were unaware that they were selling genetically modified foods to the public. Genetically modified foods constituted more than 65 % of the diet and these foods were consumed at a rate of at least 6-8 servings per day per person. Common reported health problems associated with consuming genetically modified foods included diarrhea, vomiting, rashes, difficulty in breathing, respiratory problems, hormonal imbalances and susceptibility to infection. The present legislation, that is, the Food and Drugs Act and Regulations of 1960 is ineffective and is not fully enforced and does not allow for the removal of genetically modified foods from supermarket shelves. There is an urgent need to enact and upgrade existing legislation, policies, procedures and practices to regulate, control and reduce the use of genetically modified foods until sufficient reputable, strong, empirical, scientific evidence exists to prove otherwise. At present the safety of genetically modified foods remains questionable mainly because of insufficient long term scientific data, and the vulnerability of the developing and developed countries to satisfy the food demands of their growing populations. Governments and their relevant food agencies worldwide should take the necessary precautionary measures to prevent exposure to or minimize the risk of exposure to genetically modified foods. This may serve to avert any future public health crisis and to minimize any potential food safety risks.

Key words: Genetically modified foods, genetic engineering, food safety, public health hazard

INTRODUCTION

Genetically modified foods are foods derived from animals and plants in which genes for a particular desired characteristic(s) are added to an organism's DNA. As the animal or plant grows and develops, it begins to express the proteins of the inserted genes, this leads to changes in the organism's molecular structure, biochemistry, physiology, anatomy and morphology thus resulting in the creation of a new living entity not found in nature. These changes are unprogrammed, multidirectional and difficult to control leading to the creation of highly unpredictable organisms (Oxfam, 1999).

Genetically modified foods came to the forefront when a single U.S. Supreme Court Ruling in 1980 allowed for the first time the patenting of life forms for commercialization. Since then thousands of genetically modified organisms have been created and patented in the U.S. (The Pew Institute on Food and Biotechnology, 2005).

In just three years it is estimated that 70-80 million acres of agricultural lands in U.S. were converted to raise genetically modified crops. According to statistics on the prevalence of genetically modified organisms in 2000, there

were at least 25 % of corn produced by U.S., 54 % of soybean produced by U.S., 61 % of cotton produced by U.S., 70 % of canola produced by Canada, 90 % of soybean produced by Argentina and 10-30 % of soybean produced by Brazil. Genetically engineered fish was first developed in 1990's that would grow faster and needed less feed. Human or animal growth genes were introduced into several fish species such as salmon, carp, trout, and tilapia (The Pew Institute on Food and Biotechnology, 2005).

The effects of genetically modified foods on human health and well being are at its infancy. There exist little reputable scientific evidence in the current literature to suggest that genetically modified foods are safe for human consumption and health. Food producers and processors in response to the increasing demand for cheap, nutritious foods have invested considerable resources in developing new products using genetic engineering. It is hoped that this new technology would be used to solve the problems of hunger, food security and pest control, but at what cost to the safety of the consumer and public (Oxfam, 2005; The Pew Institute on Food and Biotechnology, 2005).

The high levels of unpredictable consequences of genetic engineering have led several know groups and organizations to express their views, namely:

- (i) The Union of Concerned Scientists;
- (ii) The Prestigious Medical Journal, the Lancet;
- (iii) Britain's Medical Association;
- (iv) National Academy of Science.

The views of these groups are that genetically modified foods should never be allowed into the food chain. Genetically modified foods introduce new allergens, toxins, disruptive chemicals, soil polluting ingredients, mutated species, unknown protein combinations into our bodies and into the whole environment, create new allergens and reduce nutritional content. In addition, genetically modified monoculture threatens the biodiversity and resilience of all future crop farming practices (Batalion, 2000).

Genetically modified foods have been reported to cause deaths and near deaths in the U.S. from allergic reactions for example by the genetically altered variety of the food supplement L-tryptophan. Brazil nut gene spliced into soybean caused allergic reactions in some susceptible

individuals. In 1994, USFDA approved genetically produced growth hormone rBGH for injection into dairy cows. But, rBGH is linked to a potential chemical hormone IGF-1 and this hormone increases the risks of human breast, prostate and colon cancer up to 400 % to 500 %. Canada, the European Union, Australia and New Zealand have all banned rBGH as safe. The Codex Alimentarius has also refused to certify rBGH as safe (Batalion, 2000).

Pesticides contain commonly known carcinogens such as bromoxynil used in transgenic cotton and glufosinate used on genetically modified soybeans, corn and canola. These pesticidal foods have genes that produce a toxic pesticide inside the food's cell. There is little knowledge of the potential long-term health impacts (Oxfam, 2005; Batalion, 2000).

Much of the genetic implantation uses a genetic marker to track genes, genetically modified maize plants use ampicillin resistant gene. The resistant qualities of genetically modified bacteria in food can be transferred to other bacteria in the environment and throughout the human body. This may explain the growing resistant of bacterial infections and resurgence of infectious diseases to antibiotics misused in bioengineering (Batalion, 2000).

Genetically modified foods have lower levels of vital nutrients in particular phytoestrogen that serves to protect the body against heart disease and cancer (Oxfam, 2005; Batalion, 2000).

Trinidad is not self sufficient in food production and as consequence relies heavily on foreign imports of food to satisfy its needs (Central Statistical Office, 2000). It is estimated that TT \$ 1.7 million is spent on food imports per year and this amount is increasing every year (Central Statistical Office, 2000) making the consumption of genetically modified foods more pronounced and the urgent need for long-term studies on the effects of genetically modified foods on human health. Worldwide 672 million acres of land are under cultivation with genetically modified crops (Oxfam, 2005; The Pew Institute on Food and Biotechnology, 2005; Batalion, 2000). Many of the food imports come from countries known to produce genetically modified foods such as U.S., Canada, Argentina, China, South Africa, Australia, Mexico, Romania, Bulgaria, Spain,

Germany, Uruguay, Indonesia, Philippines, India, Columbia, Honduras and Brazil (Batalion, 2000; John & Umaharan, 2005) . Genetically modified foods from these countries include, but are not limited to corn, soybean, cotton, squash, papaya, tomatoes, sugar beet, potatoes, flax, rice and canola (Batalion, 2000; John & Umaharan, 2005). It is for this reason that imported foods may pose a real threat to public health, in particular food safety.

To add to the serious concern of public health food safety, USFDA does not require mandatory labeling of genetically modified foods. USFDA only requests of firms that they conduct their own tests of new genetically modified foods. USFDA makes no review of those tests unless voluntarily requested by the company. FDA has no way to validate the health and safety of genetically modified foods (The Pew Institute on Food and Biotechnology, 2005). So that consumers in Trinidad and the rest of the world who import genetically modified foods from the U.S. and other countries do not know the true nature of ingredients and safety of these imported foods. The present study is the first of its kind to investigate the following: (i) consumer awareness of genetically modified foods, (ii) identify genetically modified foods sold in Trinidad, (iii) consumption rates of genetically modified foods and (iv) provide recommendations on the control use of genetically modified foods.

METHODOLOGY

The present study was done during the time period January 2005 to June 2005. A questionnaire consisting of a total of 42 questions (37 closed ended questions and five open ended questions). Questions were based on demographics (n = 8 questions), awareness of genetically modified foods (n = 12 questions), labeling of genetically modified food (n = 3 questions), application of genetic modification (n = 5 questions), common medical ailments (n = 5) and consumption pattern of genetically modified foods (n = 9). Questionnaires were pretested randomly on at least ten respondents in order to ensure easy of reading, understanding, systematic and logical arrangement of questions and layout. Questionnaires were then distributed randomly to 350 households throughout Trinidad in all six counties (St. George, Caroni, Nariva/Mayaro, St. Andrew/St David, Victoria and St. Patrick) according to established scientific and ethical criteria (Patron, 2000). The

average time taken to complete a single questionnaire was 45 minutes. Questionnaires were administered in person and collected and returned to the Food and Drugs Division for analysis. Analyses were done using standard statistical methods (Swinscow, 1991). Respondents were asked to substantiate any medical claims via medical certificates, medication regimens, physician letters, prescriptions and/or hospital visits. Respondents were also asked to show representative samples of foods consumed in order to ascertain whether these foods were genetically modified or not. Genetically modified foods were identified using a previously published list from the Center for Food Safety, Washington, D.C. and the Pew Institute on Food and Biotechnology.

One hundred and fifty supermarkets throughout Trinidad in all six counties during this same time period were inspected by the Food and Drugs Inspectorate according to previously established criteria. The main purpose was to identify any genetically modified foods offered for sale on the supermarkets' shelves. Identified genetically modified foods were noted and the supplier or owner was asked whether he/she knew about genetically modified foods and if they had received any complaints from consumers and the public. This information was noted.

RESULTS

Demographics

The present study surveyed 49 % males and 51 % females. The average age ranged from between 25-35 years. Most respondents were either married (78 %), single (18 %) or other (4 %). The educational levels of respondents were primary (26 %), secondary (32 %), tertiary (35 %) and other (7 %). Most respondents surveyed were employed (79 %). Their job profession ranged from university students (12 %), clerks (7 %), university lecturers (2 %), secondary school teachers (10 %), primary school teachers (12 %), health inspectors (4 %), technicians (18 %), microbiologists (1 %), food technologists (1 %), janitors and cleaning personnel (19 %) and others (14 %). There was almost an equal mix of respondents from rural (48 %) and urban areas (52 %). Most respondents were considered economically as either middle class (65 %) or upper class (10 %) citizens of Trinidad. While, only 25 % of respondents were considered unprivileged. All respondents had daily exposure to or access to one or more of the following: television (65 %), radio

(12 %), internet (15 %), newspaper (7 %) and other (1 %).

Awareness of Genetically Modified Foods

Most respondents (90 %) did not know about genetically modified foods. Only 10 % knew about genetically modified foods. The major sources of information were the internet (87 %) and magazines

(13 %). Most respondents believed (91 %) that genetically modified foods are not being sold in Trinidad. Most suppliers (67 %) were unaware that genetically modified foods were sold in Trinidad. Respondents (95 %) were uncertain whether genetically modified foods were safe to eat and many (90 %) were reluctant to eat foods with genetically modified ingredients. When respondents were told that genetically modified foods may be more nutritious than non-genetically modified foods and may require less pesticides for growth, there were marked changes in responses from denial and reluctance to the affirmative (93 %). Price was not a marked factor in the selection of genetically modified foods for the majority of respondents

(89 %). Food safety (60 %) and health (30 %) were the major issues affecting the use of genetically modified foods as a safe source of food. Apart from these issues ethical (4 %) and religious (6 %) concerns played a minor role in the selection and consumption of genetically modified foods.

Respondents (98 %) believed that the government through the relevant agencies such as the Food and Drugs Inspectorate and the Health Education Division, Ministry of Health should be the major agencies responsible for informing the public and consumers about genetically modified foods. Most respondents agreed that there was insufficient information on genetically modified foods available to consumers and public in Trinidad.

Labeling of Genetically Modified Foods

Information required by respondents on genetically modified foods in descending order of importance included: (i) certification by relevant competent authority on safety of genetically modified foods (80 %), (ii) origin of transferred genes (12 %) and (iii) declaration of any allergic warning statement(s) (8 %).

Most respondents believed it is very important (89 %) that food products are specifically labeled as genetically modified or non-genetically

modified. This labeling should be mandatory and not voluntary.

Application of Genetic Modification

It was the general view (88 %) that genetic modification should not be used to produce food in Trinidad, until sufficient strong scientific evidence exists to validate its safety and use for human consumption. Moreover genetically modified foods should not be sold to the consumers and the public without their consent. Most respondents believed that genetic modification may be beneficial in areas such as: medicine and research (45 %), bioremediation for oil spills (23 %), horticulture (10 %), forensics (8 %), environmental management (5 %), cloning (4 %), human genetic screening (2 %), stem cell research (2 %) and other (1 %).

Common Medical Ailments as a Result of Consuming Genetically Modified Foods

Respondents (75 %) who believed that foods they consumed over a five year period were responsible or related to their common medical ailments included: allergic reactions (20 %), susceptibility to colds and infections (18 %), cancer (17 %), hormonal imbalances (15 %), respiratory problems (7 %) immunosuppression (5 %) and other (18 %). These medical claims were supported by medical certificates, diagnosis, treatment regimens, physician letters and/or prescriptions. Foods consumed were validated against the list of known genetically modified foods (Center for Food Safety, Washington DC; The Pew Institute on Food and Biotechnology, 2005).

Consumption Patterns of Genetically Modified Foods

There were no marked differences in consumption patterns in respondents in both urban and rural areas. Common foods consumed by respondents in descending order included: meat and dairy products (27 %), baby foods (15 %), soups (15 %), juice and fruit drink (14 %), fruits and vegetables (13 %), confectionery (11 %) and bakery products (5 %). Respondents were asked to provide proof of purchase of these food items and/or were asked to show actual valid samples of these foods.

Consumption Rate of Genetically Modified Foods

Most respondents (85 %) claimed that they consumed foods identified as being genetically modified or contained ingredients thereof. These

foods were consumed on average at a rate of least 6-8 servings per day per person. One serving was considered 227 g portion of a particular food. It was generally believed that genetically modified foods comprise 65 % of the diet.

Common Genetically Modified Foods Consumed in Trinidad

Of the one hundred and fifty supermarkets inspected 73 % of supermarkets had genetically modified foods in stock and were displayed for sale on supermarket shelves. Common genetically modified foods included: baby foods, bakery products, confectionery, meat and dairy products, juices and fruit drinks, soups and fruits and vegetables.

1. Baby Foods included the following: Nabisco (Phillip Morris) Infant Formula; Enfamil Infant Formula; Isomil Infant Formula; Simlac (Abbot Labs) Infant formula.
2. Baking Mixes: Aunt Jemima (Quaker); Betty Crocker (General Mills); Jiffy; Mrs Butterworths; Pillsbury.
3. Breakfast Bars: Kellogg's; Nabisco (Nabisco/Phillip Morris); Nature Valley (General Mills); Quaker.
4. Waffles: Aunt Jemima Frozen Waffles; Eggo Frozen Waffles (Kellogg's).
5. Cereals: General Mills-Cheerios, Wheaties, Total, Lucky Charms, Frosted Cheerios, Frosted Wheaties; Kellogg's-Frosted flakes, Corn Flakes, Special K, Raisin Bran, Rice Krispies, Corn Pops, Froot loops, Apple Jacks, All-Bran, Complete Wheat Bran, Complete Oat Bran, Honey Crunch Corn Flakes, Raisin Bran Crunch; Post-(Kraft Phillip Morris)-Raisin bran, Bran Flakes, Honey Comb, Cocoa Pebbles, Fruity Pebbles, Honey Nut Shredded Wheat, Fruit and Fibre Date, Raisin and Walnut; Quaker-100% Natural Granola, Toasted Oatmeal, Toasted Oatmeal Honey Nut, Oat Bran.
6. Confectionery: Cadbury/Hershey's-Moulds, Almond Joys, Dairy Milk, Roasted Almond, Fruit and Nut; Hershey's-Kit-Kat, Milk Chocolate, Kisses; Kraft (Kraft Phillip Morris)-Mars, M&M, Snickers, Three Musketeers, Milky Way, Twix; Nestle-Crunch, Milk Chocolate, Butterfinger, Chunky.
7. Drink Mixes and Dessert Toppings: Carnation (Nestle)-Hot Cocoa Mixes, Rich Chocolate, Double Chocolate, Mini Marshmallow; Hershey's-Chocolate Syrup, Special Dark Chocolate Syrup; Nestle-

- Nesquik, Strawberry Nesquik; Swiss Miss (ConAgra)-Hot Cocoa Mixes, Chocolate Sensation, Milk Chocolate, Marshmallow Lovers; Del Monte (Nabisco/Phillip Morris)-Ketchup; Heinz-Ketchup, Chili Sauce, Cocktail Sauce; Hunt's (ConAgra)-Ketchup; Kraft (Kraft Phillip/Morris)-Miracle Whip, Kraft Mayonnaise, Thick & Spicy BBQ Sauce, Honey Hickory BBQ Sauce; Nabisco (Nabisco Phillip/Morris)-A-1 Steak Sauce.
8. Condiments: Chi-Chi's (Hormel)-Fiesta Salsa; Old El Paso-Thick & Chunky Salsa, Picante Sauce.
 9. Cookies: Famous Amos (Keebler/Flowers Industries)-Chocolate Chip, Oatmeal Raisin, Chocolate Sandwich, Peanut Butter Sandwich, Vanilla Sandwich; Nabisco (Nabisco Phillip/Morris)-Oreo, Chips Ahoy, Fig Newtons, Nutter Butters, Nilla Wafers, Pecanz Shortbread, Famous Wafers; Honey Maid Graham Crackers.
 10. Crackers: Keebler-Wheatables, Snax, Stix, Town House; Nebisco-Wheat Thins, Ritz; Red Oval Farms (Nabisco Phillips/Morris)-Crisp'N Light Sourdough Rye, Crisp' N Light Wheat; Sunshine (Flowers Industries)-Cheeze-it, Krispy Original Saltines.
 11. Frozen Dinners: Banquet (ConAgra)-Pot Pies, Fried Chicken, Chicken Nugget Meal, Pepperoni Pizza Meal; Budget gourmet (Heinz)-Three Cheese Lasagne; Green Giant (Pillsbury)-Primavera Pasta, Rice Medley with Beef Flavored Sauce, Pamesan Herb Chicken, Beef Noodle, Sweet and Sour; Healthy Choice (ConAgra)-Stuffed Pasta Shells, Chicken Parmagina, Country Breaded Chicken, Roast Chicken Breast, Beef Pot Roast, Chicken and Corn Bread, Macaroni and Cheese; Rosetto Frozen Pasta (Heinz)-Cheese Ravioli, Beef Ravioli, Italian Sausage Ravioli; Stouffer (Nestle)-Macroni and Cheese, Green Bean and Mushroom casserole.
 12. Energy Bars and Drinks: Power bar (Nestle)-Oatmeal Rasin, Apple Cinnamon, Peanut Butter, Chocolate Peanut Butter, Harvest bars; Drink Mixes-Carnation Instant Breakfast Mix (Nestle); Classic Chocolate; French Vanilla; Café Mocha.
 13. Heat and Serve Meals: Chef Boyardee (ConAgra)-Befaroni, Macaroni and Cheese, Mini Ravioli; Hormel-Chili with Beans, Spaghetti rings with meat balls, macaroni

- and cheese; Franco-American (Campbell)-Spaghetti O's.
14. Meat and Dairy Alternatives: Morningstar (Worthington/Kellogg's)-Harvest Burger, Better'n Burger, Chicken Patties; Natural Touch (Worthington/Kellogg's)-Garden Vegetable Patties, Vegetarian Burger; Dairy Alternatives-Nutra Blend Soy Beverages (Best Foods).
 15. Meal Mixes and Sauce Packets: Better Crocker (General Mills)-Garden Vegetable Pilaf, Creamy Herb Risotto, Garlic Alfredo Fettuccini; Knorr (Best Foods)-Classic Sauce Packets, Pasta Sauce Packets, Alfredo, Four Cheese Pesto; Lipton (Unilever)-Rice and Sauce Packets, Beef Flavor, Chicken Flavor, Creamy Chicken; Rice-a-Roni-Beef, Chicken, Chicken and Broccoli.
 16. Frozen Pizza: Celeste (Aurora Foods)-Supreme, Pepperoni, Four Cheese, Vegetable; Totino's (Pillsbury)-Pepperoni.
 17. Snack: Act II Microwave Popcorn (ConAgra)-Butter, Extreme Butter, Corn on the Cob; Frito-Lay (Pepsi Co.)-Lay Potato Chips, Ruffles Potato Chips, Doritos Corn Chips, Tostitos Corn Chips, Fritos Corn Chips, Cheetos; Healthy Choice Microwave Popcorn (ConAgra); Popcorn (Betty Crocker/General Mills)-Natural, Homestyle, Jumbo Pop, Light, Extra Butter; Pringles (Procter and Gamble)-Original, Low Fat, Pizza Licious, Sour Cream and Onion, Salt and Vinegar, Cheezeums; Quaker Corn cakes-Caramel Corn, Strawberry Crunch.
 18. Soda and Juice Drinks: Coca Cola-Sprite, Minute Maid Orange, Minute Maid Grape, Ultra; Pepsi Co-Pepsi, Slice, Mountain Dew; Cadbury/Schwepes-7-Up, Sunkist Orange, Schwepes Ginger Ale; Capri Sun Juice (Kraft Phillip/Morris); Gatorade (Quaker); Hawaiian Punch (Procter and Gamble); Hi-C (Coca Cola); Kool Aid (Kraft Phillips/Morris); Ocean Spray; Sunny Delight (Procter and Gamble); Tropicana Twisters (Pepsi Co); V-8 (Campbells) Juices.
 19. Soups: Campbell's Soups-Tomato, Chicken Noodle, Cream of Chicken, Cream of Mushroom, Cream of Celery, Cream of Broccoli, Green Pea, Campbell's Select; Chunky; Soups to go-Chicken Noodle, Chicken Rice, Garden Vegetables, Vegetable and Rice; Simply Home; Healthy Choice (ConAgra)-Country Vegetable, Fiesta Chicken, Bean and Pasta, Chicken with Rice; Pepperidge Farms (Campbell's)-Corn Chowder, Lobster Bisque, Chicken and Wild Rice, New England Clam Chowder, Crab Soup; Progresso (Pillsbury)-Tomato Basil, Chicken Noodle, Chicken and Wild Rice, Lentil, Zesty Herb Tomato, Fat Free Roast Chicken.
 20. Tomatoes and Tomato Sauces: Del Monte (Nabisco Phillips/Morris); Five Brothers Pasta Sauce (Lipton/Unilever); Healthy Choice Pasta Sauce (ConAgra); Hunts (ConAgra) Pasta Sauce; Prego Pasta Sauce (Campbells); Ragu Sauce (Lipton/Unilever).

DISCUSSION

The present study is the first of its kind to be conducted in Trinidad on Genetically Modified Foods. The results of the present study revealed that the majority of respondents belonged to the middle and upper class groups and are unaware of the presence of genetically modified foods on supermarket shelves in Trinidad, despite exposure to at least one or more forms of communication media. Only a few respondents knew about genetically modified foods. The major sources of information were the internet and magazines. Most respondents did not believe that genetically modified foods are sold in Trinidad. A high degree of uncertainty was expressed by respondents in accessing the safety of genetically modified foods. There may be a tendency for respondents to buy foods that are more nutritious and require less pesticide. Health and safety are major factors considered by respondents in determining the acceptability of genetically modified foods. Religious and ethical beliefs seem to play in a minor role in the selection of genetically modified foods for use. The main reason may be due to the lack of proper labeling. Most respondents consumed foods without knowing that they were genetically modified. This may constitute a violation of the individual/consumer rights to know what they are eating. Consumers should be given the choice to select their own foods which are either genetically modified or foods which are not genetically modified.

The genetic engineering industry claims that no one has been harmed by eating genetically modified foods (Ticciati & Ticciati, 1998). But without proper labeling of genetically modified ingredients, there is no way to track the effects of these foods on human health and wellbeing. Doctors and scientists warn that there is not enough evidence to insure that these foods are

safe in the human diet (British Medical Association, 1999). Medical experts and health professionals in Germany and the British Medical Association have questioned the safety of genetically modified foods (Batalion, 2000; The Pew Institute on Food and Biotechnology, 2005; McCammon, 1999; Ingeborg, 1999; Rosset, 1999). In fact, there is ample evidence of risk:

- (i) Allergies: By inserting foreign DNA into common foods, without adequate safety testing, the biotech industry is introducing possible new food allergens (Bucchini & Goldman, 2002, Taylor, & Hefle, 2001; Paul, 1996; Jane & Margaret, 1996; John, 1995).
- (ii) Antibiotic Resistance: The rise of diseases that are resistant to treatment with common antibiotics is already a serious medical concern. Doctors warn that the current use of antibiotic resistance genes in genetically modified crops may add to this risk (Kristin, 1997; Fox, 1999; Grace, 1997).

In short, genetic engineering is an unpredictable technology that, for the sake of corporate profits, puts the environment and health at risk (Kimbrell & Nathanson, 1998; Lappe & Bailey, 1998; Marshall, 1999; Montgomery & Sivramiah, 1999). It is therefore possible to regard the medical claims of diarrhea, skin rashes, hormone imbalances, increased susceptibility to colds and infections, immunosuppression and cancer made by respondents in the present study as being real and requires further follow up investigations to eliminate any confounding factors that may have contributed to these medical ailments as a result of consuming genetically modified foods.

According to the U.S. Food and Drugs Act which require that added substances to food be labeled and mandates disclosure of material facts. But the USFDA does not require labeling of genetically modified foods (Batalion, 2000). The Trinidad and Tobago Food and Drugs Act of 1960 states that an ingredient means any substance including a food additive used in the preparation of a food which is present in the final product. Section 16 (1) bi of the Food and Drugs Act states that the label of a package of food shall carry on any panel except the bottom of the package a complete list of ingredients in descending order of proportion by weight or a

complete list of ingredients in which the proportion or quantity of each ingredient is stated in terms of percentage. In addition, Section 5(a, b, d) of the Food and Drugs Act states that any person who sells an article of food which has in or upon it any poisonous or harmful substances, is unfit for human consumption and is adulterated is guilty of an offence. Section 6(1) of the Food and Drugs Act states that any person who labels, packages, treats, processes, sells or advertises any food in a manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character, value, composition, merit or safety is guilty of an offence.

Despite the presence of relevant laws to monitor regulated entry and use of genetically modified foods into Trinidad, genetically modified foods are still being allowed for sale and distribution without any restriction in Trinidad. The main reasons for this are: (i) lack of effective monitoring and surveillance of genetically modified foods entering Trinidad, (ii) lack of sufficient information provided by manufacturers and also on labels, (iii) dependence on foreign countries to supply food to Trinidad, (iv) lack of the necessary enforcement by the relevant authority, (v) inability to show that genetically modified foods are potentially dangerous to human health and well being, (vi) lack of research on the effects of genetically modified foods on human health and wellbeing, (vii) political, economic and social acceptance that have led to resistance to change. These apparent weaknesses in the present system have allowed the unguarded entry of genetically modified foods into Trinidad. In order to address these weaknesses the following recommendations have been suggested:

1. Enactment of existing laws or the development of new laws to regulate and control the import and use of genetically modified foods in Trinidad. According to Section 32(2) of the Trinidad and Tobago Food and Drugs Act of 1960, no article of food, drug, cosmetic or medical device shall be imported into Trinidad and Tobago unless the article wholly conforms to the law of the country in which it was manufactured or produced and is accompanied by a certificate (such as: health certificate, free sale certificate, certificate of analysis, genetically modified organism certificate) in prescribed form and manner that the article does not contravene any known requirement

- of the law of that country and that its sale therein would not constitute a violation of the law thereof. What this law means is that foreign imports of food must comply with both local and foreign laws regarding safety and wholesomeness and the importing country that is Trinidad has the right and authority to ask for any certificate that would validate the same. This requirement should be made mandatory and enacted fully to identify genetically modified food entering Trinidad. Food imports that do not comply should be refused entry and returned to the country of origin.
2. Genetically modified foods present on shelves of food outlets should be carefully documented and a complaints desk should be established in each food outlet to monitor any problems arising out of the use of these foods. This information should be collected, pooled and supplied to a central processing center for analyses, report generation and adoption and implementation of corrective actions.
 3. Surveillance, data collection, analysis and documentation should be established for genetically modified foods.
 4. Establish proper and effective monitoring and surveillance protocols and procedures to investigate on a continuous basis the effects of genetically modified foods on human health and wellbeing and the establishment of a research bank for the adoption of the necessary corrective actions.
 5. Networking with other international organizations on the safety of genetically modified foods such as Cartagena Protocol on Biosafety (CPB). This is an international harmonizing mechanism that sets standards in dealing with the international introduction of living modified organisms into the environment (Bail, Falker & Marguard, 2000).
 6. Establish a moratorium, to partially ban, restrict or to request mandatory warning labeling on all genetically modified foods. This would allow for: (i) further scientific assessment of socio-economic health and environmental impacts; (ii) public debate and development of educational programs on biotechnology; (iii) establishment of national regulatory systems; and (iv) adapting legislation and creating company liability for adverse effects.
 7. Adopt and implement stringent penalties for non-compliance.
 8. Adopt regulated health safety testing. The Food and Drugs Inspectorate should be given the financial, human and necessary infrastructure resources to conduct independent tests in order to validate health and safety of genetically modified foods.
 9. The Precautionary Principle should be adopted that is, when scientific evidence is not very clear or is contradictory, governments should err on the side of caution when formulating standards or regulations in order to protect public health or the environment. Thus technological innovation such as genetic engineering should be put on hold until proven safe.
 10. More countries should sign the Convention on Biodiversity (CBD). The Biosafety protocol must be finalized and enshrine in the precautionary principle in relation to transboundary movement of genetically modified crops and regulate liability and compensation in relation to prompt genetically modified technology related damage.
 11. Encourage and implement public research into applications of genetically modified technology.
 12. World Trade Organization rules should: (i) be amended to allow governments to restrict imports and/or allow mandatory labeling of genetically modified seeds and foods; (ii) transformed to allow countries to decide their intellectual property regimes; (iii) exclude privatization of traditional crop varieties and their genetic characteristics.
 13. Patents on living organisms should be: (i) reviewed with emphasis on the potential impact on human life and the environment; (ii) revised to exclude products and processes and should be in the public domain.
 14. More emphasis should be placed on food security in which everyone has access to sufficient quantities of good quality food at all times. More financial resources should be put into agriculture in Trinidad rather than relying heavily on food imports from foreign countries. Less than two percent of GDP is put into agriculture in Trinidad, an amount insufficient to achieve sustainable agriculture growth and development (Central Statistical Office, 2000).
 15. Necessary questions to ask when developing policies, regulations and laws regarding genetically modified foods are as follows:

- (i) Are there any inherent hazards in the genetic modification process itself?
- (ii) Are the products of genetic modification harmful?
- (iii) Are genetically modified foods which are eaten pose a threat or hazard to human health and wellbeing?
- (iv) Can genetically modified technology lead to environmental changes which may have a secondary effect on human health and wellbeing?

IMPLICATIONS OF STUDY

The present study has revealed that the majority of respondent/consumers are unaware that there exist genetically modified foods in Trinidad and moreover that these foods are consumed unknowingly to both consumers and local suppliers. The consumption of these foods would have been different (that is, less or not consumed at all) if consumers had known that they were genetically modified or contained genetically modified ingredients. Common medical ailments claimed by most consumers included allergic reactions in the form of skin rashes, shortness of breath, respiratory problems, increased susceptibility to infections and cancer. Even though these medical claims were supported by relevant documentation it was difficult to rule out the possibility of other causative factors and provide controlled conditions or obtain suitable controls to validate these medical claims. Nevertheless, these medical claims should not be taken lightly in light of what is known about genetically modified foods and the known health effects such as allergic reactions, immunosuppression and cancer (Bucchini & Goldman, 2002; Taylor & Hefle, 2001; Batalion, 2000; Ticciati & Ticciati, 1998). The results of the study suggest that measures need to be put in place in order to provide safeguards against real or hypothetical risks posed by genetically modified foods. Some of these measures include: (i) rigorous pre-market assessment of safety; (ii) research to improve understanding of the science of genetic modification of foods; (iii) health surveillance to provide reassurance against any unexpected adverse affects on health; (iv) collaborating and networking with international agencies and organizations on the latest updates on genetically modified foods.

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