



## The Group of Hidden Hazards in Enhanced HACCP and ISO-22000 Based Quality Systems

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### Abstract

The increase in public concern worldwide regarding food hazards and decline in public trust in food risk regulators suggests that there is a need to identify the actual concerns held by the public regarding specific food hazards in order to develop effective risk communication. HACCP and ISO-22000 based quality systems are designed to prevent the occurrence of potential food safety hazards. The goal of implementing a particular food safety system is to prevent or minimize risks associated with biological, chemical, physical, electronic and mental hazards to acceptable levels as it is based on prevention rather than detection of hazards. Many food manufacturers seem to be not aware enough of the above mentioned hazards and mainly both insidious and hidden groups of hazards. It is HACCP team's responsibility to consider such hazards while analyzing hazards along the food chain in their establishments.

In this paper, we are focusing on some different types of hazards that effect health and environment that are "hidden hazards", which include different categories and subcategories such as Irradiated food, canned food, heavy metal residues in food, household chemicals, microwave ovens-cooked food, cling wrap in contact with food, bottled water in PET bottles, soft drinks, energy drinks and artificial sweeteners, artificial flavorings and colorings, refrigerators, fat and cooking oils, cooking food in aluminum and Teflon coated vessels and other cookware, vitamin and mineral tablets, the Ingredients in "Dietary Supplements" promoted for sexual enhancement and many others.

Consumers worldwide are faced nowadays with food or food ingredients and additives that may derive from distant countries or continents, and with a less transparent food supply. Safety concerns must cover the range of different food chains relevant to a certain food product or product group, including all relevant producers, manufacturing sites and food service establishments within a country as well as those importing into the country. However, a list of useful tips is being issued in this paper in order to give aid to HACCP team and people who are concern of implementing ISO-22000 in their establishments successfully. Inevitably, food safety is still mainly the responsibility of the consumer.

**Key words:** Expected hazards, Insidious hazard, Hidden hazard, Ergonomic hazard, geo-environmental management, socio-economic catastrophes, ISO-22000, HACCP, carcinogenic substances, junk foods, Consumer Behavior, Frozen foods, Meat.

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### Introduction

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Technology in general and food technology in particular hold great promise when developed, promoted and used by ethical individuals and institutions. Harmful or immorally utilized food technologies should spur us to take action to

set things right. To that end, governments, many institutions, involved scientists and individuals worldwide should work all together in order to minimize all hazards threatening the consumer's health on our planet mainly the insidious and hidden ones.

Recently, the great increase of colon and other cancers mainly in developed countries is directly related to the increasing use of plastic, carcinogenic substances like pesticides, preservatives, colorings and, of course, microwave ovens too. The increasing consumption of highly processed foods and the lack of fiber in western diets with more consumption of junk foods have contributed to this trend. Eating organically grown foods and eating raw or semi cooked vegetables and fruit will help reduce the risk of colon cancer.

### **Categories and Subcategories of Hidden Hazards in Food Industry**

In fact, there are a lot of hazards which can be eventual threats to food safety in general and to the consumer's health in particular. Many food manufacturers seem to be not aware enough of such hazards. Beside the typical three categories of hazards; physical, chemical and biological, HACCP team must take into their consideration all other categories of hazards including the insidious (Sekheta et al., 2008) and hidden hazards.

In this paper, we are going to consider the most recently common categories and Subcategories of hidden hazards in the long and sophisticated food chain from farm to fork:

**Artificial Flavorings and Colorings.** A lot of current legislations worldwide are no considerable assurance of food safety. Some of the chemicals used as food additives are known to be hazardous. A great number of dyes, flavorings and other ingredients have never been adequately tested. Some Artificial colorings, flavorings and preservatives used in processed foods cause irritation of the intestines, and can cause cancer of the liver, stomach, lymphatic system and intestines. HACCP team must be very selective when the flavors and colors are to be used in the formula of a chosen product and it must be in accordance to JECFA (U.S. Congress, 2002). Labeling including all the information needed for the consumer in accordance to the most recent legislations is a must.

**Irradiated Food.** The purpose of food irradiation is simply to prolong its shelf life. Food is often treated with radiation to reduce the number of bacteria, and to kill the growing part of the food so it does not germinate or sprout. However, irradiation also destroys vitamins and other nutrients in the food and creates unique radiolytic products (URPs) some of which are carcinogenic (U.S. Food and Drug Administration, 2000). Foods which are commonly

irradiated foods are wheat, flour, potatoes, red meats, poultry, pork, eggs, spices and vegetables (U.S. Food and Drug Administration, 2006). HACCP team should avoid using the irradiated food ingredients whenever it is possible and they should make it labeled clearly too. In some countries irradiated food is labeled but in many undeveloped countries, such labeling is not mandatory. Still, irradiated food might be source of hidden hazards to the consumers worldwide, so that it must be labeled.

**Canned Food.** Cans are very important issue in the safety of canned food. The manufacturers of canned food must ensure that the can is a steel can *{commonly Bisphenol A (BPA) is used in a thin, invisible plastic lining of the cans}* which should be free of dents, cracks and bulges. Damaged cans should be destroyed because of the risk of contamination with Clostridium botulinum, which produces a heat-stable botulinum toxin that is potentially fatal. Samples should be sent for examination in all instances where claims or retort actions are contemplated against the donor, shipper or manufacturer as a result of poor or defective quality of cans. A new study that finds danger in some canned food has released by "Consumer Reports". Based on extensive sampling, they found that the cans containing canned soups, baby food, juices and other staples such as canned green beans contain (BPA). Ingesting too much (BPA) could represent a particular risk for babies and small children. According to this study, (BPA) has been shown to be linked to adverse health effects including reproductive abnormalities, heightened risk of breast and prostate cancers, diabetes, and heart disease (Ellen Freudenheim, 2009). The impact of this chemical has been studied on animals. Unfortunately, (BPA) was found even in some canned foods labeled "organic," and others labeled as "BPA-free". Of course, it is not listed in "ingredients."

Canned foods are usually acidic in nature. So, in order to avoid or reduce the hidden hazards in canned food, an opened can of food should be consumed immediately. If it has to be stored, it must be transferred into a sterile container and refrigerate. Preserved food should always be consumed before the expiry date. HACCP team should advice their canned food manufacturers to write a clear label concerning the preventive measures of any possible hidden hazards such as when food sprays out of a can on opening it; it must be thrown away, as it is probably decayed and poisonous.

**Hormone, Antibiotics Residues and Preservatives Used in Meats.** Hormones and some antibiotics accumulate in the liver, kidneys, skin and fat, so consuming these parts are more likely to cause problems. Manufacturing chicken liver pate (paste), liver sausages and other preparations from liver are often a sure recipe for disaster to their consumers:

1) **Hormones.** The association of **hormones** used in foods, with cancer and hormonal imbalances is very well

known, yet poorly understood by most people. Hormones are commonly used to promote quick weight gain in chicken, turkey, quail, pork, beef, salmon and other meats. They are also used to stimulate production of eggs and to increase the yield of milk. Animals grown in this unnatural way, also have a high content of fat and hormones, which, when eaten, lead to weight gain, obesity, hormonal problems and an increase in cholesterol which in turn can cause heart disease. This is a leading cause for obesity and increase in height and weight in the population worldwide. Hormone residues in meats significantly increase the risk of getting cancer of the breast, thyroid, vagina, uterus and prostate (Ruth L. Ozeki, 1999). It also causes hormonal imbalances including menstrual irregularities, weight gain and hair growth in ladies. In men it can cause impotence, a feminine voice, enlargement of the breasts, hypertension, prostate cancer, weight gain and obesity. In order to reduce the hidden hazards of hormones in meats, food manufacturers should avoid using any meat of animals raised in closed and confined spaces like poultry. Anyhow, manufacturers may use such meat and that for economical reasons, but they must avoid livers, kidneys, skin, wings and fatty parts where hormones are accumulated.

- 2) **Antibiotics.** The only purpose of routinely administering antibiotics to animals raised in closed and confined spaces is to prevent infection. These antibiotics pass into their eggs, milk and remain in their meat. While consuming such products from these animals, people also absorb these antibiotics. These antibiotics kill some bacteria in the body, and thus alter the bacterial distribution in our intestines, mouth, skin & genital tract making the body more susceptible to *candidiasis*. This is a fungal infection which flourishes in the absence of the normal friendly bacteria which normally live in these areas.

Low level ingestion of antibiotics through consumed meats, over a prolonged period, causes the bacteria which live in the body to become immune to those antibiotics (Parker-Pope Tara, 2008). Hence when the immune system is suppressed by factors like lack of sleep, stress, malnutrition due to a deficiency of vitamin B complex or zinc, people fall prey to infections from these bacteria, to which the body is normally resistant. At this time, primary antibiotics are usually unable to cure these infections and the physicians are forced to prescribe more toxic and expensive antibiotics.

- 3) **Preservative.** Preservatives in general, are also poisons which are added to food to reduce bacterial growth. They also poison the mitochondria and enzymes in the body leading to fatigue and loss of energy. It is well known that sodium nitrite is added to certain meat and fish products as a preservative. Hot dogs, Wieners, Frankfurters or sausages are widely consumed nitrite-preserved meat not only in Europe but worldwide too.

Because of the proposed linkage of such products with colon cancer, a lot of studies were done and found that most N-nitroso compounds are carcinogenic in laboratory animals, and these compounds are likely risk factors for the induction of several types of human cancer. On the other hands, novel studies show that nitrites in cured meat linked to lung disease too. (Rui Jiang et al., 2007), in his new study, says that people who regularly eat cured meats are 71% more likely to have symptoms of lung disease than people who never eat such types of meat. As such meat preservatives may cause cancer and other diseases, HACCP team must control the acceptable level of meat preservatives used in their establishments and give the consumers the information needed to avoid the possible hazards of over-consuming such preservatives.

Generally, in order to avoid such hidden hazards and to safely consume meats, it is wise to eat eggs from free range chickens, to eat free range or organic meats and to drink organic milk and other milk products. Checking the qualitative and quantitative analysis of the residues of hormones, antibiotics and preservatives accumulated or used in such meat products could be considered as a CCP in some enhanced HACCP programs (Unnevehr J. Laurian et al., 1996).

**Heavy Metal Residues in Food.** Shellfish like shrimp, prawns, crabs, clams, lobsters, oysters, mussels etc. They selectively take up heavy metal residues, mostly mercury, but also nickel, zinc, cadmium and lead. Consuming shellfish caught in waters near industrialized areas often causes food poisoning and allergic reactions. Eating mercury-laden fish during pregnancy can harm a baby's developing brain, causing learning disabilities. The FDA warns women not to eat shark, swordfish, king mackerel, and tilefish because they contain high levels of mercury. Mercury poisoning either from food or from improperly made amalgam used to fill cavities in teeth can also cause mental disease, mental disorders and neurological illnesses like multiple sclerosis and loss of vision. Large fish, especially those caught in coastal waters near industrialized countries can contain significant amounts of mercury, lead, cadmium selenium and other heavy metals. Such fish are best avoided by food manufacturers. Meanwhile, small fish like sardines, mackerel, herring, anchovies and many others which live in shoals in open seas are much safer. They are also rich in Omega-3 oils which help prevent, and reverse heart and vascular disease. A study has shown that fish oils are more effective than the statin drug Lipitor in positively affecting the levels of HDL ("good") cholesterol in obese and insulin-resistant men. HDL cholesterol protects against atherosclerosis by removing excess cholesterol from arterial cells, and low HDL levels can increase the risk of cardiovascular disease, particularly for those who are obese or insulin resistant. Drinking of arsenic (As)-contaminated well water has become a serious threat to the health of

millions not only in Bangladesh but in different parts in the third world too. However, Various vegetables were sampled and screened for As, Cd, Pb, Cu and Zn by inductively coupled plasma emission spectrometry (ICP-AES) and inductively coupled plasma mass spectrometry (ICP-MS). These local contaminated food products are the basis of human nutrition in this region and of great relevance to human health (Alam, MGM et al., 2003).

A real environmental concern which draws attention to the fact that natural processes can mobilize thallium (Tl), a highly toxic metal, which may enter the food chain as a "hidden health killer" with severe health impacts on local human population. Natural processes may be exacerbated by human activities such as mining and farming, and may cause enrichment of Tl in the environment (Xiao Tangfu, et al., 2004). Thus more attention must be paid to geo-environmental management of human activities if socio-economic catastrophes are to be avoided. Due to high uptake of Tl by crops, Tl can be transferred from soils to crops and remarkably concentrated in food crops. Thus, Tl is regarded as a latent health hazard with potential risk of toxicity in humans within each area worldwide of "natural" contamination by Tl.

Consuming fresh garlic, coriander (Cilantro) & foods rich in vitamin C can help remove mercury from the body. Mercuric salts are also widely used to fumigate grain, to kill pests, and mercuric tablets are often scattered in grain like wheat & rice to prevent infestations with pests. If these tablets are not carefully removed prior to grinding the grain they can cause mercury poisoning.

**Household Cleaners and other Chemicals.** Although, most current widely used household chemicals are non-toxic and do no considerable harm to humans or the environment, still some other chemicals are extremely toxic, but have been well tested. Their effects are known and their use is strictly regulated. There are an ever increasing number of synthetic chemicals, some which have been in use for a long period, that lack adequate testing. Their safety remains an unknown quantity. It is this group of chemicals which cause most concern.

The rapid increase in the number of chemical compounds has resulted in a growth in the number of products available to householders. Many of these products are a boon to the householder.

Many chemicals remain in our surroundings. Nearly in every home, restaurant and/or food establishment there is an assortment of potentially dangerous chemical products, many of which are stored in an unsafe condition. The most sinister part of the whole chemical product area is the fact that we expose ourselves to these products every day (Green K et al., 1987). However, some chemicals are of doubtful value and some are even a frivolous use of dangerous chemicals.

HACCP team must be aware of the dangers of some products and let them listed on special labels. Such

household chemicals must be stored under strict conditions and a considerable attention must be paid to assure in accordance to adequate written procedures that there is no any residue of such chemicals after their application could be in direct touch with food.

#### **The Hidden Hazards of Microwave Ovens-cooked Food.**

Recent researches show that microwave oven-cooked food suffers severe molecular damage. When eaten, microwave oven-cooked foods, cause abnormal changes in human blood and immune systems.

As a matter of fact, microwave cooking alters food by causing cross linkages between protein and carbohydrate molecules to form synthetic glycoproteins. Nearly third of the population are unable to break down these synthetic glycoproteins in their bodies and it can accumulate on the absorbing surface of the intestine forming an impermeable plastic-like layer. This layer can interfere with the absorption of carbohydrate and water soluble vitamins such as B and C leading to indigestion, mal-absorption, irritable bowels, malnutrition and fatigue.

A similar layer of plastic can be formed in the intestine by eating food, or drinking milk and water packed in plastic bags or a bottle which are not food grade and that is why microwave ovens are unsafe for baby's milk. This indigestible plastic-like residue irritates the intestine and predisposes to colon cancer. Fats can be absorbed through this layer so the person develops a craving for fatty foods resulting in weight gain and obesity. This layer can be removed by eating foods rich in fiber like raw vegetables, fruit, bran, beans or psyllium husk. Microwave radiation also converts amino acids into forms not found in nature and some of these are carcinogenic.

Microwaving baby's formulas converted certain trans-amino acids into their synthetic cis-isomers. It's bad enough that many babies mainly in the undeveloped countries are not nursed, but now they are given fake milk made even more toxic via microwaving. A lot of scientists worldwide share with us the accurate name of these ovens as "the radiation ovens" as they really decay and change the molecular structure of the food by the process of radiation. Microwave radiation is odorless and invisible and therefore hard to detect. It can also penetrate through living tissue which is why exposure is harmful to human health. Once the oven turned off, the microwaves disappear but until then, the food handlers may be exposing themselves to dangerous levels of radiation leakage. The FDA has established microwave radiation exposure levels greater than 5 mw/cm<sup>2</sup> to be dangerous, but many medical experts disagree and think this level should be lowered. Anyhow, independent studies have revealed levels much lower may cause: Skin cancer, headaches and dizziness, birth defects in pregnant women, central nervous system damage, cataracts, blood disorders, cardiovascular problems, increased stress, temporary sterility in men, interference with some pacemakers, decrease in immune system competency and

others more (Lubec, G et al., 1989), (MatthewP. Maley 1986).

Particularly vulnerable to excessive microwave radiation is the developing fetus. The lens of the eye and the testes are also vulnerable because of the body's inability to cool down these areas.

In fact, microwave cooking is not natural, nor healthy, and is far more dangerous to the human body than anyone could imagine (Goldwater JL 1969). But because microwave ovens are so convenient and energy efficient, as compared to conventional ovens, very few food serving establishments or restaurants are without them.

High temperature use of some microwave food packaging material may cause packaging components, such as paper, adhesives and polymers, to migrate into food at excessive levels. For that reason, the use of plastic bowls or other wrap in the microwave is not allowed unless they are labeled as microwave safe. Over 56% of microwave ovens two years or older leaked levels of radiation 10% higher than the safety standards set by the FDA.

Enhanced HACCP program's team should control these ovens and establish a written procedure for periodical measurements of the level of radiation leakage as well as the adjustments needed in order to reduce the exposure to such harmful radiation. In their written procedures, HACCP team should include all needed notes and recommendations needed in order to protect both, the food handlers and the consumers such as not to use plastic bowls or wrap in the microwave unless they are labeled as microwave safe. HACCP team should take into their consideration the following facts related to the above mentioned papers and investigations:

- Microwaving prepared meats sufficiently to insure sanitary ingestion caused formation of *d-Nitrosodienthanolamines*, a well-known carcinogen.
- Microwaving milk and cereal grains converted some of their amino acids into carcinogens.
- Thawing frozen fruits converted their *glucoside* and *galactoside* containing fractions into carcinogenic substances.
- Extremely short exposure of raw, cooked or frozen vegetables converted their plant alkaloids into carcinogens.
- Carcinogenic free radicals were formed in microwaved plants, especially root vegetables.
- Decrease in nutritional value.

Finally, the following are some [safety tips](#) for food handlers for reducing the risks associated with using microwave:

- Stay at least an arm's length away from the front of an operating oven.
- Never should anyone, and especially children, stand gazing into, or directly against an operating microwave oven. Always supervise children using microwave ovens

- Never operate an oven when it is empty. This creates a no-load condition, which can damage the oven and cause excess leakage.
- Never inactivate, interfere with, or try to adjust the built-in safety interlock system of an oven, unless you are properly equipped and qualified to do so.
- Use a microwave leakage detector such as Detecto Card at least once a month
- Clean the door, seals and inside of the oven with a mild detergent - never use an abrasive cleanser or scouring pad
- Do not let food build up inside the microwave or around the door seals
- Make sure the microwave oven has properly circulated ventilation
- If the door of an oven will not close properly, is bent, warped, tampered with, or otherwise damaged in any way, only a qualified servicer with an approved RF survey meter in hand may OPERATE such oven.
- Be sure to check secondhand ovens for leakage prior to purchasing or using
- Use only containers made for microwave use as other containers may melt, explode, cause a fire or contaminate food
- The (FDA) recommends that microwave ovens not be used in home canning. It is believed that they do not produce or maintain temperatures high enough to kill harmful bacteria.

**Cling Wrap in Contact with Food.** Similarly to the above mentioned hidden hazards, the plasticizer used in Cling wrap film is another issue of hidden hazards as it is carcinogenic too (Singletary K et al., 1997). Hence cling wrap film should never be used in direct contact with food. The use of this film to wrap sandwiches, cut fruit and vegetables in many restaurants and other food serving establishments worldwide is a very bad idea indeed. However, if it is to be used, the food should be put in a glass container and then wrapped with the film in a way that there is no possibility for direct touch between food and the wrapping film used.

**Bottled water in PET bottles.** Drinking water bottled in poly ethylene tetra-phthalate (PET) bottles is generally assumed to be safer than tap water. Antimony is used in the manufacture of the PET. Some research has shown that water kept in PET bottles acquires antimony from the bottles. This contamination with antimony increases with the length and conditions of storage. To avoid such hazard, food establishments and restaurants should serve fresh bottled water with a manufacturing date as close as possible to the current date (less than three months). Antimony can cause depression and a feeling of being ill.

On the other hand, reusing disposable PET bottles is hazardous household habit worldwide as these bottles may contain a potentially carcinogenic substance called *DEHA*

or *di-ethyl-hydroxyl-amine* (Schmid P et al., 2008). Repeated washing, rinsing and deformation of the bottle can cause the plastic to break down and the carcinogens can contaminate the drinking water. It is healthier to invest in water bottles that are really meant for multiple uses, like poly carbonate bottles or use glass bottles.

In August, 2006, FDA was planning to recall more bottled water contaminated with bromate. The recall is expected to involve a range of private label bottled waters taken from the Spring-brook Springs source in Concord, New York, including water sold by the Top-Co co-operative under its food club brand. In fact, long-term exposure to bromate may increase consumers' risk of cancer, according to the US government's Environmental Protection Agency. The chances of bromate in water are higher when ozone is used as a disinfectant for mineral water, and especially in the presence of calcium chloride, which is a bromide derivative. Bromate is formed in water when ozone and bromide ions react together.

Drinking water in some cities worldwide may contain significant quantities of aluminum as Alum mainly used in the water purification process to precipitate suspended impurities. A report of the aluminum content of the water is a must and normally available at all water supply authorities. HACCP teams, mainly those who work in the drinking water supply stations or in mineral water and other drinks-making establishments should obtain special guidelines on how to avoid bromate, aluminum and other hazards in drinking water to assure its safety before being bottled.

**Hidden Hazards in Soft Drinks, Energy Drinks and Artificial Sweeteners.** Soft and energy drinks contain so many harmful substances, which when taken in excess, they contain many hidden hazards causing health problems to the consumers. These harmful substances include phosphoric and citric acids which attack teeth and bones removing the calcium and causing osteoporosis. They also contain caffeine which makes both children and adults more excitable and hyperactive and make it harder to sleep leading to insomnia. Diet soft drinks on the other hand, use aspartame as a sweetener, have all the side effects described above.

The artificial sweeteners used in soft and energy drinks such as *saccharine*, *aspartame*, *sucralose*, and others are all substitutes for sugar with more side effects on health than natural sugars. Saccharine is associated with a significantly greater risk of liver and bladder cancer. Aspartame is the sweetener which commonly used in diet cokes and other diet drinks. Its use can cause neurological ailments, multiple sclerosis, muscle spasms insomnia and others (Russell BL, 1995), (Van Den Eeden SK et al., 1994), (Walton RG et al., 1993). Stevia is a natural sugar substitute with somewhat greater safety than the artificial sweeteners.

**Refrigerators.** On purpose to gain insight into the ways consumers freeze and defrost meat, the reasons for their

behaviour and the knowledge they have about the process of freezing and defrosting, (Damen FWM et al., 2007), found that Consumers are aware of the microbiological safety risks involved in the consumption of meat. Therefore, many consumers freeze fresh meat to be able to store it safely for a longer period of time. During the investigation work, the authors found a gap between the knowledge the customers have and their actual behavior, which might result in a shortfall in the microbiological safety of the consumed meat.

Refrigerating foods reduces bacterial growth by lowering the temperature of the foods. Frequent use refrigerators and freezers should be the horizontal chest types which open from the top, where the cold air does not flow out on opening the refrigerator or freezer. In large households or institutions several small refrigerators are a wiser idea than one large refrigerator, as it allows better maintenance of food temperatures. Unfortunately, most refrigerators are designed in a vertical format which allows the cold air to flow out of the bottom, when the refrigerators are opened and thus raise the temperature of the foods as hot air flows in to replace this cold air. In households where refrigerators are opened frequently, the temperature of the food fluctuates, leading to bacterial growth and consequent deterioration in the flavor and quality. HACCP team must check periodically the temperature in the refrigerators and freezers as one of the CCPs in accordance to written procedures designed by the team members themselves. Food should be placed in a refrigerator so there is place for the air to circulate and cool the food. Foods for long term storage should be stored in the freezer or in the lower part of the refrigerator as these are cooler. The longer the food stays in the refrigerator the greater the chance of bacterial decomposition of the food. Food kept in the modern types of refrigerators tends to get dehydrated, with a change in taste and flavor unless stored in airtight containers. If food is to be frozen it should be frozen quickly in sterile, small sized shallow containers immediately after cooking which enables the food handler to defrost only what he needs for one meal or more. Food for freezing should be frozen flat so it freezes quickly preventing bacterial growth and also defrosts quickly. To serve frozen food, slowly, food handler should defrost it in the refrigerator for a few hours to minimize cellular damage. Repeated defrosting and freezing of foods should not be done as it leads to deterioration in the quality and flavor of the food and promotes bacterial decomposition.

Foods like unprocessed honey, turmeric, raw onions, and garlic have natural antibiotic qualities to prevent infection, and should be taken with food. In many places like northern part of India, Syria, Turkey and Mexico, food is classically served with raw onions which are avoided by wide sections in many of the West countries as they are not used to eat raw vegetables. In fact, raw vegetables are often safer to eat, because they contain *lysozymes* as effective natural antibacterial substances which reduce bacterial growth in

food. In warm countries like Lebanon, Syria, Turkey, Greece, Serbia, Italy and others, Garlic is an integral part of the food for the same reason. In a similar way, Turmeric is used in most Indian cooking to prevent bacterial decomposition.

Freshly cooked food is both healthier and tastier than food which has been prepared, kept and reheated. In the West eating freshly made food is a Luxury. In so called undeveloped countries where food refrigeration and other means of preservation are not available, many more people are able to enjoy the simple pleasure of freshly cooked food which is often a hard to attain luxury, in more developed countries.

Eating food which has been cooked and kept, leads to the common symptom of diarrhoea and flatulence which often afflicts travelers to the tropics. Cooked food kept at tropical temperatures allows bacterial growth, which occurs more readily in liquid foods than in solid foods. Decomposition is slower in foods which are deep fried in oil, than in foods cooked in water. Eating food in restaurants or other food serving establishments which are pre cooked and kept often leads to indigestion. In Chinese restaurants in the west this is often the case where food is displayed in show cases for the customers to choose.

Microbiological hazards were evaluated during processing of prepared and frozen hake fish fingers by (Córdoba MG et al., 2000). Microbiological analyses of the pre-elaborated product, surfaces of equipment, and food handlers in the different steps of the process were performed. Both raw materials, hake and flour, were the main sources of microbial contamination. During the manufacturing process *Clostridium perfringens* and *Staphylococcus aureus* were detected. The frying step followed in the commercial processing, with a duration of 1-2 min at an oil temperature of 180°C, appeared to be ineffective for removing the microbiological hazards. Increases in oil temperature and time of frying to 200°C and 3 min, respectively, provoked an effective reduction of previous microbial hazards. This should be considered in the implementation of HACCP programs in the commercial processing of meat especially fish fingers.

In order to keep the quality of the meat, the freezing and defrosting process should follow certain basic principles. HACCP team working in restaurants or other food services establishments must take all the above mentioned guidelines and facts into their considerations while establishing their HACCP programs and writing the adequate procedures in order to prevent the consumer's health from more hidden hazards.

**Fat and Cooking Oils.** Animal fat like tallow and Samn Arabi or baladi (Middle Eastern source for animal fat, kind of ghee extracted from buttered milk) often contains large residues of pesticides, fertilizers and antibiotics.

As a matter of fact, fat and cooking oils should constitute 10-20% of adult daily calorie intake. For the physically

active consumers who live in cold climate their fat intake should be higher. In warm climates and with a sedentary lifestyle they need less fat in their diet. The requirements for an adult thus range between 15 - 60 grams a day of fat in his diet. Eating only a single type of oil can lead to abnormalities in the levels of different blood fats in the blood. The body needs a mix of different types of oils for it to function adequately.

Unrefined cooking oils are safer for health and should be used in preference to refined cooking oils. The unrefined cooking oils contain lecithin which makes it easier to digest absorb and utilize fats, antioxidants like vitamin E and beta carotene which prevent cancer, phytosterols which protect the immune system, heart and arteries and chlorophyll which contains magnesium necessary for heart, muscle and nerve function. However unrefined oils and food cooked in them, tend to go rancid faster when stored. Consuming rancid oil leads to increased free radical production which causes heart disease and cancer.

Refined oils are unbalanced oils purified by removing lecithin, antioxidants like vitamin E and beta carotene, phytosterols and chlorophyll. The refining process uses corrosive bases, bleaching acids and clays which may leave residues in the oil. Hydrogenated oils like margarine and dalda (Indian substitute for ghee) should be used sparingly as they contribute to raising blood cholesterol when used in large quantities. Still, most vegetable oils decompose in five to eight months at room temperature.

Although, oils made from nuts decompose faster than other oils. However, they can be used several times for deep frying. Poly unsaturated oils on the other hand, such as sunflower, safflower and corn should not be reused for frying. Saturated oils like ghee, coconut oil, animal tallow and palm oil, may be reused several times for frying. Frying food specially Eggplant, Potatoes and the popular Falafel (Syrian national food) reusing the oil leads to formation of acryl-amides, the well known cancer causing substance, in the oil and also in the fried food. High oleic sunflower oil, cottonseeds oil, peanut oil, sesame oil, canola oil and olive oil decompose less during cooking. Artificial hydrogenation involves mixing polyunsaturated oils with hydrogen atoms under very high pressure. High heat can also cause PUFAs to trans-isomerize into trans fats, if it is applied for long enough. Still, it is obvious that normal cooking temperatures and times are not nearly enough to create any significant amount of trans fats in the foods prepared and cooked at home (Wolff, R. L., 1993).

Either HACCP or ISO-22000 team working in restaurants and fast food serving establishments should take the above mentioned facts into their consideration in order to protect consumer's health from such possible hidden hazards. The process of frying food thus, is to be considered as a CCP in HACCP or other enhanced food safety programs/systems.

**Cooking Food in Aluminum and Teflon Coated Vessels and other Cookware.** Pots, pans and other cookware are

made from a variety of materials. These materials can enter the food that we cook in them. Most of the time, this is harmless. However, care should be taken with some materials. Most of the cookware in the developed countries is safe to use for daily meal preparation, as long as it is maintained well and used as intended. However, beside their benefits, there are some potential risks in some cookware materials such as aluminum, anodized aluminum cookware, stainless steel and iron cookware, ceramic, enamel and glass, plastics and nonstick coatings and silicone cookware.

During cooking in cookware made of aluminum, aluminum will dissolve most easily from worm or pitted pots and pans. The longer food is cooked or stored in aluminum, the greater the amount that gets into cooked food. Leafy vegetables and acidic foods, such as tomatoes, citrus products and some kinds of teas, absorb the most aluminum. Some unpleasant effects of consuming food cooked in aluminum are hyperacidity, indigestion, flatulence, skin problems like pigmentation, eczema, dandruff and chronic inflammation of the intestine, which may be diagnosed or mis-diagnosed as *Ulcerative colitis*, *Crohn's disease* or as *chronic amoebic dysentery*. On the other hand, there has been speculation linking aluminum to *Alzheimer's disease*. Although the link has never been proved, concerned consumers, should avoid cooking acidic foods, such as tomato sauce, in aluminum pans. For other uses, well-maintained aluminum pans as well as stainless steel, copper and iron pots and pans, present no apparent hazards.

During storage and preparation of food, aluminium foil is often used for wrapping heat-sensitive raw food for protection against direct heat, e.g. grilled or baked fish fillets. Considering the present state of knowledge and the suggested provisional tolerable daily intake of 1 mg Al/kg bodyweight per day of the (WHO, 1989), no risk to health of the consumer would be expected from eating meals prepared in aluminium foil (Ranau R et al., 2001).

Other sources of aluminum poisoning may be drinks (like colas & beer) in aluminum cans (Vela MM et al., 1998), draft beer packaged in aluminum kegs, foods packed in aluminum cans (sardines, soups, baked beans etc.), mayonnaise, mustard & sauces in aluminum tubes, poor quality tetra packs, vegetables & chips and other snacks packed in Aluminum foil bags, processed cheese slices, deodorants, water filters, free flowing salt where aluminum salts are added as an anti-caking agent, some baking powder brands and food cooked in aluminum foil. Aluminum dissolves faster into acidic foods than into basic foods. It is always unwise to cook acidic foods like tomatoes, tea & coffee in aluminum vessels. Some people with aluminum allergy may react to medicines packed in aluminum foil especially to acidic medication like aspirin. Many antacids contain aluminum hydroxide and should be substituted by calcium carbonate antacids.

These poisonous properties of aluminum have been well known for over a hundred years. Anodized aluminum

cookware conducts heat as well as ordinary aluminum, but has a hard, non-stick surface which makes it scratch-resistant, durable, and easy to clean. Anodization also reduces leaching of aluminum from cookware into foods, particularly acidic foods like tomatoes and rhubarb.

In developed countries aluminum cookware usually has a non-stick or Teflon coating on it to prevent the aluminum from dissolving in the food. Unfortunately in many developing countries this protection is available at a price which makes it unaffordable to large sections of the population. Anyhow, Recent evidence shows that the use of Teflon coated non-stick utensils suppresses immunity and increases the risk of cancers of the blood like leukemia especially in children (Rose Marie Williams MA 2006), (Knight-Rider News Service, 2005).

Most non-stick cookware is made from aluminum or its alloys covered with a Teflon coating or anodized aluminum in order to prevent aluminum from dissolving in the cooked food. Over time, this coating gets scratched and the aluminum is able to come into contact with the food and dissolve into it. The non-stick cookware should be washed with soft soap and a soft sponge too.

According to ATSDR in 1997, exposure to aluminum is usually not harmful. Aluminum is excreted by the kidneys, and only a small amount of aluminum is absorbed (JECFA, 1989). However, soluble aluminum salts are more easily absorbed. Patients with impaired renal function treated by dialysis could show a higher aluminum blood level. In the past, some of these dialyzed patients have shown neurological symptoms of aluminum intoxication due to an inappropriate treatment which is no longer used; these symptoms have sometimes been mistaken for those of *Alzheimer's disease*. It is important to mention that WHO (IPCS 1997) has concluded that aluminum is not the origin of *Alzheimer's disease*. So far no association could be proven between elevated aluminium uptake from foods including drinking water, medicinal products or cosmetics and *Alzheimer's disease* (Gómez M, et al., 2008).

Concerning the increased solubility of aluminium in the presence of acids and salts, BfR recommends that no aluminium-containing pans or bowls should be used for foods like apple puree, rhubarb, tomato puree or salted herring. No aluminium foil should be used in contact with these foods either. This is one way of actively avoiding unnecessary aluminium uptake.

In general and in order to get the benefits and minimize risks of different cookware materials used in a restaurant or food service establishment, HACCP team together with food handlers, while dealing with such cookware, should take into their consideration the following guidelines and have them included in their procedures:

- Avoid cooking or storing food for long periods of time in aluminum cookware.
- Abrasive scourers should never be used to clean Teflon or anodized aluminum coated vessels.



- Avoid using badly scratched or un-coated copper cookware to cook or store food. If you do have some older tin or nickel-coated cookware, use it for decorative purposes only. Do not scour coated copper cookware.
- Using nickel-plated cookware could harm people who are allergic to nickel. In addition, foods known to contain higher levels of nickel include oats and oat products, peas, beans, lentils and cocoa products, such as chocolate, particularly dark chocolate.
- Avoid storing foods that are highly acidic, such as stewed rhubarb or stewed tomatoes, in stainless steel containers.
- Be aware that the glazed ceramic cookware used in your establishment meets the legislation of your country concerning the permitted levels for lead and cadmium.
- Avoid using plastic bowls or wrap in the microwave unless they are labeled as microwave safe.
- In case of reusing plastic items for storage, food must be cooled before storing and then refrigerated immediately. Avoid visibly damaged, stained or unpleasant smelling plastics and containers. Never heat or store food in plastic containers that were not intended for food.
- Avoid using silicone cookware for stove-top cooking in oven temperatures above 220°C as it will melt if exposed to high temperatures.

**Hazards in Stale and left over food.** Stale, left over and any food eaten many hours after cooking can cause indigestion and flatulence as bacteria, viruses and fungi like yeast are able to grow and multiply in such food. Cooked food should be eaten fresh as it ferments with growth of bacteria when kept for any length of time. Cooked food provides an ideal environment for the growth of bacteria and so, should be eaten, as soon as possible after preparation. Cooking food, makes it easier to digest, and kills viruses and bacteria in the food. It also destroys the natural protective enzymes called *lysozymes* which are present in raw food and help prevent bacterial growth. Bacterial growth and subsequent decomposition of food occurs at all temperatures from (4 – 60)°C with maximum growth between (30 – 37)°C. Cooked food kept at temperatures from (30 - 40)°C, allow rapid bacterial growth and decomposition of food. These temperatures are common in kitchens and dining rooms, almost in both hot and cold countries worldwide. This temperature range is also suitable for viruses to thrive.

Food-borne diseases are an important issue for diarrhoeal deaths among Indian children less than five years. Since many food-borne illnesses arise from street-food and home kitchens, parents, but mainly, mothers can be the final line of defense. It was attempted to assess perceptions and practices of mothers (Sudershan, R.V et al., 2008), (Adelson SF et al., 1961). A survey on food safety knowledge and practices of street-food vendors from a representative urban university campus in Quezon City, Philippines was done by (Azanza MPV et al., 2000). The

study found that among the 54 street-food vendors surveyed, knowledge on food safety concepts was established particularly on topics that dealt with health and personal hygiene, food contamination and good manufacturing procedures. A significant gap between knowledge and practice on these topics was established and it was primarily attributed to the tendencies of street food vendors to compromise food safety for financial issues. The provision of continuous food safety education, some financial assistance through social services affiliations, and basic water and waste management utilities were recommended to diminish the gap between knowledge and practices of safe street-food vending in school campuses. Television is the preferred medium to seek information on food safety.

To minimize hazards of stale and leftover food, leftover dinner rolls can be used in a variety of ways to help you save both money and time when making future meals. Leftover dinner rolls can be kept in plastic bags for 1-2 days, or frozen for longer storage. If the rolls were frozen in plastic bags, it is possible to thaw them by leaving the bags at room temperature until defrosted. This method will minimize moisture loss too. Frozen leftover dinner rolls can also be reheated safely (The Many Facets of Freezing Food (2), 1979). Although it is possible to thaw frozen rolls in the microwave, reheating in the oven gives better.

If the leftover dinner rolls have become stale, they should be processed in a food processor in order to create bread crumbs. Homemade bread crumbs should be used within a few days, or they must be frozen for longer storage. Leftover dinner rolls can be turned into croutons, and used for French toast, or bread pudding.

**Hidden Hazards of Vitamin, Mineral Tablets and other Food Supplements.** It is very common in the food and drug industry that many "natural" food supplements contain an awesome list of synthetic fillers (Kovar MG, 1985). In general, the more filler, the cheaper the supplement which most probably contains some type of harmful filler (Jennifer A. O’Dea, 2003). With some exceptions, pure substances such as vitamin, mineral chelates, herbs or amino acids do not possess the necessary characteristics which allow them to be compressed directly without the addition of binders, lubricants, diluents, disintegrators, coloring and flavoring agents. The larger the tablet, the more it requires the use of binders, substances that give cohesive qualities to powdered materials; in other words, they hold the ingredients together for tablet formulation (Thermal characterization of drug/polymer and excipient/polymer interactions in some film coating formulation, 1989). A common binder is cellulose but smaller tablets may be manufactured using the cellulose derivatives (*ethyl, methyl*) as binders.

Time release tablets are perhaps the most worrisome. For example, the release of 1000 mg. of Vitamin C over a period of 6 hours may require the addition of 400 mg. of hydrogenated oil (plastic butter) to the tablet. The addition

of more oil prolongs the release, while the use of less allows quicker disintegration. Little has been published about adverse events resulting from the improper use of certain dosage formulations. (Lesar TS 2002), characterized prescribing errors involving or related to medication dosage forms in hospital patients. The most common error (in 70% of cases) was failure to specify the extended-release formulation when it was intended. Another common error (in 12% of cases) was the prescribing of extended-release formulations for administration through a feeding tube, which can also result in adverse consequences. The risk of errors related to dosage formulation is not limited to prescribing; errors may also occur at other stages, including the review of the medication order and drug preparation, dispensing and administration (Burge FI, 1986). It is quite important to mention that there are certain drug formulations which should not be crushed (Mitchell JF 2000). Doing so may alter the intended effect of the drug and, in some cases, may cause an adverse event.

Although it is true that most healthy people will have no obvious side effects from ingesting the small amount of toxins found in cheap vitamins, the long term consequences of continuous, daily intakes are potentially dangerous (DiPalma, JR et al., 1977). Over 7% of the population displays sensitivity to these chemicals which, for the most part, do not elicit immediate allergic reactions in the average healthy person (Greenberger PA et al., 2001). Allergic reactions can affect any organ system in the body including the brain which often displays symptoms such as fatigue, memory loss, depression, anxiety, hallucinations and insomnia.

#### **Propylene Glycol Used in Personal Care Preparations.**

It is the well-known anti-freeze used in products such as windshield washer fluid in vehicles. It is also the major ingredient in brake and hydraulic fluid. It can be a strong skin irritant with frequent use in cosmetics, shampoos and medicinal lotions. Propylene glycol has been documented to cause liver abnormalities and kidney damage.

#### **Do Consumers have a Right to know what they are consuming!**

A new campaign to ensure that shoppers know exactly what they are buying and eating is launched recently by the Food Commission with a 10-point charter calling for better labeling and improved regulations and standards.

**Label Requirements.** In the US, EU and many other developed including some undeveloped countries worldwide, by law, all packaged foods must bear a label listing ingredients in order of predominance. Among other things, the manufacturers must tell how to store the item, and give the sell-by date clearly. Still, in some countries, a manufacturer doesn't have to show nutritional information

on the label but the only exception is if they make a specific nutritional claim.

ISO-22000 and HACCP team together with food handlers in food industry has to ensure that every package of manufactured food in their establishment must offer such listing.

#### **Conclusion**

The recent and growing concern worldwide about food safety on the part of public health authorities, the food industry and consumers has been the major impetus in the application of the HACCP system. In the last decade, hazard have become a part of everyday life as have never been before. Some hazard remain hidden from society because the nature of hazard themselves. Is it possible that millions of people in many countries are ignorantly sacrificing their health in exchange for the using or eating stuff that effecting their health in dangerous way.

This article discusses recently, the most recognized issues related to the group of hidden hazards that are influencing the evolution of food safety regulation in developed and, to a lesser extent, developing countries. This group of hidden hazards includes numerous issues of different categories and subcategories which also can affects on food safety.

The most important discussed categories of this group, were artificial flavorings and colorings, hormone, antibiotics residues and preservatives used in meats, vitamin, mineral tablets and other food supplements (E-numbers). The hidden hazards of other categories such as heavy metal residues in food and irradiated and/or canned food, hazards in soft drinks, energy drinks and artificial sweeteners and many other issues such as the using of cooking oil, sugar, Teflon ware, and microwaves oven effecting health in many different ways were also discussed and analyzed.

In order to eliminate or avoid the above health harmful hazards of the hidden hazards group, we came to the conclusion that we need to implement enhanced HACCP and ISO-22000 based quality systems which can be used to detect and prevent such hazards. Besides, we strongly recommend that labeling including all the information needed for the consumer in accordance to the most recent legislations is a must.

Enhanced HACCP and ISO-22000 based quality systems are having a positive effect throughout the horticultural industry, however, confusion relating to choice and the requirement for multiple systems is not conducive to rallying support for such inside the farm gate. The first few steps for the horticulturalist are difficult enough without having to face such a predicament. HACCP offers a more comprehensive and science-based alternative for controlling food safety hazards compared with traditional sanitation programs based upon good manufacturing practices (GMP).

Finally, controlling measures for all discussed hazards including the insidious is the key to have much safer food production controlled by enhanced HACCP and ISO-22000 systems.

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