THE COLLOQUIUM -A Multi disciplinary Thematic Policy Journal
www.ccsonlinejournals.com
Volume 8 , Number 1 , 2020 Pages 57-68
 Print ISSN : 2971-6624 eISSN: 2971-6632

FOOD PACKAGING MATERIALS : HEALTH AND ENVIRONMENT

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Abstract
Food packaging is just one among the ways of food preservation which helps in the extension of the shelf-life of the food product and easy for shipment and marketing. The goal of food packaging is to contain food in a cost-effective way that satisfies industry requirements and consumer desires, maintain food safety, and minimizes environmental impact. Different food Packaging materials such as metals, steel, aluminum, plastic, glass, polyethylene, polypropylene, paper, paperboard, laminates, metalized films, plant leaves etc play major roles in terms of protection and preservation which include chemical, physical and biological protection, containment and food waste reduction, convenience, marketing and information, traceability, tamper indication. The chemicals used in the production of these food packaging materials includes but not limited to intentionally added ingredients (ortho-phthalates. perchlorate, per-and poly-fluorinated alkyl substances, benzophenone, ethyl and methyl-glycol, toluene, n-methyl-pyrrolidone, bisphenol A,F,S) and non intentionally added materials which is not limited to contaminants like- heavy metals(lead, arsenic, cadmium, mercury etc) leached into food and is being consumed into the body unknown to us thereby causing a lot of negative effect on human health via endocrine disruption, cardiovascular disease, chronic respiratory disease, cancers, tooth development defects, hormonal imbalance which results in reproductive disorder in men and women, decrease semen quality in men, endometriosis in women etc. These food packaging materials affect our environment which also result to littering the environment, causing health effect and pollution. In order to reduce these effects, the use of these chemicals should be reduced or totally removed.
Keywords: *Chemicals, Environment, Food, Health, Packaging Materials.*

Introduction

Advances in food packaging play a major role in keeping food supply safe in the world. Packaging maintains the benefits of food processing after the process is complete, enabling food travel safely for long distances from their point of origin and still be wholesome at the time of consumption. Food packaging is just one among the ways of food preservation which helps in the extension of the shelf-life of the food product and easy for shipment and marketing. Food packaging purposely protect the food products from environmental hazards throughout the period of the shelf-life. According to Robertson (2006), food packaging material is the container in which the food products are bundled or put inside to ensure safer transfer to the consumer. He also opined that food packaging containers can be in direct contact to the food products. Food packaging materials holds, protects, preserves and identifies the food product in addition to facilitate handling and to exploits something for maximum financial gain. However, packaging technology must balance food protection with other issues, including energy and material costs, heightened social and environmental consciousness and strict regulation on pollutants and disposal of municipal solid waste (MSW). Packaging

Cite this article as
Nwosu,J. C. U., & Ebujor, G. C. (2020). Food packaging materials: Health and Environment
THE COLLOQUIUM, 8(1), 57-68

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has become an integral part of food products. The basic functions of food packaging are to protect and preserve the food products, make it easier to carry, display the product or graphical representation of the product and communicate a message to consumers (Meyer, 1998). Soroka (1996), described packaging as a coordinated system of preparing food for transport distribution, storage, sale and use. He further stated that packaging is the science, art and technology of enclosing or protecting, protects for distribution.

Food packaging materials can be classified in three (3) namely:

i.Primary packaging which is the direct contact with the product or content,

ii.Secondary packaging which contains one or more primary packages and serves to protect and identify the primary and

iii.Tertiary packaging which is known as transport packaging which offers protection for the primary and secondary packaging while being transported. Each packaging layers contributes to the overall process to product delivery from manufacturer to consumers. According to Okaka (2001), Fabrication of each package must be based on an accurate knowledge of the specific sensitivities of the product, the climate and mechanical stress expected on the package during handling and the turnover time between production and consumption of the product. Packaging materials should posses some characteristics like- below cost, non-toxic, provide good barrier against light, gases and water vapour, provide sanitary protection to the food, be of light weight, easily filled, poured and disposed of, have reasonable impact resistant and mechanical strength, exhibit adequate transparency where practicable etc.

Historical Development Of Food Packaging Materials

The earliest human who found a large leaf to carry water away from a stream created the first rudimentary packages and ideas on industry that still endures today. For centuries, people have used various materials to assist in the protection, storage and transportation of wider range of items. Clay, glass and wood for packaging purpose for instance have been used for packaging for 5000 years, while paper cardboard and paper board became the go materials in 1900's (Hedwin, 2007). The early man developed his own packaging technology by using leaves for wrapping purposes in Nigeria such as Cocoyam, banana, plantain and *Una* leaves. Again, the skin of a goat served as the first flexible packaging material in the environment for the transportation of water and wine. Hedwin (2007) further asserted that the packaging used this time would have been formed from easily accessible and naturally occurring objects such as leaves from various plants and trees were likely the first packaging containers. Animal's skin, hollowed out wood was used to store large amount of food for longer periods of time.

In the ancient Egypt and Roman empires, materials such as clay were used as containers, glass, metal and paper were later introduced upon their invention and therefore used in packaging. Butter and cheese were kept in baskets, vinegar in barrels, and tea in chest whilst grains were put in sacks during the Victorian time (Hook & Hermlich, 2007). The first ever branded packages were introduced in England in 1746 by Dr. Robert James who packaged "fever-powder" in a box for retracting (Ariev, 2007). Other people followed suit by introducing other form of packaging by using 12 different materials such as metals and glass. The

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famous French warrior Napolean Banaparte realizing the need to preserve and transport food to his army, during a French war, offered a prize to reward anyone who could find answer to his demand in 1809. Nicholas Appert, a confectioner invented the process of canning by introducing an air tight glass jar to win the prize and also introduce canning which was further developed to the light weight cans of today (Hook and Hermlich,2007).

Traditionally (in Nigeria), food products are packaged with leaves, animal skins, newspaper, cement paper bags, jute bags, basket, bamboo, cane basket, and pottery, discarded bottles and jars, old stock of paper prints, broad leaves, empty fluted gourds, fruit shell, coconut shells, maize-sheath, glass-sided boxes, jute sacks, poly sacks, polyethylene bags etc. (Adejumo & Ola, 2008; Oladepo et al., 2015; Sarpong, 2015). Unfortunately, the traditional materials offer little or no protection to perishable agricultural products, neither are they considered suitable for efficient handling and transportation (Aworh & Olorunda, 1981; Salami, 2002). Adejumo and Ola (2008) opined that the role of packaging has not been accomplished; but that doesn't not make traditional food packaging totally useless, they only offer to a limited degree, physical protection, containment, marketing and portion control of the foods. Although, there is a significant challenge in the trade and marketing of the products under reference, traditional packaging system cannot be forgotten because they are integral aspect of our culture (Kabuo et al., 2015); progress in the food industry can only be achieved with improved technology in packaging. As Sarpong (2015) puts it, a food package should be resistant to both internal and external hazards, as well as possessing the ability to effectively guarantee resistance to gas, oxygen, water and odours.

Roles of Food Packaging

The principal roles of food packaging are to protect food products from outside influences and damage, to contain the food, and to provide consumers with ingredients and nutritional information (Coles , 2003). Traceability, convenience and tamper indication are secondary functions of increasing importance. The goal of food packaging is to contain food in a cost-effective way that satisfies industry requirements and consumer desires, maintain food safety, and minimizes environmental impact.

i. Protection and Preservation*:* Food packaging can retard product deterioration, retain the beneficial effects of processing, extend shelf-life and maintain or increase the quality and safety of food. In doing so, packaging provides protection from 3 major classes of external influences; Chemical, Biological and Physical.

- Chemical Protection minimizes compositional changes triggered by environmental influences such as exposure to gases (typically oxygen), moisture (gain or loss) or light (visible, infrared or ultra violet).
- Biological Protection provides a barrier to micro Organism (pathogen and spoiling agents), insects, rodents and other animals, thereby preventing disease and spoilage. In addition, biological barriers maintain conditions to control senescence (ripening and aging).
- Physical protection shields food from mechanical damages and includes cushioning against the shock and vibration encountered during distribution. Typically developed from paper board and corrugated materials, physical barriers resist impacts, abrasions and crushing damage, so they are

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widely used as shipping containers and as packaging for delicate food such as eggs and fresh fruits physical packaging also protects consumers from various hazards.

ii.**Containment and Food Waste Reduction*:***

Any assessment of food packaging impact on the environment must consider the positive/ benefits of reduced food waste throughout the supply chain (FAO, 1989). Inadequate preservation/protection, storage and transportation have been cited as causes of food waste (Marsh & Bugusu, 2007). Packaging reduces total waste by extending the shelf-life of foods, thereby prolonging their usability and contributes to the reduction of total solid waste.

iii.Marketing and Information*:* A package is the face of a product and often is the only product exposure consumer's experiences prior to purchase. Consequently, distinctive or innovative packaging can boost/increase sales in a competitive environment. Some packages are designed to improve the product image and /or differentiate the product from the competition. Packaging also provides information to the consumer and also satisfies legal requirements for products identification, nutritional value, ingredient declaration, net weight, manufacturer's information, cooking instructions, brand identification and pricing.

iv.Convenience: Convenience features such as ease of access, handling and disposal; product visibility; researchability and microwavability greatly influence package innovation. Advances in food packaging have facilitated the development of modern retail formats that offer consumers the convenience of 1-stop shopping and the availability of food from around the world. These convenience features add value and competitive advantages to products but may also influence the amount and type of packaging waste requiring disposal.

v.*Traceability*: The Codex Alimentaries Commissions defines traceability as "the ability to follow the movement of a food through specified stages of production, processing and distribution" (Codex Alimentarius Commission, 2004). Traceability has three (3) objectives: to improve supply management, to facilitate trace-back for food safety and quality purposes and to differentiate and market foods with subtle or undetectable quality attributes (Golan et al., 2004). A special code is being cooperated onto the package labels of their products to allow them to track their products throughout the distribution process.

vi.*Tamper Indication*: Willful tampering with food products has restricted in special packaging features designed to reduce or eliminate the risk of tampering and adulteration. Although any package can be breached, tampered-evident features cannot easily be replaced. Tamper-evident packaging usually requires additional packaging materials, which exacerbates disposal issues but the benefits generally outweigh any draw back.

vii.Other Functions*:* Packaging may serve other functions, such as a carrier for premiums (for example, inclusion of a girl, additional product or coupon) or containers for household use.

Different Types of Food Packaging Materials

Food packaging uses different types of materials. However, often times several materials are combined to create food packaging This method normally exploits each of the material functions (Marsh, 2007). Now

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these two materials combined helps to determine attributes like shelf-life, product protection and the packages insulation properties. Food packaging materials must have some basic characters which are capable of maintaining not only food quality but also food safety. Food packaging materials also posses the capacity to prevent unfavourable intrinsic and extrinsic factors that affect food spoilage such as spoilage micro-organisms, moisture, oxygen, light, humidity, temperature, external forces and serve other purposes. (Shaw, 2013). Food packaging materials may come in different types with various functions relative to their properties. It is essential for food packaging materials to have a balance between its type and its function. The type of food to pack/preserve determines the type of packaging material to be used. The pH and nutrient content of the food determines the type of packaging material to be use also.

Given the packaging's main purpose of preservation, containment, protection of food, etc. The packaging materials can be rigid, flexible or semi flexible (Siracusa &Rosa 2018). Materials that have been used are glass, metal, aluminium foil, free steel, tin plate, laminates, plastics, polyolefins, paper, paper board, etc.

i.Glass: glass has an extremely long history in food packaging, the first glass objects for holding foods are believed to have appeared around 3000BC (Sacharow & Griffin, 1980). Glass containers used in food packaging are often surface-coated to provide lubrication in the production line and eliminate scratching or surface abrasion. Glass coating also increases and preserves the strength of the bottle to reduce breakage (Mckown, 2000). Because it is odourless and chemically inert with virtually all food products, glass has several advantages for food. Glass is impermeable to gases and vapour which helps in maintaining product freshness for a long period of time without impairing taste or flavour. The ability to withstand high processing temperature makes glass useful for heat sterilization of both low acid and high acid foods. The transparency of glass allows consumers to see the product, yet variations in glass colour can protect light sensitive contents (Marsh, 2007).
ii.Metal*:* Metal is the most versatile of all packaging forms. Which offers a combination of excellent physical protection and barrier properties, formability and decorative potential, recyclability and consumer acceptance. The two (2) metal most pre-dominantly used in packaging are aluminum and steel (Fellows, 2002).

iii. Aluminium*:* Aluminum is commonly used to make cans, foil and laminated paper or plastic. Aluminum is a light weight, silvery white metal derived from barite ore, where it exists in combination with oxygen as alumina. Magnesium and Manganese are often added to aluminium to improve its strength properties (Page et al., 2003). Unlike many metals, aluminium is highly resistant to most forms of corrosion. Its natural coating with aluminium oxide provides a highly affective barrier to the impacts of air, temperature, moisture and chemical attack. Apart from providing an excellent barrier to moisture, air, odour, light and micro organism, aluminium has good flexibility and surface resilience, excellent malleability and formability, and outstanding embossing potential. It is also an ideal material for recycling because it is easy to reclaim and process into new products.

iv.Aluminium Foil: This is made by rolling pure aluminium metal into very thin sheets, followed by annealing to achieve dead-folding properties (a crease or fold made in the film will stay in place), which allows it to be folded tightly. Foils provide an excellent barrier to moisture, air, odor, light and micro organisms. It is inert to acidic foods and does not require lacquer or other protections.

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v.Laminates and metalized films: Lamination of packaging involves the binding of aluminium foil to paper or plastic film to improve barrier properties. Lamination to plastic enables heat seal ability, the seal does not completely bar moisture and air. It is relatively expensive and typically used to package high value foods such as dried soups, herbs and spices. But a less expensive alternative to laminated packaging is metalized films which are plastic containing a thin layer of aluminum metal (Fellows and Axtell, 2002). Metalized films have improved barrier properties to moisture, oils, air and odors. They are very attractive to consumers and are used in packaging snacks.

vi.Steel*:* Steel is used for cans, containers, caps and closures. Organic coatings are also required to resist corrosion. Steel cans are fabricated from tin plate which is tin-coated steel, or from electrolytic chromium coated steel (ECCS) (Geueke, 2018), also known as tin free steel. Steel being a permanent material, can be recycled open-endedly while retaining its quality.

- Tin plate is a remarkable barrier to gasses, water vapour, light and odours. It is convenient for sterile products for it can undergo heat treatment and hermetic sealing. (Marsh and Bugusu, 2007).
- Tin free steel also has good strength and formability and it's slightly cheaper then tin plate. It has good resistance to heat and black sulphides stain, which makes it convenient for making fish can.

vii.Plastic*:* These are the most common and most wide ranging materials used for food packaging. According to Mohanty and Swain (2017), the volume of plastic allocated to food packaging amounts to around 40% of plastics. The convenience and wide spread use of plastics in food packaging is owed to its low cost, ease of processability, formability, chemical resistance, light weight and a variety of physical properties (Marsha & Bugusu 2007). Plastic suffer from permeability to gas vapour and light.

Plastic can be classified into thermoset and thermoplastics.

- **Thermosets** are polymers that irrevocably solidify upon heat and are non-reformable, which makes them unsuitable for food packaging.
- **Thermoplastics**, on the other hand, soften when heated and are able to retain their initial condition at room temperature.

viii.Polyethylene and Polyproplene*:* are materials from the polyolefin category. These two materials are extensively used due to their light weight, malleability, strength, stability, processability, reusability and resistance to chemical and moisture. Polypropylene is use when heat resistance is needed. The most common used polyester in food packaging is polyethylene terephthalate, a resistor of heat oils, solvents and acids. It has good ductility, strength and hardness.

ix. Paper and Paper Board*:* Paper is one of the oldest packaging materials, dating back to the 17th century (Kirwan & Coles, 2003). Paper is used for temporary food containment and protection due to its high permeability and inability to be sealed with heat. Depending on its method of production and packaging purpose, paper can be found as kraft paper, sulphite paper, grease proof paper, and Glassine or parchment paper.

x.Paper Board: is a relatively thicker and heavier material than paper. It is widely used as secondary packaging that is not indirect contact with the food.

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- White board is the only paper board advised for primary packaging
- Solid board is a strong and durable paper board, used to package milk, fruit juices and soft drinks]
- Chip board is the cheapest form of paper board, made of recycled paper and it is used as outer layers of food cartons, such as cereals and tea.
- Fibre board is used to ship bulk food due to its strength and resistance to impact scratching and crushing damage (Soroka,1999).

xi. Plant Leaves : The packaging of food in leaves is a widespread age long practice in tropical regions of the world (Ng, 2015). Both fresh and dried leaves are used, although the fresh, mature and untorn ones are preferred. Leaves commonly used for wrapping food include those of Thaumatococcus daniellii("ewe eran" in Yoruba language), Musa paradisiaca, Tectona grandis (teak), Manihotesculenta (cassava), Thespesia populnea (Portia tree), Marantodea spp., and Musa sinensisand the sheaths of maize (Zea mays), cocoyam leaves (Xanthosoma sagittifolium and Colocasia esculenta) and okpopia leaves (Alchornea laxifora), etc. Adegunloye et al. (2006) reported that wrapping food in plant leaves may lead to a decrease in the pH content of the food thereby making it susceptible for micro organism to attack the food materials whereas crude fibre, ash content and crude protein increased slightly.

Effect of Food Packaging on Health

Food packaging chemicals may be harmful to human health. According to Marie (2014), many of the synthetic chemicals involve in packaging and storing the food we eat can leak/leach into it, potentially harming our long term health. Some of these chemicals are regulated and people come into contact with them almost everyday through package or processed foods. Scientist working on developmental biology, endocrinology, epidemiology, toxicology and environmental and public health are concerned that public health is currently insufficiently protected from harmful exposures to food contact chemical (FCCs). Food contact chemical (FCCs) are the chemical constituents of food contact materials found in food packaging materials and food storage containers. (Muncke et al., 2017 and Grobet, 2006). According to Koch et al., (2007), FCCs can migrate from food contact material into food indicating a high probability that a large majority of the human population is exposed to some or many of these chemicals in which some of them may have multiple uses and also non-food contact exposure pathways. Food contact materials regulations firstly assume that low levels chemical exposures, i.e. exposures below the toxicologically established no effects level, pose negligible risks to consumers, excepts for carcinogenic (Crump, 2011).

Lately, recent scientific information demonstrates that this assumption is not generally valid, with the available evidence showing that exposure to low levels of endocrine disrupting chemical can contribute to adverse health effects. (Vanderberg et al., 2012). Chemical mixtures can also play a role in the development of adverse health effects. Foods wrapped or packaged with plant leaves either by wrapping before cooking or cooked before wrapping pose a treat to health because micro organisms and fungi grows in the food after few days of storage. Some of the leaves habours a significant number of microbes in them. Most of the leaves are not being wash before use. These microbes causes food poising and infections to health which can leads to death.

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Intentionally added ingredients in production of Food packaging materials and their Health effect

- **Ortho-Pathalates***:* (Primarily used in plastic but many other uses including printing inks). Neltner (2019) shows that these chemicals are linked to endocrine disruption, developmental and reproductive toxicity. Their contamination of food is widespread.
- **Perchlorate:** (Anti-Static agent used in plastic for dry food and in food handling equipment). This chemical disrupts the thyroid glands normal function and reduces production of the thyroid hormone needed for healthy foetal and child brain development.
- **Per And Poly- Fluorinated Aklkyl Substances***:* (Grease – proofing agent used in paper packaging. PFAS, often distinguished as long-chain or short – chain, are bioaccumulating, persistent chemicals associated with an array of health problems including endocrine disruption and children's developmental harm elevated cholesterol levels, reproductive – low infants birth weights, immune-lowering of immune function, liver and kidney damage, thyroid function disruption, cancer in some case. There is widespread human exposure to PFAS, water and food are the likely sources.
- **Benzophenone:** (used as a plasticizer in rubber articles intended for repeat use) Citing the carcinogenic evidence regarding Benzophenone.

- **Ethyl And Methyl Glycol, Toluene And N-Methyl-Pymolidone (NMP).** These solvents often used in leaves residues in packaging pose a risk in reproductive or development harm.
  - **Bisphenol A, F, S,** : Bisphenol A chemical was originally discovered in 1891, it was not until the 1950s that researcher realized that bishphenol A (HPA) could be polymized to create polycarbonate plastic that exhibited exceptional transparency colorability and flexibility, while being light weight and maintaining a unique resistance to heat, impact and chemical (Eladak et al., 2015). BPA become one of the most widely produced plastic components. When incorporated into food products, BPA has been found to leach from those containers resulting in human consumption. The accumulated of BPA following chronic low-dose ingestion has been associated with a wider variety of toxic health effects.

Most predominantly endocrine disruption by reducing testosterone secretions. Others effects of BPA exposure includes developmental and/or reproductive toxicity, obesity, diabetes, cardiovascular diseases, chronic respiratory diseases, kidney diseases, breast cancer, behavioural issues, tooth development defects, reproductive disorders in both men and women etc. A 2015 in vitro study confirms that Bisphenol S and F chemicals demonstrate similar endocrine toxicity to BPA (Eladak et al., 2015).

- **Phthalates:** The three major types of phthalates include diisonoylphathalates (DINP), di (2-ethylhexyl), adipate (DEHP) and disobutylphthalate (DISP), all of which are typically added to plastic resins in an effort to increase the flexibility of final products (Serrano et al., 2014). The bonds between phthalate chemicals and other parent materials are non-convalent in nature, thereby making it easy for these potentially harmful chemicals to leach from plastic products and be ingested thereby causing adverse health effects of an endocrine disruptor, decreased semen quality in men, increased risk of endometriosis in women, increase in the waist circumference and body mass index (BMI) in men and women, effects on pregnant women and their fetuses which include changes in labour time, altered infant hormone levels and altered infant and child neurobehaviour outcome (Serrano et al, 2014).

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There are still many substances that are present in plastic and other materials as non-intentionally added substances (NIAS). Even though the EU regulations 10/2011 explicitly and EU 1935/2004 generally require a risk assessment of NIAS, there are many difficulties, first, identification of NIAS is very demanding. (Pieke et al., 2018). Secondly, studying the effects on human health is often not possible because for example the chemical are not available as pure substances or testing would be too expensive.

- **Contaminants**

Heavy metals (Lead, Arsenic, Cadmium, Chromium VI, and Mercury) EDF has demonstrated heavy metal contamination in food, particularly baby food. Though not intentionally added, contamination of food packaging may be a source.

Effect of Food packaging materials on the environment

When it comes to waste management, food packaging waste has occupied a large proportion of municipal solid waste (MSW) resulting in a risk in environmental concerns (Rydz , 2013). For municipal solid waste, food packaging materials have become major items in the litter systems. It has resulted in many detrimental environmental effects including animal choking, pollution, blockage of channels, rivers and streams and landscape disfigurement. Food packaging materials especially plastic, can, steels, polyethylene, aluminium etc pose a threat not only to human and marine life, but also to agricultural land. These packaging materials are accountable for the dilapidation of the atmosphere and agricultural land, which has inadvertently used up precious earth resources, in particular oil (Sugii, 2008). This poses a major challenge to environmental and agricultural production. Food packaging waste materials irresponsibly dumped could also be ingested by other animals causing their demise. Waste dumps within the oceans create an enormous degrading to the environment and also the creatures living within the sea and also the waste might affect the mating seasons (Thomas, 2020).

Robertson (2013) and Sachanow and Griffen (2008) opined that the effects of food packaging material on the environment includes;

- Littering
- Health effect
- Pollution

-Littering: Simply means throwing away objects on the ground or leaving them lying on the ground instead of disposing them at garbage can, recycle bin or trash container – littering constitute an environmental hazards like;

- looking bad and negatively affects the image of places, especially the appearance of communities. –it attracts litter which gives the people impression that people do not care about their surrounding and it is acceptable to litter.
- It can result to fire hazard, accumulated litter and careless discarded cigarattee butts are potential fire hazard.

- Health Effects

- Accumulated litter breed mosquitoes and in turn causes malaria parasite.

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- Litter is a threat to public health; it attracts vermin (insects and pest) and is a breeding ground for bacteria.

-Pollution Effects*:* Pollution is the introduction of contaminants into the environment that causes harm or discomfort to human or other living organisms that damage the environment. It occurs in all habitats – lands, seas, fresh water and in the atmosphere.

- Polluted water bodies and demanded forest is not fit environment for many living organisms.
- The sea is being discolorated because of all these food packaging materials such as cans, bags, bottles, plastics etc (Kenneth & Betty, 2007).

Conclusion

Food packaging materials have been of tremendous help in food industry, home, society and environment. One of the predominant roles of food packaging materials to food is the ability to increase in the shelf-life/shelf-stability of the product thereby reducing food waste. But on the other hand, chemicals used in production of food packaging material pose a lot of treat to human health and the environment. The chemicals use leach into food during processing, heating and storage. Humans consume them unknown to them and keep accumulating them in the body system, causing a lot of disruption in the body organs, generating cancer diseases, etc. Plant leaves and other unwashed and unsterilized packaging materials used localy in storing of food also pose a treat to lives because some of them habours a lot fungi and micro organisms. The major impacts of packaging materials on the environment are that some of them take time like years for them to decompose. In addition, toxic substances are released into the soil when plastic bags breaks down under sunlight and if they are burned, they release toxic substances into the air causing ambient air pollution.

Recommendations

Producers of food packaging materials should be guided by the Food safety Alliance for packaging (FSAP) rules, a part of the institute of packaging professionals, released “food packaging product stewardship considerations”, a set of best practices to reduce problematic chemicals in food packaging (Neltner, 2019). These includes,

- Heavy metals and long-chain PFAS must not be used
- Ortho – phthalates, BPA, and toilluene should not be used.
- Ethyl and Methyl glycel use should be minimize
- Short-chain PFAS should only be used after considering alternatives.

References

Adegunloye, D.V., Agarry, O. O., Adebolu, T.T., & Adetuyi, F.C. (2006). Effect of leaf-packaging on the microbiological assessment of some food items. *Afr. J. Biotechnol*., 5(5),445-447.

Adejumo, B. A., & Ola, F. A. (2008). *The Appraisal of Local Food Packaging Materials in Nigeria. Cont. J ournal Eng. Sci*., 3,13 – 20

Cite this article as
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CC-BY-NC-SA 4.0 International Print ISSN : 2971-6624 eISSN: 2971-6632

Aworh, O.C., & Olorunda, A.O. (1981). Effects of packaging methods on post- harvest losses of perishable fruits and vegetables in the Nigerian marketing system. *Nigerian Food Journal* ,3, 33 -57

Codex Alimentarius Commission. (2004). Report of the 20th session of the Codex committee on general principles. Joint FAO/WHO food standards program M e. *2004 May 2–7*. Paris , France .

Crump K.S.(2011). Use of threshold and mode of action in risk assessment. *Crit Rev Toxicol.*, 41(8), 637–50.

[FAO] Food and Agriculture Organization of the United Nations (1989). Prevention of post- harvest food losses: fruits, vegetables, and root crops. A training manual. FAO. Code: 17, AGRIS

Fellows, P., & Axtell, B. (2002). *Packaging materials. In: P Fellows, B Axtell, editors. Appropriate food packaging: materials and methods for small businesses*. Essex .ITDG Publishing

Eladak, S., Grisoh, T. ,Moison, P., Guerquin, J. , N'Thumba-Byn, T., & Pozzi-Gaudin S. (2015). A new chapter in the bisphenol A story Bisphenol S and Bisphenol F are not safe alternatives to this compound .*Vertility and sterility* ,103(1), 11-21 DOI, 101016/J.Fertnstert 2014. 11 . 005

Geueke, B., Wagner, C., Charlotte & Muncke, J. (2014). Food contact substances and Chemicals of concern: A comparsion of inventories food addition and contaminants. Part A: chemistry, analysis, control, exposure and risk assessment,31(8),1438–1450 DOI:10.1080/19440049.2014-831600

Geueke, B (2018). Food packaging the circular economy: Over view of chemical safety aspects for commonly used materials. *Journal of cleaner production*, 193, 491 – 505

Myers, J., Zoeller, R. & Vom Saal, F.(2009). A clash of old and new scientific concepts in toxicity, with important implications for public health. *Environ Health Perspect*,117(11), 652–655

Kabuo, N.O., Asoegwu, S.N., Nwosu, J.N., Onuegbu, N.C., Akajiaku, L.O. & Nwaimo, J.C. (2015). Assessment of leaf-type and number of leaves used in wrapping on the quality of "ugba" (fermented Pentaclathra macrophylla, Benth seed). European Journal of Food Sci. Technol., 3(1), 11-23.

Kenneth, M., & Betty, B. (2007). Food packaging role, materials and environmental issue. *Journal of food science*, 17, 50 – 53.

Liao, G, Liu, F. and Kaman, K. (2013). Occurrence of and Dietary Exposure to parabens in food – stuffs from the United States. *Environmental Science and Technology*,47,3918-3925 DOI:10.1021/es.4007245

Mash, K., & Bugusu, B. (2017). Food packaging – Role, Materials and Environmental Issues. *Institute of food Technologis*t ,72(3), 39 – 55.

Cite this article as
Nwosu,J. C. U., & Ebujor, G. C. (2020). Food packaging materials: Health and Environment
THE COLLOQUIUM, 8(1), 57-68

 Print ISSN : 2971-6624 eISSN: 2971-6632

Mohanty, F., & Swain, S. K. (2017). Bionane composites for food packaging Applications Nanotechnology. *Application in food*, 363 – 379.

Ng, C. (2015). Plant leaves in food preparation and packaging.*Utar Agric.Sci. J.*,1(4), 35-38.

Page, B., Edwards, M., & May, N. (2003). Metal cans. In R Coles, D. McDowell, & M.J. Kirwan, (eds). *Food packaging technology*. Blackwell Publishing, CRC Press.

Robertson, G. L. (2013). *Food packaging; principles and practice.* CRC Press

Ryde, J. (2018). Present and future of biodegradable polymas for food packaging application, *Biopolymers for food design*, 431 – 469

Sacharrow, S. & Griff, R. (2008). *Principles of food packaging* (2nded). Crest Books .

Salami, G.I. (2002). Assessment of some needs of the food packaging industry in South-western Nigeria. An unpublished M.Sc. Thesis submitted to Obafemi Awolowo University, Ile-Ife, Nigeria.

Sarpong, S.O. (2015) Exploring the Concept of Standout in Structural Packaging-challenges and Prospects in Ghana. An unpublished Master of Communication Design thesis, Kwame Nkrumah University of Science and Technology, Ghana http://ir.knust.edu.gh/bitstream/123456789/6907/3/SAMUEL%20OSEI%20SARPONG% 203.pdf

Serrano, S. E., Braun, J. Trasande, L. Dills, R., & Sathyanarayana, S. (2014). Phittalates and Diet: a review of the food monitoring and epidemiology data. *Environmental Healthy*, 13 (43). DOI.:10.1186/1476-069x-13-43

Siracusa, V., & Rose, M. D (2018). *Sustainable Packaging in suitable Food systems from Agriculture to industry. 275 – 307*

Tom, N. (2019). Toxic chemicals can enter food through packaging environmental Defense Fund (EDF). https//blogs.edf.org/health/201903/26

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