

Full Length Research Paper

Analysis of Health Consequences of Preservatives on Agricultural Foods

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ABSTRACT: In analyzing the health consequences of preservatives on agricultural products such as food, a randomized, double-blinded, placebo-controlled trial was conducted by a team of scientists at the University of Southampton in England. This was intended to test whether the intake of artificial food color and additives (AFCA) would affect children's behavior. 153 three-year-old and 144 children aged eight to nine years of age were used for the experiment. The result showed that artificial colour or a sodium benzoate preservative (or both) in the diet result in increased hyperactivity in 3-year-old and 8/9-year-old children. The advantages of using food preservatives are that they allow for a variety of foods year-round, and improve the nutritional value, taste, texture, consistency or colour of certain foods. The disadvantages are that synthetic preservatives such as sulphites, benzoates,

sorbates, high fructose corn syrup, etc. can result in immediate or long-time health effects. These may include headaches, changes in energy level, alterations in mental concentration, behaviour or immune response, etc. Long-term effects may increase the risk of cancer, cardiovascular disease, and other degenerative conditions. The study recommended avoiding foods containing additives and preservatives particularly the aged, the use of organically raised commodities, spending time cooking for oneself, and returning to the original plan of God. Preference for natural additives and self-detoxification if food with preservatives cannot be avoided is also recommended.

Keywords: Agricultural Food, Sodium Benzoate, High Fructose Corn Syrup, Advantage and Disadvantage, Degenerative Condition, Organically Raised Commodities

INTRODUCTION

Agriculture has been defined as the art and science involved in the production of plants and animals useful to man. It provides food for energy (Udah, 2004). Food is any substance or material eaten or drunk to provide nutritional support for the body. It usually consists of plant or animal origin, which contains essential nutrients such as carbohydrates, fats, proteins, vitamins, or minerals. Food is ingested and assimilated by an organism to produce energy, stimulate growth and maintain life (Abdulummeen *et al.*, 2013; Francis, 2000). As plausible as the role of food is, its functions in promoting growth and excellent health are being compromised by additives and preservatives. Well-meaning individuals and manufacturing companies handling food for the public

have introduced these substances into food to make it stay longer, look better or become cheaper for customers to buy.

In its broadest sense, a food additive is any substance added to food. Legally, the term refers to any substance the intended use which results or may reasonably be expected to result-directly or indirectly-in it becoming a component or otherwise affecting the characteristics of any food. This definition includes any substance used in the production, processing, treatment, packaging, transportation or storage of food (Abdulummeen *et al.*, 2013; Kunkel and Barbara, 2004). With the ever-growing world population and the need to store and transport the food from one place to another where it is needed, food

preservation becomes necessary in order to increase its shelf life and maintain and improve the quality of processed foods. The most common food additives and preservatives used are sodium benzoate, sodium chloride, titanium dioxide (Mall and Sunita, 2018). Preservatives may be added to food to prevent the growth of fungi. Preservative food additives can be used alone or in conjunction with other methods of food preservation. Preservatives may be antimicrobial preservatives, which inhibit the growth of bacteria or fungi, including mold, or antioxidants such as oxygen absorbers, which inhibit the oxidation of food constituents. Common antimicrobial preservatives include calcium propionate, sodium nitrate, sodium nitrite, sulfites (sulfur dioxide, sodium bisulfite, potassium hydrogen sulfite, etc.) and disodium.

The benefits and safety of many artificial food additives (including preservatives) is the subject of debate among academics and regulators specializing in food science, toxicology, and biology. Natural substances such as salt, sugar, vinegar, alcohol etc. are also used as traditional preservatives. Certain processes such as freezing, pickling, smoking and salting can also be used to preserve food. Another group of preservatives targets enzymes in fruits and vegetables that continue to metabolize after they are cut. For instance, citric and ascorbic acids from lemon or other citrus juice can inhibit the action of the enzyme phenolase which turns surfaces of cut apples and potatoes brown. Most foods contain enzymes or natural chemicals, such as acids or alcohols that cause them to begin to lose desirable characteristics almost immediately after harvest or preparation. In addition, a host of environmental factors, such as heat and the presence of microorganisms, acts to change foodstuffs in ways that may harm the food product (Abdulummeen *et al.*, 2012; Daniel, 2007).

The health implications of these preservatives can be a great concern for food and nutrition experts. According to Abdulummeen *et al.* (2012), many foods available in the market contain different types of preservatives. These chemicals can give rise to certain health problems (Abdulummeen *et al.*, 2012). Saffron, for example, is a yellow food coloring obtained from the flower of the *Crocus sativa* plant. This has been reported as a cause of anaphylaxis (Abdulummeen *et al.*, 2012; Abdullayev 2002). This study is, therefore, designed to present the good and bad side of food additive. The information would afford users the opportunity to decide whether they want to patronize or continue to patronize them. This would also contribute to the design of appropriate policies that might result in addressing whatever problems associated with food preservatives.

Statement of the problem

To keep food longer than usual through processing, well-meaning food manufacturers and other food handlers

have introduced preservatives. This is because of the perishable nature of agricultural commodity. Keeping food longer than usual has become necessary to meet up with the jet age as population and way of doing things in the world today have continue to increase unabated. The chemical substances used to achieve the purpose of preservation are: aluminum silicate, amino acid compounds, ammonium carbonates, sodium nitrate, propyl gallate, butylated hydroxyl toluene (BHT), butylated hydroxy anisole (BHA), monosodium glutamate, white sugar, potassium bromate, potassium sorbate, sodium benzoate, etc. Some artificial colors are also added to the foods to give them an appealing look. These coloring substances are erythrosine (red), canthaxanthin (orange), amaranth (Azoic red), tartrazine (Azoic yellow) and annatto bixin (yellow orange) (Abdulummeen *et al.*, 2012).

When the food is to be stored for a prolonged period, use of additives and preservatives is essential in order to maintain its quality and flavor. The excess water in the foods can cause the growth of bacteria, fungi and yeasts. Use of additives and preservatives prevents spoiling of the foods due to the growth of bacteria and fungi. Additives and preservatives maintain the quality and consistency of the foods. They also maintain palatability and wholesomeness of the food, improve or maintain its nutritional value, control appropriate pH, provide leavening and color, and enhance its flavor (Abdulummeen *et al.*, 2012).

As was indicated in the introduction, these chemicals can give rise to certain health problems. Presently, the use of protective food additives such as benzoic acid and sodium nitrate is quite common. However, it was found that these additives, which initially appeared to be harmless, led to the emergence of several health problems. Cancer and diseases and deaths with no apparent causes are among the leading concerns (Sarac and Sari, 2019). If food preservative and additives are largely responsible for stimulation of all kind of diseases over the years, is it little wonder why a reduction in ill-health cannot be realized? When the food that is supposed to provide the necessary nutrients and energy are compromised with additives and preservatives, it becomes too difficult to achieve wellbeing. The result is mysterious illnesses that cannot be diagnosed and increase in hospital visits and hospitalization. This study, therefore, addressed the questions:

- (i) What is the purpose of food preservatives?
- (ii) What are the advantages and disadvantages of using food with preservatives?
- (iii) What can be done to correct the problem arising from food preservatives and keep people healthy?

The answers to these questions give the basis of suggesting where policy can be rightly applied to tackle

undesirable health issues and enhance wellness in United States and the world in general.

Justification of the study

Even though wellness and growth cannot be achieved until food and agriculture perform their role of supplying the necessary nutrients, those who mean well have continued to use chemical substances to preserve them. The preservatives have been adjudged to have some advantages and disadvantages. The disadvantage is tilted toward causing illness rather than wellness thereby undermining the role food plays. This work, therefore, presents both the advantages and disadvantages of the preservatives for the populace to make an informed decision as to whether to use them or not. For a proper design of health and wellness enhancing policies, policy makers should have good knowledge of the best and workable policy instrument. They should know what accounts for variation in different policy instruments and their implementation; including the roles of such factors in health and wellness. With the information provided in this work, policy makers can evaluate and select the best instrument for positive and all-round effects on health.

U.S. bureau of labour statistics (USBLS) reported that health care and social assistance are expected to top all other industrial sectors in terms of employment by the year 2029

[<https://www.bls.gov/emp/tables/employment-by-major-industry-sector.htm>]. Analysis of health consequences of preservatives on agricultural foods is, therefore, an appropriate way of finding where policies can rightly respond to the issues of increasing health care centers and hospitalization in U.S. The outcome of this work would therefore assist in gaining better understanding concerning a more beneficial and appropriate public policy.

Finally, for a sensitive subject such as food and health, more literatures are required to beef up the existing ones so that paucity of materials on wellness will not arise. This study therefore not only contributes to the literature on analysis of health consequences of preservatives on agricultural foods but with its focus on U.S., it further contributes to the tendency to redefines U.S. perspectives on food preservatives.

Methodology

Study area

This study was done in United State of American U.S. It has a total land boundary of 12,048 km and bordered by Canada 8893 km (including 2477 km with Alaska), Mexico 3155 km and U.S. Naval Base at Guantanamo Bay which was leased to US by Cuba. The base

boundary is 28.5 ([https://www.google.com/search?q=\(CIA+World+Factbook%2C+2019\)](https://www.google.com/search?q=(CIA+World+Factbook%2C+2019))). The current population of the United States of America is 331,658,650 as of Monday, November 2, 2020, based on Worldometer elaboration of the latest United Nations data. The United States population is equivalent to 4.25% of the total world population. U.S.A. ranks number 3 in the list of countries (and dependencies) by population with population density of 36 per Km² (94 people per mi²). The total land area is 9,147,420 Km² (3,531,837 sq. miles). 82.8 % of the population is urban (273,975,139 people in 2020) ([https://www.google.com/search?q=\(U.N.+Worldometer+%2C2019\)&oq](https://www.google.com/search?q=(U.N.+Worldometer+%2C2019)&oq)).

Sources of data

The study relies wholly on secondary data and source information from books, journal articles, bulletins, U.S. bureau of statistics, internet etc.

Method of analysis

The important role which food/agriculture plays in promoting wellbeing could be illustrated by examining various studies and researches by experts on food additives and preservatives. We have already defined food and agriculture and identify that they provide nutrients needed for growth and wellbeing. It is our duty to examine how the role which food and agriculture play could be undermined by food additives and preservatives to bring about ill-health. For the purpose of this study, we use food additives and preservatives synonymously.

Scientists at University of Southampton in England conducted a well-designed clinical trial—randomized, double-blind, placebo-controlled, crossover—intended to test whether intake of artificial food color and additives (AFCA) would affect children's behavior. They enrolled 153 three-year-old and 144 children aged eight to nine years of age. They were separated into three groups, and each group received a different drink:

- (i) Test Drink A with sodium benzoate (preservative) and artificial food color mix A.
- (ii) Test Drink B with sodium benzoate (preservative) and artificial food color mix B.
- (iii) Placebo drink free of artificial additives and preservatives.

Each group consumed their beverage daily for six weeks. The researchers estimated that the test drink groups ingested artificial additives and preservatives in daily amounts roughly equal to those found in two standard candy bars. In addition to a computer test, the children were evaluated by parents and/or teachers who were unaware of which drinks the children had consumed (*Weatherby, 2007*).

The researchers found that children of all ages who consumed Test Drink A were significantly more hyperactive and that they had shorter attention spans, compared with the placebo drink groups. No behavior differences were found between the placebo group and Test Drink B group.

The authors came to this conclusion: "Artificial colours or a sodium benzoate preservative (or both) in the diet result in increased hyperactivity in 3-year-old and 8/9-year-old children..."

Since all the children received a mix of additives, the authors could not say which of the additives caused problems, but they plan to conduct further trials to pinpoint the problematic compounds (*Weatherby, 2007*).

DISCUSSION

Some modern synthetic preservatives have become controversial because they have been shown to cause respiratory or other health problems. Some studies point to synthetic preservatives and artificial coloring agents aggravating Attention Deficit Disorder (ADD) and Attention Deficit and Hyperactivity Disorder (ADHD) symptoms in those affected (*Abdulmumeen et al., 2012; Gustafsson, 2003*). According to Dr. David Kahana a gastroenterologist, modern diet is full of unnatural diet like high fructose corn syrup, unnatural food additives, environmental toxins and Tran fats that can overwhelm the liver and trigger inflammation (*Kahana, (2020)*). Although preservative is saddled with undesirable outcomes, there are many benefits. This section, therefore, presents both the advantages and disadvantages of using food preservatives and allows the consumer to make an informed decision as whether to use them or not.

Advantages of preservatives

Food additives which include preservative play a vital role in today's food supply. They allow our growing urban population to have a variety of foods year-round. They make possible an array of convenience foods without the inconvenience of daily shopping. Food additives perform a variety of useful functions in foods that are often taken for granted. Since most people no longer live on farms, additives help keep food wholesome and appealing while enroute to markets sometimes thousands of miles away from where it is grown or manufactured. Additives also improve the nutritional value of certain foods and can make them more appealing by improving their taste, texture, consistency or colour (*Abdulmumeen et al., 2012; Houghton, 2002*).

Basically, additives are used in foods for five main reasons: i) To maintain product consistency. Emulsifiers give products a consistent texture and prevent them from separating. Stabilizers and thickeners give smooth uniform texture. Anti-caking agents help substances such

as salt to flow freely. ii) To improve or maintain nutritional value. Vitamins and minerals are added to many common foods such as milk, flour, cereal and margarine to make up for those likely to be lacking in a person's diet or lost in processing. Such fortification and enrichment have helped reduce malnutrition among the U.S. population. All products containing added nutrients must be appropriately labeled. iii) To maintain palatability and wholesomeness. Preservatives retard product spoilage caused by mold, air, bacteria, fungi or yeast. Bacterial contamination can cause foodborne illness, including life-threatening botulism (*Abdulmumeen et al., 2012; Houghton, 2002*).

Antioxidants are preservatives that prevent fats and oils in baked goods and other foods from becoming rancid or developing an off flavor. They also prevent cut fresh fruits such as apples from turning brown when exposed to air. iv) To provide leavening or control acidity/alkalinity. Leavening agents that release acids when heated can react with baking soda to help cakes, biscuits and other baked goods to rise during baking. Other additives help to modify the acidity and alkalinity of foods for proper flavor, taste and color. v) To enhance flavor or impact desired color. Many spices, natural and synthetic flavors enhance the taste of foods. Colors, likewise, enhance the appearance of certain foods to meet consumer expectations (*Abdulmumeen et al., 2012; Houghton, 2002*).

Disadvantages of food additives

The harmful effects of food additive may be immediate or long time. Immediate effects may include headaches, change in energy level, alterations in mental concentration, behaviour, or immune response (*Sharif et al., 2017; Pandey et al., 2012*). Food additives can cause harmful effect if they are use beyond the prescribed level. Many foods available in the market contain different types of preservatives. These chemical give rise to certain types of health problems. Some of the additive are extracted from natural sources such as corn, beet and soybean, salt, vinegar, honey and are known as conventional preservation method. Some are the artificial additives known as modern technology preservation method. Conventional method of food preservatives uses natural ingredients (*Mall and Sunita, 2018; Sharif et al., 2017*).

The use of synthetic preservative such as sulphites, benzoates, sorbates etc. for food preservation can cause certain health problems. In this light, replacing these synthetic preservatives with natural preservatives are much safer for human and environment. Furthermore, natural preservatives are easy to obtain since the sources are from plant, animal and microbes' origin. Some people have reactions after eating certain foods. Some do not have reactions until a day or two later. One way to test for problematic food due to additive and preservatives is diet

elimination. Thus, people must go on an elimination diet. They stop eating all foods that might be problematic and introduce one at a time to see if a reaction occurs. Long term effects may increase risk of cancer, cardiovascular disease and other degenerative conditions. Some modern synthetic preservatives have become controversial because they have been shown to cause respiratory or other health problem (Mall and Sunita, 2018; Pressinger, 1997; Sharif *et al.*, 2017).

In the early 1990s the Food and Drug Administration (FDA) had urged companies not to use benzoate in products that also contain ascorbic acid, but in the 2000s companies were still using that combination. A lawsuit filed in 2006 by private attorneys ultimately forced Coca-Cola, Pepsi, and other soft-drink makers in the U.S. to reformulate affected beverages, typically fruit-flavored products (Shazia *et al.*, 2017; Pandey and Upadhyay, 2012). The commonly used sodium benzoate has been found to extend the shelf life of bottled tomato paste to 40 weeks without loss of quality; however, it can form the carcinogen benzene when combined with vitamin C. Many food manufacturers have reformed their products to eliminate this combination, but a risk still exists (Shazia *et al.*, 2017; Kumar *et al.*, 2013). The reaction from these additives can be very mild to life-threatening. They can be immediate or build up in the body over time. Only in recent years have researchers seriously considered the physical impact of these additives over the long term (Abdulmumeen *et al.*, 2012; Pressinger, 1997). Synthetic food additives react with the cellular component of the body leading to the various food disturbances (effects). If we must use food additives, because of their advantages, they should be the natural ones which have minimal effects and those that are generally recognized as safe (GRAS) and in the case of those not generally recognized as safe (Non GRAS), the acceptable daily intakes (ADIs) should not be exceeded. To minimize the risk of developing health problems due to food additives and preservatives, one should, therefore, avoid the foods containing these additives and preservatives. Before purchasing the canned food, its ingredients should be checked. Purchase only organic foods, which are free from artificial additives and preservatives (Mall and Sunita, 2018). It is best to eat a preservative-free diet if possible (Abdulmumeen *et al.*, 2012; Pressinger, 1997). Another possibility is for individuals to return to prescription given to man by God. "And God said, Behold, I have given you every herb bearing seed, which is upon the verse:29 and of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat." "And by the river upon the bank thereof, on this side and on that side, shall grow all trees for meat, whose leaf shall not fade, neither shall the fruit thereof be consumed: it shall bring forth new fruit according to his months, because their waters they issued out of the sanctuary: and the fruit thereof shall be for meat, and the leaf thereof for medicine. After the flood,

God added animals.

"Every moving thing that lives shall be meat for you" but cannot be eaten with blood (The Bible, King James Version, Genesis Chapter 1 verse 29 and Chapter 9 verses 3&4; The Bible, King James Version, Ezekiel Chapter 47 verses12).

Summary of findings

This study analyzed the health consequences of preservatives on agricultural food. A randomized, double-blinded, placebo-controlled, crossover trial to test whether intake of artificial food, colour and additives (AFCA) affected childhood behavior shows that artificial colours or a sodium benzoate preservative (or both) in the diet result in increased hyperactivity in 3-year-old and 8/9-year-old children in the general population. The advantages of using food preservatives is that they allow for variety of foods year-round, and improve the nutritional value, taste, texture, consistency or colour of certain foods. The disadvantages are that synthetic preservative such as sulphites, benzoates, sorbates etc. can result to immediate or long-time health effects. These may include headaches, change in energy level, alterations in mental concentration, behaviour, or immune response etc. Long term effects may increase risk of cancer, cardiovascular disease and other degenerative conditions. To minimize the risk of developing health problems due to food additives and preservatives, one should consider avoiding the foods containing these additives and preservatives. Before purchasing, check for natural ingredients. Purchase only organic foods, prepare your food yourself and embrace God's instruction given in the Bible.

Conclusion

The purpose of this study is to analyze the health consequences of preservatives on agricultural food. The underlying fact and from the result of the finding is that there are advantages and disadvantages of the additives and preservatives on our food. While food additives have necessitated having food year-round and improvement in nutritional values, most of them have resulted to health issues. Several analysis and results show that hypersensitivity, headaches, immune response, palpitations, change in energy level can occur. Long term effects may increase risk of cancer, cardiovascular disease and other degenerative conditions. This implied that one should consider avoiding preservative food and purchase only organic foods, which are free from artificial additives and preservatives or follow Biblical injunction. If one must use food with preservative, it is wise to look for ones with natural additives or apply method of detoxification occasionally.

Recommendations

Based on the findings from the analysis, the following recommendations are made:

- (i) To minimize the risk of developing health problems due to food additives and preservatives, one should avoid the foods containing these additives and preservatives. This is particularly true for the aged because the body system of an average person slows down as he or she gets older.
 - (ii) Use of organic food. This approach is to ensure that harmful chemicals are avoided. Although organic food is more expensive but when hospital bills are taken into consideration, it might be cheaper in the long run.
 - (iv) If we must use food additives, because of their advantages, they should be the natural ones which have minimal effects and those that are generally recognized as safe (GRAS). It is advisable to read labels of food and insist on natural ingredients.
 - (iv) Plan to spend time preparing your food yourself. This will ensure that you are in control of what goes into your system.
 - (v) The study also advocated embracing original plan of God as outlined in scripture.
- Finally, if it is not possible to avoid preservatives, detoxification methods are recommended.

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