A Review of Control in Food Pollution of Local Markets

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*Food and its products represent a suitable environment for the growth and reproduction of microbes, whether they are pathogenic or spoilage, and are thus vulnerable to contamination with these microbes. The most important sources of pollution are water, air, dust, equipment, sewage, insects, rodents and workers. Among these sources, the workers themselves represent the most important source of infection, as they transmit the infection of diseases, especially toxin and non-toxic food poisoning diseases. Contamination of raw materials from soil, wastewater, live animals, and the external surfaces and internal organs of slaughtered animals can also occur. Additional contamination from sick animals can also occur, although the provision of hygiene may reduce this source. Pollution can be minimized by controlling the external conditions surrounding the food and by following sound health practices in everything related to food handling, processing or preparation, while providing the necessary protection during storage, and properly disposing of garbage and dirt. The aim of all of this is to reduce the chances of food contamination with microbes, that is, to protect food from contamination. As for the remaining microorganisms that can withstand different protection methods, they must be eliminated or inactivated during the different manufacturing processes (**1**). Control of the external and environmental conditions surrounding the food:-*

1-Maintaining the safety of the foodstuff:

Technical principles must be taken into account in the collection, preparation, packaging, transportation and storage of food crops. When collecting the fruits of the fruits, it is taken into account not to violently remove them, drag them or drop them on a solid ground, which leads to their crushing. All precautions must be taken in their packaging, transportation, display for sale, and circulation in the markets or inside the factories that manufacture them. Care must also be taken to collect vegetables, follow procedures to ensure proper packaging, transport and storage to prevent contamination, and to choose the appropriate containers for each type that ensure their safety.

2-Protecting food from contamination:

The number of microbes contaminating food has an effective effect on transmitting diseases and in the speed of their corruption, and for this reason, the maximum possible health practice must be observed so that the number of microbes contaminating the food is minimal.When producing milk, for example, it is necessary to take into account the cleanliness of the animal, the place of milking and the milking parlor itself, the milking utensils, and all that is used in

the transportation, circulation and distribution of milk. The same hygiene must be observed in the manufacture of dairy products. In the case of vegetables, special attention must be paid to their cleanliness due to their proximity to the soil, which is the first source of contamination. Therefore, care must be taken to wash it thoroughly with pure water free of microbes, remove any dirt or dust that may be stuck to it, and avoid using water streams or stagnant water, which leads to increased contamination with various types of pathogenic microbes and microbes that cause their corruption. The fruit must also be clean, and this may require washing many of the fruits intended for marketing with disinfectants. It is also necessary to take into account the cleanliness of poultry eggs and the non-sticking of dust and dirt to their surface, as well as the cleanliness of their packages and places of storage. All health requirements must be followed in preparing meat, and animal flesh should not be contaminated when slaughtered. Also, consideration must be given to examining meat, inspecting it with a veterinarian, and culling the affected parts. It must also ensure the cleanliness of the tools used for slaughtering. In general, the cleanliness of uncooked material must be taken into account during its production, circulation, transport and storage, and to ensure the cleanliness of packages, places of packing, storage, sale, etc. It is also necessary to take care of the sources of water used in washing and their quantity, and to be assured of the efficiency of the means used in the washing process and the use of detergents and disinfectants whenever the need arises. Steam, boiling water or chlorinated water may be used in washing operations in food factories to destroy the microbes, and the food item must be protected from the action of various vermin, whether it is while it is in the field or in stores, with the need to take care of the design of stores that ensure the protection of the food item from the arrival of rodents Or insects leak into it. The necessary ventilation must also be taken into account, and that the walls, floors and ceilings of the stores are free of cracks that allow the larvae to spin their cocoons inside them, or the cockroaches and other insects to hide in them, all of which are carriers of microbes. It is also necessary to take care of these stores, to ensure that they are clean and clean and not to store contaminated materials inside them, or to put empty used bags that may be contaminated with some insects. It is also necessary to resist insects that infect foodstuffs as soon as the infection appears, and to use pesticides that suit them and do not harm the foodstuffs or make them unfit for consumption. To achieve these goals, the place in the warehouse must be spacious and equipped with all necessary means to protect food from dust and other foreign materials, insects and rodents. The spacious places that allow the free transfer or change of foodstuffs, often reduce the chances of pollution, and allow cleaning and the conduct of various operations in a regular manner, and the floors can also be swept and the shelves cleaned with various detergents and disinfectants. It must not be allowed to collect dirt or waste in food storage places. In places where food is presented, distributed or packed, food should not be touched with hands if it is intended for consumption

without cooking, or even after cooking if this can be avoided. If touching by hand is necessary, workers must wash their hands well and repeatedly before that, whenever circumstances require the use of hands and touching food. The chances of hand contact can be reduced by using polyethylene gloves during manufacture, preparation or serving, which are used once and then discarded. Food intended for consumption, presentation or handling must be covered with a suitable cover, and cleaned in a way to prevent the gathering of dirt or dirt. If the nature of the food does not allow the use of this type of protection, the food must be stored in a dust-free container, and at an appropriate temperature. And when distributing foods preserved or packed in standard packages such as milk and juice, the distribution must take place directly from the package. Food intended to be served during display in restaurants must also be protected by using transparent container containers placed either in front of the food surface or in the front of it, as a barrier that protects the food from air pollution, sneezing or coughing. The chances of workers coming into contact with food in general should be reduced. Any food that came into contact with any unclean surface should be cleaned. Any equipment or utensils used in manufacturing, packaging, packaging, preparation or serving must also be cleaned and disinfected (**2**). In general, workers responsible for handling containers for preparing or serving food must refrain from touching their hands with any surface that might come into contact with the food or the consumer's mouth. It is noted that the manufacture or preparation of food always produces large amounts of waste and waste. In order to reduce the chances of food contamination, such waste should be placed in special packages or bags and removed from places of manufacture or food preparation periodically. Separate waste containers should be used from those used to dispose of dirt. In the workplace, special containers must be placed to put waste consisting of food parts or packaging materials and to disinfect these containers periodically and repeatedly.

3-Extermination of polluting microbes and curb their activity:

Microbes are considered dead if they lose the ability to reproduce, even when they move to another environment suitable for growth under appropriate environmental conditions. There is a difference between death and dormancy, especially with regard to spores and bacteria, as the dormant microbes still have the ability to reproduce and can be cultured by cultivation for a long time or transfer to a different growth environment or any form of activation. Regardless of the cause of death, Microbes follow in the speed of their death a logarithmic system, as previously mentioned in their growth stages(**3**). This suggests that germ cells die at a relatively constant speed. However, this rule may pervert if other lethal factors are found in the environment that accelerate their death or the presence of a flora with a homogeneous resistance force. The methods of controlling contaminated microbes, whether pathogenic or spoilage depend on several methods that can be divided into four groups:

Most of the methods of combating microbes contaminating food are food preservation technology that relies on the use of several factors simultaneously, as the preservative effect of each factor alone does not inhibit the activity of the microbes enough to serve as an independent preservation agent.

1-Removal of microorganisms by microfiltration:

Microorganisms in some liquid foodstuffs such as juice and some alcoholic beverages can be removed by filtering them with special filters "after they have been purified". This filtration process is called microfiltration or filtration. In this method, thin-pore membranes are used that do not allow the passage of microorganisms. This method is widely used in filtering drinking water in many regions of the Arab world. The used filters cannot be filtered and reused.

2-Reducing or removing moisture in foodstuff:

Moisture is necessary for the growth and reproduction of microorganisms, and the various self-enzymatic reactions that take place in a food item and lead to changes in its properties or to its corruption can only take place in an aqueous medium. Reducing the moisture content of the foodstuff to a level that is inappropriate for the growth of microorganisms and the occurrence of unwanted biological changes while not harming the nutritional value and the sensory and natural qualities of the foodstuff, is one of the methods known from ancient times to prolong the period of validity of the food for consumption. Moisture 4% While the fruit crops are dried to a moisture content of approximately 26%, the contaminated microorganisms are unable to cause corruption. The reason is that the fruit does not need to reduce the moisture content to less than that because it contains a high percentage of dissolved solids, which after drying may reach 60-66%, which in turn acts as a hindrance to the growth of microorganisms. Reducing the moisture content of fruits to less than 34% leads to great damage to the dried product, related to color and taste, due to its high content of sugars. The drying of vegetables and fruits is carried out either in a natural way that depends on the movement of air in the shade or in the sun, depending on the evaporation of moisture by taking advantage of the movement of relatively hot air, or by industrial methods that depend on artificially heated forced air currents. This is done by various special devices. The moisture in the liquid foodstuff of fruit juice, tomato and dairy juice may be reduced by evaporating water with heat under high atmospheric pressure or under vacuum, and this process is called various terms such as concentration, condensation or vaporization, and each of them suits specific products, it is said, for example. , Tomato juice concentrate or tomato paste, fruit juice concentrate, evaporated milk. Evaporated milk is milk that has lost part of its moisture content by evaporation. Condensed milk is evaporated milk with added sugar, which

increases the concentration of dissolved solids and makes it more preservative. If the canister containing evaporated milk is opened, it must be stored after that at a low temperature "by cooling" in order to deal with spoilage due to contaminated germs. As for condensed milk, which is sugar added, its quality is kept at room temperature after opening its package, due to the inability of contaminated microorganisms to grow and multiply in this excess concentration of dissolved solids. There is another way to remove moisture from the food, which is in a state of freezing with emptying. When the pressure rises more than that, the water has only two forms, which are the solid form and the gaseous form. Therefore, at a pressure ranging between 1.3 - 4 mm Hg, the food is frozen and then exposed to a severe vacuum until its temperature rises, then the ambient temperature is raised(**4**). Gradually, the water vapor arises, which collects upon its formation on the surface of tubes located at the back of the device, containing a coolant “usually Freon 21”, so that a new part of the water vapor can be released from the food. In this way, 99% of the moisture of the food can be removed without Damage to the natural properties of the food material, such as taste, smell, color or texture This method is characterized by the rapid recovery of the food item to its state by adding water to it, provided that it is packaged after the freeze-drying process in containers that are impermeable to the surrounding water vapor. M. Freeze-drying methods of "lyophilization" to reduce moisture content in coffee and tea extracts.

3-Using high or low temperatures:

A-Pasteurization: attributed to the French scientist Louis Pasteur, who proposed it to preserve wines. It is a heat treatment intended to kill perishable organisms. It is a method of temporary preservation, as the microorganisms that have not been destroyed by heat can grow and multiply and lead to food spoilage, and for this reason, food must be preserved after pasteurization by cold. This heat treatment greatly improves the preservation strength of milk, but it has a clearer effect and is more useful in preserving fruit juice drinks or alcoholic drinks, because these products are by nature not suitable for the growth of microorganisms due to their acidity or the presence of alcohol in them. There are two common methods of pasteurization, one of which is the fast method, in which the milk is heated to 57.5 ° C for a period of not less than 15 seconds, and the second method is the slow method, in which the milk is heated at 62.5 ° C for a period of not less than 30 minutes. In both cases, the milk is cooled to a temperature of 10 ° C.

B - Sterilization: sterilization in the medical sense means killing all microorganisms, and this cannot be applied with regard to food, because this leads to the destruction of the taste, smell, texture, color, and nutritional value. Therefore, in the case of food, what is called commercial sterilization or processing is used, which means killing all microorganisms that can grow

under anaerobic conditions. Spores of aerobic and highly heat-resistant germs may be present, but they cannot grow in the absence of oxygen.

C-Canning: It is a method for preserving food in sealed containers that do not allow air or microorganisms to enter through them or into them after the air has been expelled from them, using high enough temperatures to kill most of the contaminated microbes and stop the action of enzymes, while not harming the natural and physical properties and nutritional value For food, including preservation in tin, aluminum or glass containers. Since the pH of foodstuffs also affects the extent to which microorganisms are affected by heat, acidic foods with a pH of less than 4.5, such as fruits and tomatoes, are usually sterilized at 100 ° C for 15-30 minutes, according to The size of the container, the texture of the foodstuff and the degree of primary contamination As for non-acidic foods with a pH higher than 4.5, such as vegetables "except for tomatoes", legumes, meat and fish, they are sterilized at 116 - 121 ° C for a period that varies according to the size of the container, the consistency of the food and the degree of primary contamination(**5**).

D- UHT sterilization: It is used for sterilization of liquid foodstuffs, such as milk and fruit juice, in which heat can be transferred quickly. It is better than commercial sterilization, and it can eliminate many contaminated microorganisms, by heating the liquid foodstuff to 130-150 ° C for a few seconds and then cooling it directly. In this way, the food preservation period can be extended for a period ranging from weeks to months at normal temperature, depending on the temperature and the period used for that, if it is packed directly in sealed containers.

E- Refrigeration: This is done by keeping the vessels at a temperature higher than their freezing point. Refrigeration is used as a preservation method for a limited time, and it has been widely used in transporting, shipping and storing foodstuffs for short periods of time, such as meat, fish, eggs, vegetables and fruits. The storage time depends on the type of material, its condition, degree of contamination, cooling temperature and relative humidity. Refrigerated transport vehicles are often used to transport large quantities of fresh fruits and vegetables and eggs over long distances. Cooling does not kill pathogen or spoilage microorganisms, but it only slows down their growth. Microorganisms in general are clearly resistant to low temperatures, so that pathogens that cannot be considered under any conditions live at these low temperatures for a long time, but their growth slows down considerably, as do self-decomposition microbes as well as enzymatic and chemical reactions.

F-Freezing: This is cooling to temperatures that reach a limit that leads to freezing of free water in the foodstuff. And when storing food by freezing method, it must be stored after that at lower temperatures to maintain its frozen state while maintaining the stability of these temperatures. The freezing may be quick freezing or slow freezing and it is preferable to use

rapid freezing because it leads to the formation of small, smooth ice crystals inside the cells, unlike slow freezing, which results in the formation of large ice crystals in the form of sheets with sharp edges that help to break down the cell walls and exit the cellular juice from them. When heated, this reduces its nutritional value and changes its physical properties and nature. Freezing not only leads to sterilization of the food item, but also slows down microbiological and enzymatic reactions significantly, including pathogenic microbes. It is nothing more than a way to extend the period of preservation of food for a period that exceeds the period of cold preservation.

4-Direct inhibition of microorganisms:

A- Using ionizing rays: Ionizing radiation means that energy emitted from the nuclei of atoms of radioactive elements as a result of the difference between the number of neutrons and the number of protons inside the nucleus. This energy is often expressed in electromagnetic waves and is called gamma rays. The same rays can be obtained artificially by transferring the electrons of some elements from one orbital plane to another level in special ways, and this case is known as x-rays x-rays to distinguish them from gamma(**6**). The exact mechanism that leads to the decimation of microorganisms remains unknown. Cell death appears to be by inhibiting certain components inside the cell when they absorb this energy inside the cell. A cell inhibited by the scans will not be able to divide or grow. The strength of the radiation dose is measured in units of the rad, which is the acronym for radiation absorber dose.Ionizing rays that result from absorbing 100% of energy per gram of material and irradiation may be done in low doses and is called cold pasteurization, where the dose ranges between 2 × 10 and 5 × 10 rad or less, or in high doses and it is called cold sterilization, where the dose ranges Between 2 and 4.5 million rads (that is, 2 and 4.5 megarads). It was possible to extend the storage period for fish by cooling after irradiating them with cold pasteurization doses, to reach 30 days, while this period does not exceed 9 days without irradiation. The same doses are used to kill insect larvae that infect stored grains, and to produce sterile larvae for insects that hide inside the fruits.

A- antibiotics: It is a group of complex organic compounds characterized by their ability to stop the activity of microorganisms for a limited period after which the compound can acclimatize itself to the conditions of its presence in the environment, and regain its activity after the disappearance of its effect, that is, its effect inhibits or stops the activity of the organism and is not fatal to it except in a few cases . Its vital effect is to inhibit the enzymes of the microorganism itself and make it unable to cause any vital activity. Usually, broad-spectrum antibiotics are used in the form of solutions to immerse the food to be stored, especially fish, crustaceans, poultry, some vegetables and fruits, or to spray the surfaces of

dry cheese, as in the case of nicin. The most important antibiotics used to inhibit the activity of microbes in foods are nicin, chloramphenicol, chlortracycline, and oxytetracycline. The maximum permissible concentration is 5 parts per million, and some laws prohibit its use.

B- Preservatives: They are chemical compounds capable of preventing, delaying or stopping the growth and reproduction of microorganisms contaminating food and thus prolonging its preservation period. It can be divided into three sections according to their effects.

1-Disinfectants or substances that kill microbes:

Including chlorine and ozone gases, which are mainly used to sterilize drinking water, as the first volatilize into the air and the second turns into oxygen. Sulfur dioxide is used in water "1-2%" as a disinfectant solution for devices, barrels, bottles, cork stoppers and other tools that are used in the beverage industry and some other food industries. The same gas is also used in treating and disinfecting the barrels by burning mineral sulfur inside the barrels, where the formed gas has Antiseptic effect**.(7**)

2-Substances that inhibit microbial activity, the most important of which are:

A - benzoic acid :-this acid has an inhibitory effect on bacterial and yeast enzymes inside the cell that control the metabolism of acetic acid "acetic" and the addition of phosphorous group by oxidation, as well as an effect on the cell wall. Its effectiveness is generally concentrated against yeasts and fungi "including the fungi that cause the formation of aflatoxin", while its effectiveness against germs is less. Only the de-ionized part of the acid has an anti-microorganism effect, which is why it can only be used as a preservative to preserve acidic products. It is used as a preservative in fat products such as margarine and mayonnaise, and it is also used in fish, vegetable, fruit and beverages products(**8**).

B- Sorbic acid and its salts: This acid has an inhibitory effect on some microbial cell enzymes, especially those related to the metabolism of carbohydrates such as enolase and lactate dehydrogenase, and to a lesser extent on a number of enzymes related to the citric acid cycle. Only the non-ionized part of sorbic acid has efficacy against microorganisms as it can deplete inside the cell, thus sorbic acid is distinguished over other preservatives due to its low rate of ionization, and for this, sorbic acid can preserve foods that are low in acidity or with a high pH. And sorbic acid affects mainly yeasts and fungi (including fungi forming aflatoxin) and it is less effective against germs. Catalase positive bacteria are more sensitive to sorbic acid than catalase negative bacteria. Aerobic bacteria are the most affected types, and the least affected are Lactobacillus and clostrdia. The reason for this is that the optimum pH for the growth of Clostridium is 7 and sorbic acid is not effective in this neutral area. However,

sorbic acid is effective in inhibiting Clostridium and preventing toxin formation when used in small concentrations which are considered ineffective alone, but with nitrites, table salt or phosphates, and with the reduction of pH to some extent. Sorbic acid is not suitable in practical application in preserving food contaminated with a large number of microorganisms, but only in preserving food produced in healthy conditions and containing a limited number of microorganisms. Some microorganisms have the ability to introduce sorbic acid into metabolismif the acid is present in concentrations less than the influencing or sublethal, or when the microorganisms are present in large numbers. Sorbic chickpeas are used to preserve fat products, dairy, meat, fish, vegetables, fruits, beverages, grain products, "pastries" and sweets(**9**).

C- Sulfur dioxide and sulfite salts: Sulfur acid and its salts have an effective effect against microorganisms, but its effectiveness against germs is much stronger than its effectiveness against yeasts or fungi. The effect of acid on yeast varies according to the offspring. Its effect against microorganisms is due to its interference in different ways in the enzyme system of the cell, especially the enzymes that carry the sh group. The sensitivity of these enzymes to sulfur is due to the inhibitory effect of the reactions that depend on the coenzyme “NAD” I. As is the case with other preservative acids, the degree of pH of the food to be preserved has a significant effect on the effectiveness of sulfur dioxide or sulfuric acid against microorganisms. Sulfur dioxide is widely used in preserving meat products, fruit and beverages.

D- Propionic acid and its salts: This acid has an inhibitory effect on microorganisms, especially against fungi. However, there are some strains of strains of fungi that can grow despite the presence of propionic acid. Some yeasts, such as some strains of Torula, have the ability to use propionic acid for their metabolism. Propionic acid and its salts have the ability to inhibit the growth of Bacillus mesenteric us spoilage and the formation of rope in bread. There are many types of microorganisms that produce propionic acid in metabolism. Some of them can use acid as an energy source for breathing, except in high concentrations, as is the case when they are used as a preservative. It has an inhibitory effect due to its accumulation in the cell, and it stops the metabolism of food by inhibiting the enzymes, especially the

enzymes that lead to the growth of the cell, as it competes with the substances necessary for growth, especially alanine and other amino acids. The acid and its salts are used successfully in the preservation of dairy products and pastes (**10**).

E-Oxidizing substances: the most important of which are nitrites and nitrates. They are mainly used in the manufacture of marinated meat with the intention of stabilizing the color and preventing the growth of anaerobic germs that cause corruption. Nitrates mainly affect anaerobic microorganisms while encouraging the growth of aerobic microorganisms and some microorganisms can use nitrates as a source of nitrogen. The concentrations used in meat processing have no effect on germs, and the effectiveness of nitrates on microorganisms is due to the nitrite that composes them. Some countries allow the addition of sodium or potassium nitrate in the processing of certain products of meat, fish and some types of cheese at concentrations not exceeding 500 parts per million in the final product. Due to the unpredictability of the extent of nitrate conversion to nitrite, some countries prohibit the use of nitrates and limit the use in food to nitrites for the purpose of stabilizing color and preservation. Nitrite does not affect the growth of any yeast or fungi, and its effect is limited to germs as a result of the formation of nitrous acid, and the resulting nitrogen oxides, as these compounds bind with the amine group of the enzyme dehydrogenase in the germ cell, which inhibits the activity of the microbe, which is a reaction as well. With hemoprotein such as cytochromes and sulfur-containing enzymes, the full details of the mechanism of nitrite's effect on germs are not yet known. The effect of nitrite increases by increasing the acidity of the environment, while it needs 4000 parts per million nitrite at a pH of 6.9 to inhibit staphylococcus aurus, This percentage drops to 400 ppm at a pH of 5.8, and to 80 ppm at a pH of 5.05. Therefore, adding acid-producing substances such as glucose-delta-lactone or inoculating with lactobacillus-forming germs increases the activity of nitrite. Nitrite is used in meat technology at a rate of 80-160 mg per kilogram, and this concentration is not sufficient to effectively inhibit bacterial growth. Other favorable conditions such as salt addition,

drying, storage temperature, heat treatment, and acidity modification, together with reduced microbial load of food, suppress bacterial growth (**11**,**12**).

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