

Food safety hazards in drying and marinating food



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Food Microbiology Assignment topic:

You have been approached by a local businesswoman who has developed a dried snack food to sell from her market stall. The product is made from thin strips of steak which are marinated with herbs and spices for 24 hours prior to being dried by gentle heating. The final dried meat product is stored at ambient temperature and intended for consumption without further processing as a snack food.

- a. What advice would you give the businesswoman regarding the potential food safety hazards that may be present in the snack product? Justify the reason for including each hazard in your advice. (Suggested word limit 500 words; 30% of the marks)

- b. What additional information would you request from the businesswoman to assist you in determining if the snack product is being prepared safely and consistently? Explain why the information you request would be important in establishing the safety of the food. (Suggested word limit 700 words; 50% of the marks)

- c. A sample of product is available for laboratory analysis. State which tests would be appropriate for this ready-to-eat product and the microbiological criteria you would apply to determine if the food was fit for human consumption. (Suggested word limit 300 words; 20% of the marks)

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Question (a)

What advice would you give the businesswoman regarding the potential food safety hazards that may be present in the snack product? Justify the reason for including each hazard in your advice. (Suggested word limit 500 words; 30% of the marks)

Developing the dried snack food requires food processing which includes transforming raw plants and animal materials, such as grains, meat and dairy. It is important that food safety is emphasized when developing food products as this can make them be safer to consume by destroying the toxins and also the elimination or inhibition of pathogens. Refrigerating, freezing, fermenting, drying and adding salt or sugar are techniques that can slow or stop the growth of pathogens. Processes that use heat such as pasteurization and cooking can eliminate pathogens. As this techniques do help to protect consumers, most cases involving foodborne illness include raw animal products, fruits and vegetables that have been contaminated by pathogens. (Hopkins, 2015, p. 9)

In regards to the development of the dried snack food, this product is made from thin strips of steak, which is a source of meat, originating from livestock animals and organisms are most likely to be present in raw meats. All animals carry bacteria in their intestine as they were from Farms. The organisms that are likely to be present here are Bacterias, and they are such as *E. coli* and *Salmonella spp.*

The organism, *E. coli*, is a common bacteria that lives in the lower gastrointestinal tract of humans and animals. It can be isolated from water and soil, and though most strains are harmless, there are some strains of *E.*

E. coli that are capable of producing powerful toxins that can be causing severe illness. As this organism lives in the gastrointestinal tract of animals, animals to human transmission is possible. Meat can be contaminated during the slaughtering or during processing, and infection can occur from eating contaminated undercooked meat (*E. coli* , UCSF Medical Center, 2002-2015).

In particular, one *E. coli* strain called *E. coli* O157: H7 can cause severe diarrhea and kidney damage (*E. coli* O157: H7 Infection, New York State, December 2006). *E. coli* O157 is a lipopolysaccharide 157 strain, and generally *E. coli* is a gram-negative bacteria, facultative anaerobe and non-sporulating bacteria. In its habitat, *E. coli* is a commensal bacteria and has rapid colonization. Beef and dairy cattle are known reservoirs for *E. coli* O157 and for example, the likelihood of consuming food such as beef burgers, human will get infected after consumption. Apart from the gut, *E. coli* is also found in soil. *E. coli* O157 may colonize the gastrointestinal tract of cattle, and potentially contaminate beef carcasses during processing. *E. coli* bacteria are classified by their O and H antigens and broadly categorized as Shiga toxin-producing *E. coli* O157 or non-O157 STEC. (Marler, Clark, 2005-2015).

Another organism that can be present in the meat, is *Salmonella* . *Salmonella* , lives in the intestines of humans, animals and birds. *Salmonella* may be found in the gut of many animals, including wild animals, farm animals and pets. Poultry are especially more likely to carry *Salmonella* . With proper and adequate cooking of meat and poultry, it usually kills *Salmonella* bacteria. Humans can become infected if they eat undercooked meat that is contaminated with *Salmonella* . (Dr Wright, Michelle, 2013)

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The usage of herbs and spices for the marination of the meat in this snack product brings about additional microbiological hazards, which includes *Bacillus* and some other spore-forming organisms that are capable of withstanding the drying process and producing toxins. Herbs and spices originate from plants and likelihood of the spore-forming organisms to be present.

Bacillus species are endospore-forming aerobic or facultatively anaerobic, Gram-positive bacteria and the spores are resistant to heat, cold, radiation, desiccation and disinfectants and it is a frequent cause of contamination.

Bacillus species are well known in the food industries as troublesome spoilage organisms (NCBI Bookshelf, 1996). Another sporeforming organism present in the food would be the *Clostridium* species. Clostridium is spore-forming Gram- Positive anaerobes bacteria. They are known to have produce variety of toxins, of which could be fatal (MicrobeWiki, 2010).

Having to state the above microbiological hazards, there are physical and chemical hazards too in regards to the potential food safety hazards in food manufacturing process. In physical hazards, sources for such contaminants include raw materials, badly maintained facilities/equipment and improper production procedures. Processors must have procedures to control physical hazards and also include hazard analysis portion of developing a HACCP plan (Food Safety – Physical Hazards, 2005). Chemical hazards include pesticides, herbicides, growth hormones and antibiotics, and additives. These shall be addressed in steps of the production process, which include the storage, during usage, during processing and prior to shipment of product. For the food safety management system, all chemicals used in manufactured

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product should have specifications developed, as well as a letter of guarantee from the manufacturer (Food Safety – Chemical Hazards, 2005).

b. What additional information would you request from the businesswoman to assist you in determining if the snack product is being prepared safely and consistently? Explain why the information you request would be important in establishing the safety of the food. (Suggested word limit 700 words; 50% of the marks)

In regards to the safe and consistent preparation of the snack product, it should include the following additional informations such as the slaughtering process, the heating process, the storage, the hygiene factors and proper preservation process.

As the product is made from meat, there has to be proper slaughtering process. In order to ensure that meat supply is safe, it is important that the businesswoman make efforts to keep feces from spreading from the animals' intestines or hides onto tables and the tools for slaughtering and butchering, or infact onto the meat itself. This is emphasized because in meat preparation, especially during the butchering, contamination does take place especially if the production lines of the processing moved so quickly, leading to likelihood of contamination of bacteria in meat and eventually causing foodborne illnesses (GRACE, Communications Foundation, 2015). In addition, she can also include meat inspection, so that she can ensure that the product for commercial sale is safely produced with the government inspectors present. Such inspection program is based on the Hazard Analysis and Critical Control Point (HACCP) system. This allows removing potentially

contaminated meat from the production line during the slaughtering processes.

Time and temperatures of marinating

It is stated that the strips of the steak are marinated with herbs and spices for 24 hours, prior to being dried by gentle heating. This is seen as marinating outdoor and in room temperature, and bacteria can quickly multiply on raw meat. Marinating at room temperatures causes meat to enter the Danger zone between 40 degrees F. and 140 degrees F., where bacteria multiply rapidly (Stradley, Linda, 2004-2014). Marinating times vary depending on the type of cut and size of the meat. All meats are best refrigerated after marinating

http://textbookofbacteriology.net/nutgro_5.html

<http://www.fao.org/docrep/004/t0279e/t0279e03.htm>

<http://www.maff.go.jp/aqs/hou/require/pdf/17-1095cn.pdf>

<http://www.encyclopedia.com/doc/1G2-3409800375.html>

<http://www.fao.org/docrep/t0562e/t0562e04.htm>

The second factor would be the heating process. It is stated that the strips of the steak are marinated with herbs and spices for 24 hours and they are dried by gentle heating. In this process, it is important that the businesswoman ensures that the heating of the meat is long enough so that most of the pathogens are killed off. The heating parameters to be applied in meat processing can vary considerably in temperature and duration,

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depending of the type of product. Heat treatment methods cause various physical and chemical alterations in meat, which also results in the beneficial sensory and hygienic effects on processed products (FAO, United Nations 2013). For processed meat products, the exact temperature control is indispensable as there should be balance found between the two opposite requirements and they are firstly, heat treatments temperatures should be raised high enough to accomplish proper microbial reduction for shelf life extension, and the other, the heat treatment temperatures should be kept low enough to prevent deterioration of the eating quality.

The organisms least affected by the conditions on meat surfaces are Salmonella and E. coli and are likely to be the main hazards on meat of normal pH held at room temperatures. Mesophilic bacteria are involved in food contamination and degradation such as in meats

Times and temperatures of drying

The storage

In the proper preservation process, it includes the water activity (aw), which is a free water in the food product

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