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A Review Report of Hygiene and Safety of Foodstuffs in Iranian Army

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ABSTRACT

Unhealthy foodstuffs are responsible for as many as 2 million deaths every year most whom are young children. Food poisonings are on the top of the list of major food concerns for many politicians. On the other hand, we may also say that application of biological materials against various purposes such as agriculture may take different forms. Such activities can be described in terms of three words: biological war, biological terrorism, and biological crime. New threats against foodstuffs health are emerging every day. Changes made to production methods, distribution and consumption of foodstuffs, changes made in the environment, development of new pathogens, and antimicrobial resistance are a major challenge against the health of foodstuffs. The present research has used descriptive-analytical and inferential methods to analyze the data obtained through library researches. The present research seeks to improve the hygiene level and safety of foodstuff in the chain of production, distribution, storage in the food resources of the Iranian Army and to minimize the level of contaminations and diseases associated with foodstuffs. It also seeks to minimize the food waste. All these goals are accomplished by establishing health management and food safety systems and international standards. These standards form a useful strategy in order to make sure about the food safety in food chain whose key elements are mutual communication, management system, proposed plans, loss analysis principles, and critical points control. A nutrition plan based upon the scientific principles and with due consideration of all our requirements that has no microbial, chemical, etc. contaminations will certainly guarantee human health. By making it possible to have access to healthy food in production, distribution and storage chain, we may prevent food-based diseases among conscripts and army personnel.

Key words: Hygiene, Foodstuff Safety, Health, Standard, Army

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INTRODUCTION

Hygiene and safety of foodstuffs is a major principle in preventing affliction with various diseases and preserve the environment from various contaminations (1). Millions of people get afflicted with diseases which are transmitted through foodstuffs and this is a common problem in all countries (2). The diseases which are transmitted through the foodstuffs are a sign of the prevalence and development of general health problems in developing and developed countries. However, these problems have a greater effect on health and economy in developing countries than what is observed in developed ones (3). WHO views the diseases caused by contaminated foodstuffs as one of the most important hygiene problems in contemporary world. Many people in less developed countries are poisoned as a result of poor hygiene information and storing food in unhealthy conditions (4). Statistical information point to the fact microorganisms are responsible for most cases of diseases transmitted through foodstuffs (5). Having access to a sufficient amount of food is a basic need for humans. Making sure of the health and safety of food is a major concern of many health organizations, governments and individuals (6). The dangers posed by unhealthy foodstuffs are quite significant and they are sometime difficult to measure. Production of healthy food is a chain involving various groups

and no individual group can be held responsible for producing healthy food (7). The chain of producing healthy food starts from farms and continues with production, storage, distribution and ends with consumption. Distributing foods while they are completely bereft of any microorganisms can never be achieved as most of them have an animal or a plant origin. The environment where the food is produced impedes the process of producing non-contaminated food, but there are methods that help reduce foodstuffs contamination (8). Foodstuff producers are required to use logical methods to prevent entrance of risk factors into the food chain. To assure food safety, the food needs to be distributed in a proper manner and the consumer must prepare it in a good way (9).

The diseases associated with foodstuffs are caused through unhealthy processes of preparing foodstuffs and include intoxications and poisoning. Microbes such as Salmonella, Campylobacter, Escherichia coli and Listeria are responsible for food infections, while Staphylococcus aureus and Clostridium botulinum develop in the food, increase and produce poison. Then, they cause food poisoning (10). Acting as a vehicle, food can carry many infectious and non-infections germs. It can support the development of the infectious germ and act as an active carrier or just act as an inactive carrier. In the latter case, the infectious factor will not grow in the food and will only be transmitted to humans through food (11). These diseases endanger many lives every year and culminate in social and economic problems and these diseases are more common in developing countries. The military personnel as people who have an active and stressful life are never an exception. They require a special and healthy diet due to their physical and mental conditions (12).

So far, no bylaw has been passed concerning the hygiene, quality and safety of foodstuffs from farm (production level) to plate (last consumption phase) in the Iranian Army. As a result, in an attempt to improve the hygiene and security level of foodstuffs in production, distribution and storage chain of the food resources of the Iranian Army and in the military sections of the world armies (with relatively similar contents), we decided to prepare a review report of foodstuffs hygiene and safety.

MATERIALS AND METHODS

This is a library research conducted through notetaking. Having identified the resources, the important and required issues were compiled in research notes. The reference from which each information was obtained was specifically specified and all the notes were classified with a proper and logical order.

In this library research, all printed documents such as books, encyclopedias, dictionaries, magazines, newspapers, weeklies, monthlies, yearbooks, printed interviews, research papers, scientific congregation books, scientific texts indexed in information banks and internet and intranet and any other printed source were utilized.

To collect information concerning the theoretical principles and literature of topic, library resources, articles, required books and websites were utilized. We used descriptive-analytical and inferential methods to analyze the data obtained through library researches. By making a qualitative comparison of the results obtained in assessing the foodstuffs hygiene and safety bylaw in the military sections of the army, we searched the bylaws which are used in American and European countries.

RESULTS

The results are, hereby, divided into two parts: 1) foodstuffs hygiene and safety in the army and 2) foodstuffs safety, security and preservation in some world armies.

First part: foodstuff hygiene and security

1. Managing foodstuff purchase

One of the effective factors in preserving the power of military forces to carry out their duties is their health which is accomplished through correct nutrition and with due observation of scientific principles. The authorities are required to make thorough plans and manage nutrition as a particular issue with great priority so that it can be organized, planned, and managed in a proper manner (13).

1-1 Supply chain management

Supply chain management includes the process of effective planning, executing and control of ingredients' flow, the assets, final products, and its relative information flow from the starting point to consumption which seeks to answer the demands of consumers (14).

Kaihara (2001) describes supply chain management as one of the best tools which can be used to improve organizational performance (15).

Keysuk Kim (2007) has also come up with the following definition: supply chain management tries to create trust between various stages of the chain, exchange information about market demands, and develop new products so that the various stages of this chain may have a long-term relationship with one another in order to fulfill the consumers' needs (16).

2. The process of purchase

The main goal of purchase management is to systematically decide to find useful and effective answers in order to determine the best purchase arrangement. The processes of purchasing, buying and obtaining the needs are some financial methods which are made possible by paying money. However, provision may be accomplished using non-financial methods such as takeover and seizure. Lisons (2000) has defined purchase as the process of assessing needs, selecting the suppliers, determining the price and negotiation, and making arrangements for shipment (17).

2-1 Status (system) of the purchase section

Purchasing is a difficult task which requires accuracy, patience, assessment, and determination. Simply put, purchase management is systematic decision making in order to find useful and effective answers for the three topics concerning purchase subject, purchase source, and purchase time collectively known as purchase mix.

Organizational purchase task consists of four main dimensions. These dimensions are (18):
Technical dimensions: it is concerned with the properties of purchased products. Commercial dimensions: it deals with conditions and terms which need to be negotiated with supplier. Logistic dimensions: it is concerned with the timing and delivery of products. Executive dimensions: it deals with executive activities that the buyer must take.

Duties of each dimensions:
1. Technical dimensions: A) specifying the properties and particulars of products and services. B) studying the authenticity and quality of suppliers. C) value analysis. D) quality control. E) selecting the supplier. F) signing the contract. 2. Commercial dimension: A) market researches. B) meeting the suppliers. C) asking the price and studying it. D) negotiating with the suppliers. 3. Logistic dimensions: A) optimization of the order policy and controlling the inventory. B) acceleration and follow up. C) inspection. D) supervision of timely delivery. 4. Executive dimension: archiving the suppliers' documents, managing the orders and acceleration. B) follow up and making payments to suppliers.

3. The principles and policies governing the purchase activities of military organizations

The major principles that need to be followed by military organizations while purchasing materials:
1. good quality: the buyer is required to receive the properties and standards of the product ordered. The purchase system will not be allowed to buy something if it doesn't have the particulars and properties of that product.
2. proper amount: as the purchase system is not allowed to buy anything unless the amount of order is specified, a major principle in this system is purchase based upon the order of the consumer.
3. proper price: the proper price is the result of the real value of product based upon proper source in proper moment.
4. proper source: the buyer is required to identify the most appropriate and favorable production and sales source and take proper measures to purchase the products.
5. proper time: as purchasing is always influenced by economical, industrial, manufacturing, and commercial conditions of market, the buyer should always be looking for a proper purchase time.
The general phases of purchase are as follows:
1. Examining the properties of product 2. Examining the price and value 3. Examining the sources that provide the product 4. Negotiating with suppliers 5. Purchase rituals and signing the contract 6. Examining and guaranteeing the quality of products 7. Carrying and delivering the products

4. Important hygiene and safety points while providing and preparing food

First stage: providing the ingredients
Raw ingredients, particularly those that expire quickly, must be obtained from familiar sellers or well-known shopping centers. 1. Check the Standard emblem and expiry date on the package while buying packed foodstuffs. Make sure the products are fresh and safe. 2. The cans of food should look natural (without any depression or bump). 3. Time and temperature are two important factors for perishable items. The proper temperature for diaries or meat products must be below 7 °C while buying them. 4. The foodstuffs need to be separated from one another while they are being carried.

Second stage: hygiene and safety in preparing foodstuffs

1. observing the principles of personal hygiene. 2. All instruments and the place where the food is being prepared need to be cleaned before and after cooking. 3. All raw foodstuffs need to be completely washed and cleaned before consumption.

Third stage: cooking hygiene
1. Meat must be cooked in a temperature of at least 60 °C. 2. The ingredients must be added in the early phases of cooking so that they get prepared in proper temperature. 3. Smoking is forbidden during the whole process of food preparation. 4. Using burnt out foodstuffs, particularly meat and bread, must be absolutely forbidden. 5. Hands should never touch face, hair or any other thing other than clean dishes and foodstuff while preparing the food.

Fourth stage: health tips while distributing and consuming food
1. Hot food must be consumed when it is still hot and cold food must be used cold. 2. The time we spend on eating should not be too long as room temperature is the ideal setting for growth and development of pathogens. 3. Never use slow heat transfer method while heating the food. 4. Always check the expiry date of pre-prepared foods before consuming them.

5. Risk assessment
Many chemicals with a human or natural source enter food and water. These chemicals are unfavorable contaminations or are part of the mixture used in a diet. The following contaminations with a human source have a major influence on the health of individuals and animals: resistant organic contaminations (such as Dioxin, Polychlorinated biphenyls, fire resistant materials containing Boron, Perfluoro Alcoholic acid), Maillard reaction products (Acrylamide, furan), Phthalates, medical products and acid residues and chemicals allowed to be used in food products and animal food such as Pesticides/Biocides and food additives (19). The major groups of natural contaminations are heavy metals such as lead, cadmium, uranium, mercury, and metalloids such as Arsenic and natural poisons produced by bacteria, protozoa, algae, fungus, and plants.

Measuring the risk of chemicals: general principles
Measuring the risk of chemicals on human health is a hot topic in many researches conducted by international organizations dealing with foodstuff safety such as Joint Expert Committee for Food Additives (JECFA), Food and Agriculture Organization (FAO), World Health Organization (WHO), Environment Preservation Agency of the US (EPA), Food and Drug Administration (FDA) of the US, European Food Safety Authority and many other national organizations. In toxicological terms, risk assessment converts the external dose (assessing exposure to danger, the amount of material we are exposed to) into internal dose (toxicodynamics, meaning the ultimate effect of poison on the body). This dose is then studied to determine the safe exposure level to this danger (19).

5-2 Assessing the risk of chemicals in food for humans
Assessing the risk of chemicals which are being used for humans seeks to protect human populations against the potential risks of exposure to chemicals. This is accomplished by determining the safe levels of exposure through separate methods for mutagenic Carcinogenic substances or threshold toxicity. MOE method is used for mutagenic compounds or their active metabolites that interact directly with cellular DNA. This forms a Covalent bond in target cells which culminates in tumor formation in laboratory animals.

6. Identifying the danger and its properties
For a specific chemical substance, the danger features determination seeks to evaluate all data associated with toxicokinetics (absorption, distribution, metabolism and excretion) and mode of action and toxicity (target organ, ultimate toxicity point) of that material and it seeks to identify accumulation/removal patterns. In some limited cases, human epidemiological data have also been utilized to identify the danger and determine the properties of danger, particularly for contaminations such as Aflatoxin B1, heavy metals (lead, cadmium) and metalloids (arsenic) (19).
In the absence of sufficient toxicological data for human and animals, structure-activity data can also be very important for predicting toxicokinetics of chemical substances in the body and it is an indicator of its toxicity for groups with relatively similar chemical structure and it may include threshold of toxicological concern (TTC). TTC method was first proposed for determining the contact thresholds below which a material may be considered without any harmful effects.

7. Experiments for determining the safety of foodstuffs

Toxicological examinations are carried out on all compounds such as intentional additives and pesticides. First, an accurate experiment needs to be carried out on materials where at least 2 types of lab animals are used in order to specify the lethal dose 50 (LD50) (a dose which kills half the population of an animal). If the substances under consideration have a low level of toxicity, metabolic experiments would be carried out on several species of animals. These tests track what happens to substances inside our body known as toxicokinetics. Then, acute toxicity tests are conducted. They require nutrition in a range of lethal doses below LD50 and are carried out on at least to species and last 2 to 3 months.

8. Analysis of contaminations, residues, and harmful chemical compounds

The intensity of a damaging effect caused by a danger in the food is usually directly associated with the dose of that material. In most cases, there is a threshold with no harmful effects in levels below it. EPA determines these resistance levels and FDA and USDA support them. However, the dangers associated with food, microbial and chemical safety continually take place in the nature. The residues of pesticides, mycotoxins, veterinary medicines, some food additives, and environmental contaminations constitute major concerns. Rapid Alert System for Food and Feed (RASFF) reports that as many as 12641 alarms were sent from July 2003 to June 2007. These alerts are categorized as follows: chemical alerts (44%), mycotoxins (29%), microbial (17%), and other alerts (10%). In chemical alerts group, the greatest hazard reports belonged to allergens (such as Histamine and Sulfite), heavy metals (such as mercury, lead, and cadmium), pesticides (Omethoate, Dimethoate, Isofenphos-Methyl) and veterinary medicines (such as beta-lactam, nitroforans, Nitrofurals, Sulfonamide, and Chloramphenicol).

8-2 Analytical method

Similar to the analysis of any foodstuff, there is an array of techniques to analyze the hazards of a foodstuff. Various factors such as goal, expenditures, attempt, reliability of method, food matrix complexity, the probable level of contamination, and availability of analysis devices influence the selection of method.

8-3 Selectin the analysis method

Selecting an analysis method to identify and specify the dangers in food should account for complexity of food matrix. It should also account for the properties of analyte such as polarity, hydrophobia, Volatility, thermal stability, and chemical reactivity (20).

9. Qualitative, semi-quantitative and quantitative methods

Qualitative and semi-quantitative methods which are known as screening methods are usually used to test a relatively large sample size to check if there is one or more contaminant from a similar family. These methods are used for a relatively short period of time. These methods are usually very powerful, have little sensitivity for small changes in experimental or environmental conditions and are not limited to the controlled environment of labs. While qualitative methods identify certain contaminations, semi-quantitative methods are used to estimate the density of a contamination or residue of a toxin. The main advantages of these methods can be described as low cost, relatively quick pace, and simplicity. These methods include thin layer chromatography (TLC), enzyme inhibition, and security test.

10. Biochemical technics

Similar to enzyme inhibition and security test, biochemical technics are widely used to diagnose pesticides. The test kits are commercially available such as enzyme inhibition tests. These tests are usually based upon inhibiting a certain enzyme essential for vital performances among insects using the pesticides discussed in the sample. Without any pesticide, the enzyme would remain active. It will have a reaction with substrate and the color changes. If there is no color change, the test for pesticide presence will be positive and future verification tests will be carried out with more complicated enzymes such as HPLC and GC so that the presence of certain pesticides can be diagnosed and they can be quantitatively measured.

11. Chromatography technics

11-1 Thin layer chromatography

Thin layer chromatography (TLC) can be used for screening in analyzing pesticides. Due to its low separation power, low accuracy, and limited identification of GC and HPLC, this technic can not be utilized as a quantitative method. However, TLC can be used as a semi-quantitative method. An example is its utilization in identifying and estimating the level of pesticides that inhibit insect enzymes such as Cholinesterase.

11-2 Gas chromatography

Through development of Silica Gel capillary columns, many pesticides with different physical and chemical properties can be separated and diagnosed. GC is usually the preferred method used to diagnose volatile and heat-resistant pesticides including Organochlorides and Organophosphate. The columns and detectors are selected based upon the nature of pesticides. For example, the stationary phase containing 5% Diphenyl and 95% Dimethyl Polycyclosans are usually used in MRM's.

11-3 High Performing Liquid Chromatography

Using HPLC analysis is quite necessary to separate and diagnose the pesticieds as some pesticieds exhibit low volatility, high degrees of polarity and are unstable when exposed to heat. Groups such as N-methyl carbamate (NMC), Urea herbicides, Benzoyl urea pesticides, and Benzimidazole Fungicides are usually analyzed by HPLC. These compounds are usually analyzed by reverse phase chromatography using C18 or C8 columns and Aqueous mobile phase, UV absorption detectors, UV diode arrangement, fluorescence, or MS.

12. Analysis and Mycotoxin

Molds that are Filamentous fungi can develop on foodstuff and produce various types of chemical toxins collectively known as mycotoxins. The main producers of mycotoxins are fungus species belonging to Aspergillus, Fusarium, and Penicillium. More than 300 mycotoxins belonging to various chemical groups have been recognized. The mycotoxin groups with a toxic influence on human health are Aflatoxins (B1, B2, M1, M2, G1, and G2), Ochratoxin (such as Ochratoxin A, OTA), Terry Coltsen (such as deoxynivalenol (DON), T2, HT-2), Fumonisins (FB's such as FB1, FB2, FB3, etc.), Patulin (a certain type of mycotoxin usually found in apple and products made from apple), and Zearalenone (ZEA). Mycotoxins have the following toxic effects: Genotoxicity, Carcinogenicity, mutagenicity, and immunotoxicity. Genotoxic compounds can be effective in every dose. Thus, it is impossible to define a threshold dose for them and foods should never be exposed to them.

A key critical point to limit humans' exposure to mycotoxins would be to prevent processing raw materials with unaccepted levels of mycotoxin. As a result, periodic tests are a necessity which include safe sampling methods and analysis confirmation methods. Organizations such as AOAC, American Oil Chemists Society (AOCS), AACC, and International Union of Applied and Absolute Chemistry (IUPAC) have certain conformational plans to analyze mycotoxins.

13. Identification and measurement

Following sampling, sample preparation mostly includes extraction, purification, and condensing. Sample preparation steps which are dedicated to mycotoxin are usually developed. ASE is usually used to extract mycotoxin, while SPE is usually used for purification particularly when several mycotoxins are required. For a particular mycotoxin, LC is used for purification.

In what follows, we will briefly discuss some current and newly developed analytical methods for measuring and identifying mycotoxins in foodstuffs.

14. Quick diagnosis methods

14-1. TLC

Many TLC methods have been admitted for analyzing mycotoxins by AOAC including DON for wheat and barley, aflatoxin in peanut and corn, M1 aflatoxin in milk and cheese, OTA in barley and green coffee, and ZEA in corn. General TLC technics are usually used for screening and their identification range is 2 ng/g (21).

14-2. Immunology tests

Three main types of security tests can be used to analyze mycotoxins: radioimmunoassay (RIA), ELISA, fluorescence polarization immunoassay (FPIA). Using RIA, where mycotoxins (such as aflatoxin) are labeled with radioactive substances, has gradually been replaced by ELISA. Immunoassay methods including membrane-based immunoassay, LFS and biosensors are also used to control or test mycotoxins. Membrane-based immunoassays are based upon the principles of direct competitive ELISA principles where mycotoxin antibody covers the surface of membrane. For instance, test kits based upon membrane-based immunoassays have been confirmed for OTA measurement in wheat, rye, corn and barley. LFS, an Immuno-chromatographic test, is a quick method capable of diagnosing many mycotoxins simultaneously.

15. Quantitative and conformational chemical assessment methods

15-1. HPLC

For the purpose of quantitative assessment, HPLC is the favorable method for many mycotoxins particularly aflatoxin, DON, OTA, ZEA, FB, and patulin. Derivation before injection after column and after exiting the column (using Trifluoroacetic acid or iodine) is necessary for diagnosing fluorescence aflatoxins, OTA, ZEA, and FB.

However, direct UV detector is used for DON and Patulin (22). Just like pesticides residue analysis, pairing HPLC with MS analysis particularly LC-MS/MS provides greater sensitivity and selection and allows us to simultaneously analyze several groups of mycotoxins.

15-2. GC

GC is not extensively used to diagnose mycotoxins, except for trichothecene. Trichothecenes don't have strong light absorption in UV-Vis range and they are non-fluorescence: as a result, GC methods have been developed to measure them. GC capillary column is used for simultaneous diagnosis of various trichothecene such as DON, T2, and HT-2 through derivation with Trifluoroacetyl, Heptafluorobutyric, or Trimethylsilyl with electron receptor detector.

15-3. Capillary Electrophoresis

Capillary electrophoresis (CE) is usually known as a chromatographic technic and can be used to separate mycotoxins from food matrix components using electrical potential. These methods are used to detect patulin in apple juice, Ochratoxin (A & B) and aflatoxins. It is also used to determine ZEA using Cyclodextrin (to improve inherent fluorescence property).

16. Analysis of antibiotics residues

The residue of any antibiotics given to animals that are eaten by humans causes concerns for several reasons. Some consumers might be allergic to some antibiotics besides the possibility that some microbes may grow resistant to antibiotics as a result of constant exposure to them. Recent information has shown that some antibiotics may also be carcinogenic such as Nitrofuran compounds. Using quick monitoring method, samples are analyzed for presence of antibiotic residues. Obtaining a positive result from a screening test suggests one or more than one type of antibiotics. Thus, more tests are required to diagnose and to quantitatively measure current antibiotics.

17. ISO 22000 standard

This standard determines a foodstuffs immunity management system which guarantees key known elements to ensure the safety of foodstuffs throughout the foodstuffs chain up to consumption: 1. Mutual relationship, 2. System management, 3. Prerequisite plans, and 4. HACCP principles.

This standard determines the following standards in order to enable an organization:

A- Planning, designing, enforcing, applying, preserving, and updating a food safety management system in order to provide products with required safety and standards. B- Proving that the requirements and safety standards of foodstuffs match one another. C- Studying and measuring customers' obligations and pointing to the fact that this mutual agreement would result in greater satisfaction on the part of customers. D- Effective relationship concerning the foodstuff safety and providers and other interest groups in food chain. E- Ensuring that the company follows foodstuffs' safety policy. F- Proving such match between the relative interest groups. G- Asking for certificate or registration of foodstuffs immunity management system by an external organization through self-assessment, self-expression, or following this standard (23).

18. General obligations

The organization is required to design, document, and execute an effective foodstuffs immunity management system and update this standard if necessary. The organization must ensure that the dangers threatening foodstuffs immunity are identified, assessed and controlled in a proper way so that the organization's products cause no direct or indirect damages to the health of consumers, B- exchange the proper information concerning the safety aspects of products throughout the food chain, C- exchange information about development, execution, and updating foodstuffs immunity management system throughout the organization in order to ensure the foodstuffs immunity specified in this standard, D- the foodstuffs immunity management system needs to be periodically updated so as to make sure that it reflects company's activities and provides the latest information concerning the measures taken to control foodstuffs immunity hazards (23).

18-1 Documentation necessities

Documentation of foodstuffs immunity management system must include:

A- foodstuffs immunity policy statements and documented goals, B- executive methods and the required documented records for this standard, and C- the documents that the company requires to ensure effective development, execution and update of foodstuffs immunity management system.

A documented executive method needs to be developed in order to determine the following necessary controls:
A- passing documents for their adequacy before publicizing them, B- reviewing and updating documents and re-approving them if necessary, C- ensuring diagnosis of changes and current revision status of documents, D- ensuring the availability of documents' edition in the places where they had been used, E- ensuring that the documents are readable and can be easily recognized, F- ensuring that those documents whose sources are outside the organization can be identified and easily controlled, G-preventing any unintentional utilization of obsolete documents and ensuring their diagnosis if they are preserved for any reasons (24).

19. Records control
In order to provide evidences of following the necessities and evidences of utilizing foodstuffs immunity management system, records must be made and kept. These records need to be readable and easily identified and restorable. A precise method needs to be defined in order to provide the controls necessary for diagnosing, storing, preserving, restoring, storage time and to determine the assignments if various individuals.

19-1 Responsibilities of management
19-1-1 Obligations of management
The senior management is required to provide evidences concerning its commitment to developing and executing foodstuffs immunity management system and their constant improvement through the following measures:
A- showing that foodstuffs safety is supported by company's financial goals, B- making the company aware of the importance of fulfilling the requirements of this standard, legal requirements and rules and customer's obligations concerning foodstuffs immunity, C- establishing foodstuffs immunity policy, D- leading management revisions, and E- ensuring access to resources.

20. Foodstuffs immunity policy
The senior management must determine, document, announce and communicate its foodstuffs immunity policy. The senior management must ensure that foodstuffs immunity policy:
A- complies with the role organization plays in foodstuffs chain, B- complies with both legal obligations and safety rules and requirements of foodstuffs agreed upon with customers, C- is announced, executed and preserved in all levels of organization, D- is revised in order to guarantee its continuation, E- describes the relationship in a proper way, and F- is supported by measurable goals.

21. Planning foodstuffs immunity system design
The senior management must ensure that:
A- foodstuff immunity system design seeks to achieve the obligations and organizational goals that support foodstuffs immunity, B- system's integrity is preserved when changes are made to foodstuffs immunity management system (25).

21-1 Responsibility and authority
The senior management must ensure that the responsibilities and authorities defined inside the organization in order to have an effective performance and preserve foodstuffs immunity management system are being executed and communicated. All employees are responsible for reporting foodstuffs immunity management system to certain individual. Selected workers need to possess defined responsibilities and authorities in order to begin and record their actions.

21-2 Foodstuffs immunity group leader
The senior management needs to select someone to lead foodstuffs immunity group regardless of other responsibilities. This individual must be authorized to:
A- manage foodstuffs immunity group and organize its affairs, B- ensure proper education and training for group members, C- ensure development, execution, preservation and updating foodstuffs immunity management system, and D- report about the effectiveness and efficiency of foodstuffs immunity system to senior management.

21-3 Outside the organization relationships
This is used to ensure that enough information about foodstuffs immunity aspects is available throughout the food chain. The organization is required to take proper measures to communicate with the following:
A- providers and contractor, B- customers or consumers, particularly concerning the product information (including instructions about consumption, storage obligations in proper cases, durability), requests, contracts or orders such as amendments and customers' feedback like their complaints, C- legal references and rules, D- other organizations that play a major role in effectiveness

or updating foodstuffs immunity management system.
Such relationships must ensure the immunity of organization's foodstuffs in relative to other organizations inside the food chain (24).

21-4 Inter-organizational communications
The organization needs to establish, execute and preserve a positive relationship with its employees concerning the rule they play in foodstuffs immunity. In order to ensure the effectiveness of foodstuffs immunity, the organization needs to be sure that group members are aware of these changes:
A- new product(s), B- raw materials, ingredients and services, C- equipments and production systems, D- production halls, where the equipments are located, the surrounding environment, E- cleaning and optimization plans, F- package, storage and distribution systems, G- workers' level of proficiency or their duties and authorities, H- legal rules and necessities, I- knowledge of foodstuff hazards and control actions, J- obligations of customer, unit and organization, K- requests submitted by other interest groups outside the organization, L-the complaints showing foodstuff immunity hazards of products, and M- other conditions influencing foodstuffs immunity.
The data need to be presented in such a way that the senior management can relate the information with foodstuffs immunity system.

21-5 Preparation and reaction in emergency situations
The senior management needs to take into consideration the emergency conditions and potential incidents that may influence foodstuffs safety and the role of organizations in food chain and predict proper measures to plan, execute and preserve them (25).

22. Controlling foodstuffs hazards
Owners of foodstuffs companies need to use systems such as HACCP in order to control the dangers and hazards of foodstuffs. They must:
A- identify operations for foodstuffs safety. B- execute effective control methods. C- control methods need to be constantly monitored to assure their effectiveness. D- review control methods periodically when the operation changes. E- these systems are utilized to control foodstuffs health during the food chain through proper design of product and procedure.

23. Key aspects of health control systems
Time and temperature control: insufficient control of foodstuffs temperature is one of the most common causes of food intoxication or the diseases caused by it. These controls include length and temperature of cooking, cooling, processing and preserving in storages. Effective control of temperature is a critical factor to ensure foodstuffs safety. The following factors need to be taken into consideration in temperature control system: nature of the foodstuff such as water activity, pH, possible initial microbial load and the type of its microorganisms, the durability period of product, processing and packing methods and temperature keeping devices need to be controlled to ensure their functioning.
Other phases that help foodstuffs hygiene are as follows:
Cooling, heating procedure, irradiation, drying, chemical preservation, packing in vacuum or modified and improved atmosphere.

24. Microbial and other features
Management systems provide us with a way to ensure the safety and appropriateness of foodstuffs. In cases where microbial, chemical or physical properties are utilized in foodstuffs control system, these properties need to be monitored based upon proper scientific and legal principles and improved if necessary (24).

25. Microbial secondary (intersecting) contaminations
Pathogenic microorganisms can be relegated from one foodstuff to another. These transfer may take place as a result of direct contact or through individuals handling foodstuffs, contact surfaces or air. Non-processed raw foodstuffs need to be physically or temporally separated from prepared foods. They also need to be cleaned and, if necessary, disinfected (23).

24-2 Physical and Chemical Contamination
A system needs to be established to prevent food contaminations caused by external objects such as glass, Iron filings from machines, dust, harmful steams and unfavorable chemicals. In various phases of production and processing, proper tools need to be utilized to trace and separate contaminations.

24-3 Necessities of ingredients
Raw materials and ingredients containing fungus, harmful microorganisms, pesticides, animal

medicines or toxic products, spoiled materials and external particles which can not be minimized through separation or common processing should never be accepted by organization. The properties of raw material need to be determined and applied wherever suitable.

25. Packing

Designing, packaging and the materials used in production should minimize contaminations and prevent any harm to foodstuffs and comply with proper labeling principles. The packed materials or gases used need to be non-toxic and cause no danger as a result of storing and using them in pre-specified conditions. Reusable containers (such as soda bottles) need to be durable and impregnable.

26. Inspection management

The required type of control and inspection depends upon the size and extent of the work, nature of its activities and various types of foodstuffs. The managers and supervisors need to possess sufficient knowledge concerning the principles and methods of foodstuffs health so that they can comment on possible hazards and take preventive and proper measures and ensure effectiveness of inspection and monitoring.

27. Documentation and record keeping

Whenever required, production processing records must be kept longer than food durability period. Documentation can enhance the validity and efficiency of foodstuff immunity control system.

28. Recalling executive methods

Managers need to ensure there are proper executive methods in place concerning foodstuff immunity hazards and it is possible to recall final products from the market if necessary. Whenever a product is recalled as a result of health hazards, other products produced under similar conditions which may have similar dangers for general health need to be analyzed in terms of their immunity and recalled if necessary. People need to be informed of what's going on if necessary (23).

29. Foodstuffs transportation

Following the general principles of health and hygiene during transportation is quite necessary to prevent any contamination and toxicities. If proper measures are not taken while transferring the foodstuffs, it will be highly possible that the foodstuffs may get contaminated. Such a scenario is possible even if proper hygiene measures are taken throughout the foodstuff chain.

30. Operation control in foodstuffs transportation

The transporter needs to keep a record of all cargos, their cleanness and full information of transportation units in order to analyze the potential risk factors. These records need to be kept in an easily accessible place for a period of six months (26).

Section two: foodstuffs immunity, safety and preservation in some world armies

1. The US Army:

Foodstuffs management organization requires risk management, responsibility of major companies and legal obligations. However, this condition must have a competitive nature and preserve and improve brand validity (American State Standard, 2003) (27). An effective foodstuffs immunity management system based upon fixed standards in all levels of production, distribution and consumption is required so that we make sure the foodstuffs are healthy. What's more, assessment and issuing management system certificate by an independent third person would optimize the immunity of foodstuffs management system (American State Standard, 2003) (27). The US Army is known to take foodstuff immunity and preservation issues very serious. As a result, the reported number of diseases associated with foodstuffs in Army Organizations has experienced a substantial decrease (Medical Regulations of US Army, 2002) (28). The foodstuff immunity, safety and defense of US Army seeks to integrate the activities of various organizations inside and outside the army in order to carry out researches in the field of bacteriology, sociology, economics, bioterrorism, etc. (US Army Regulations, 2006) (29). In major organizations such as the US Army, there is a system in place to control the crisis and danger caused by food immunity hazards. The US Army is obliged to use the products of major industrial companies active in the field of foodstuff production with a famous brand. These companies need to possess a unique trades system in order to compete in sales markets by improving quality and obtaining a greater share in sales market (US Army Standards, 2002) (30).

The US Army has an inspection chain which controls the immunity of foodstuffs from source to consumption. Source monitoring is carried out by their health audit or by well-known foodstuff

control organizations such as Food and Drug Association (FDA) and US Department of Agriculture (USDA) in production industries. This audit has been achieved through guidelines provided by Department of Defense (US Food and Drug Association, 2005) (31). This document has been verified to be used by all organizations of Department of Defense. The Department of Defense is committed to producing and storing healthy foodstuffs and supervises foodstuff organizations in order to prevent diseases from being transmitted through foodstuff contamination and diseases to US Armed Forces members.

1-1. Resources and organizations verified by the US Army

In order to ensure the immunity and safety of the foodstuffs consumed by its personnel in critical and dangerous conditions, the US Army has prepared a list of verified foodstuffs providers that follow the principles and guideline passed based upon US Army Standards (US Army Regulations, 2006) (29). This guideline requires every organization seeking to cooperate with the US Army in providing foodstuffs in all levels (production, distribution, and storage) to follow these standards and principles and the inspectors and audits defined in this guideline must be allowed to examine them (US Army Regulations, 2006) (29).

2. Malayan Army

Private corporations and governmental organizations such as the army have paid special attention to foodstuffs immunity issue. A rise was observed in food-transmitted diseases from 2005 to 2008 in the army and other organizations of Malaysia (32, 33). Transmission of diseases through foodstuff can be attributed to various factors. One of these factors is the major damage caused to foodstuffs quality by those who prepare them, particularly in the army and other military organizations, hospitals, etc. that prepare and distribute large amounts of food. As these people and others involved in in food transfer chain have insufficient information of immunity and foodstuff health issues, contaminations may get transmitted to consumers of their final products (FAO, 2012) (35). This section includes a proper chain, foodstuffs storage, maintaining a healthy environment while preparing foodstuffs and ensuring reduced contamination in foodstuffs which reduce the number and rate of diseases transmitted to individuals through foodstuffs. This issue is of significant importance for army personnel who spent most of their time in their organization due to the nature of their jobs. Clayton et al (2002) asserted that most diseases and intoxications are caused by unhealthy measure taken in the process of preparing foodstuffs and low quality and weakness in foodstuff chain (36).

2-1. Foodstuff services system in Malayan Army

Organizational foodstuff services system as a non-commercial provider of foodstuffs that doesn't seek to make profit is quite important in military organizations (37). Walker believes that food service system can be executed in many centers including hospitals, schools, army, and industry (38). This food provision system is an important element in army's organization. This is due to central and very large kitchens in the army used by all personnel. Absence of food service system in the army will increase the possibility of diseases and food intoxication among army personnel (39). Considering the rise in the cased of food-transmitted diseases, pathogenic bacteria such as vibrio parahaemolyticus, bacillus cereus and campylobacter may be transmitted to consumers (40, 41). This shows immunity and health failures in organizations with a lot of personnel such as the army. Food service provision system is a large and comprehensive system in army organization. According to Walker, proper guidelines for military personnel nutrition (including personnel, conscripts, and army officers) need to be installed in clubs, restaurants and hospitals of the army covering all issues such as raw material purchase, storing and preparing foodstuff based upon healthy principles in order to preserve the health of personnel, conscripts and officers of the army.

3. Serbian Army

All sciences such as biology, toxicology, physics and biological procedures have a major influence on immunity quality of foodstuff. Studying the immunity quality of foodstuff is on the top agenda of the organizational chart of organizations with a large number of personnel. Army is an inseparable part of the people of society and each countries executive and security systems. In order to improve the performance quality of the army's organization, having international laws and standards to improve nutrition quality and foodstuff immunity of army personnel is something quite necessary. The executive system of the army pays special attention to immunity issues of foodstuffs due to very complicated procedures. In order to improve foodstuff immunity quality in all organizations and various managerial levels, it is necessary to use international immunity devices,

equipments and systems verified by domestic reference organizations. Standard organization uses foodstuff immunity management systems to control contamination levels and safety of foodstuffs such as HACCP and ISO 22000 standards (42).

3-1. HACCP system standards in Serbian Army

Foodstuff immunity is something quite essential in human health. Many health problems and diseases such as obesity, cardiovascular diseases and microbial contaminations such as milk intoxication with Salmonella and other (physical and chemical) sources of contamination are associated with foodstuff immunity. As a result, one of the most important issues in human life and military organizations such as the army is foodstuff immunity, and defining instructions and standards to study problems and food immunity is obligatory throughout the world. The main goal of defining instructions and standards is to enhance food immunity by providing a correct definition of foodstuff examinations in order to achieve the necessary minimums to preserve people's health. HACCP or hazard critical points analysis is the basis of defining instructions to prevent any dangers and hazards in food chain (production, processing, storage, and distribution) (42).

3-2. Administrating ISO 22000 standard in Serbian Army

ISO 22000 was globally executed in 2005 for foodstuff immunity system. In order to improve sources and reduce foodstuff immunity hazards of HACCP and ISO 9000 standards, ISO 22000 has been defined. Defining standards and following them in organizations such as the army, helps the organization identify and control critical dangers and food chain. Creating ISO 22000 secures the organization in the process of procuring and preserving foodstuff and preventing food hazards. ISO 22000 is a standard used by managers in order to improve foodstuff immunity and establish a team to control foodstuff immunity. Resources management is the basis used to assess the resources required for healthy production and includes primary and previous executive plans and defining HACCP plan (42).

DISCUSSION

Keeping in mind the problems of hygiene status of places where foodstuff is procured, produced, cooked and distributed and other places and prevalence of the effect of such places on the health of individuals working there, it is necessary to pay serious attention to the health and hygiene of these places (1). Investing in executing hygiene programs would yield valuable consequences such as compensating the associated costs and preventing diseases and helping the physical and spiritual health of personnel.

Daily rise of production and livestock and poultry rearing systems in order to provide people with the protein products they require has resulted in production and invention of various types of chemical drugs and materials in various levels of agriculture and animal husbandry such as chemical toxins, pesticides (insecticides, fungicides, rodenticides, etc.) and various kinds of antibiotics and chemical drugs to prevent or cure infectious and microbial diseases of livestock and poultry. Growth stimulators are also used so that livestock and poultry gain greater weight. Imandel (1991) has published an article titled health hazards and side effects of medical and chemical substances in livestock food products (43). All chemical products and drugs have significant advantages in controlling or treating the diseases of livestock and poultry and help increase their production rate, but non-standard and uncontrolled consumption of them without due observation of health standards or intentional consumption of them by livestock may result in their residue in some of their tissues and organs. If proper time is not allowed from their consumption up to the slaughter and consumption time, some portion of the product may get relegated into human body through consumption of their meat and meat products, milk, dailies and eggs as those medicines and substances will not have enough time for excretion. As a result, they will have adverse and unnatural effects such as Teratogenic, mutagenic, Carcinogenic Toxic and immunity effects on our bodies and will cause disorders in reproduction. They may also cause drug resistance among sensitive groups and people of society particularly infants, neonatals, the elderly, patients, and pregnant women. Keeping in mind the importance of this issue and the necessity of preventing foodstuff contaminations as a result of these drugs consumption by livestock and with due consideration of hygiene and quality of livestock food, it is quite essential to conduct various researches in this field. Considering the importance of health hazards and the adverse effects of the residue of hormones and anabolic materials used by some livestock to gain greater weight, various anabolic compounds used by livestock such as Diethylstilbestrol and health

hazards of consuming meat products containing artificial hormones, particularly their carcinogenesis risk in humans, was studied and discussed in the first section of this research.
Ababio and Lovatt (2015) searched the process of obtaining good food hygiene and immunity principles. They arrived at the conclusion that it is necessary to introduce new standards and bylaws, develop food immunity management systems, and increase public awareness of foodstuff hygiene and immunity methods (44).

A research by Jahed et al (2012) concerning the insight of students of Tehran Medical Sciences University showed that 68% of respondents had a good level of awareness, while 31% had an average level of awareness concerning foodstuff immunity and hygiene (45).

Researches by Tavakoli et al (2008) on Botulism in Iran from 2003 to 2007 showed taking measures such as general health training, refraining from using traditional and unhealthy methods for processing food, using proper heat during consumption, not using non-pasteurized dailies and regular inspection and control by health authorities may play a major role in preventing this dangerous disease (46).

In less developed countries, many people are poisoned due to lack of health awareness and keeping food under unhealthy conditions (47).
Epidemiological studies of food-transmitted diseases have shown consumers' behaviors like eating raw and less cooked foods in weak hygiene conditions plays a major role in epidemics of food-transmitted diseases (48).

Various studies have shown that 50 to 87 percent of food-transmitted diseases is associated with house. Some of these diseases are caused as a result of eating raw food and inappropriate preparation of food (49).

CONCLUSION

By making it possible to have access to healthy food in production, distribution and storage chain, we may prevent food-transmitted diseases among conscripts and army personnel.

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