GUIDELINES FOR
GOOD HYGIENE PRACTICES (GHP) AND GOOD MANUFACTURING PRACTICES (GMP) FOR EGGS AND EGGS PRODUCTS

Funded by
the European Union

EU FOOD SAFETY
AB GIDA GÜVENLİĞİ

Turkish Cypriot Community Food Safety Project

Funded under the EU Aid Program for the Turkish Cypriot community (TCc), the "TCc Food Safety Project" executed under the contract 2021/423-933 "Technical assistance to improve implementation of food safety standards and disease crisis preparedness", strives to support faster social and institutional development of the Turkish Cypriot community and higher economic growth of its agri-food chain sector. The aim is to achieve improved food safety, public health, animal health, and protection of the environment, and to mitigate the impact of potential exotic animal diseases, in particular those posing imminent threats. The project started in May 2021 and will be completed in April 2024.

For more information about the project, you can visit the project's website, and follow its social media account and contact the project team through the following communication channels:

tccfoodsafetyproject.eu

tccfoodsafety

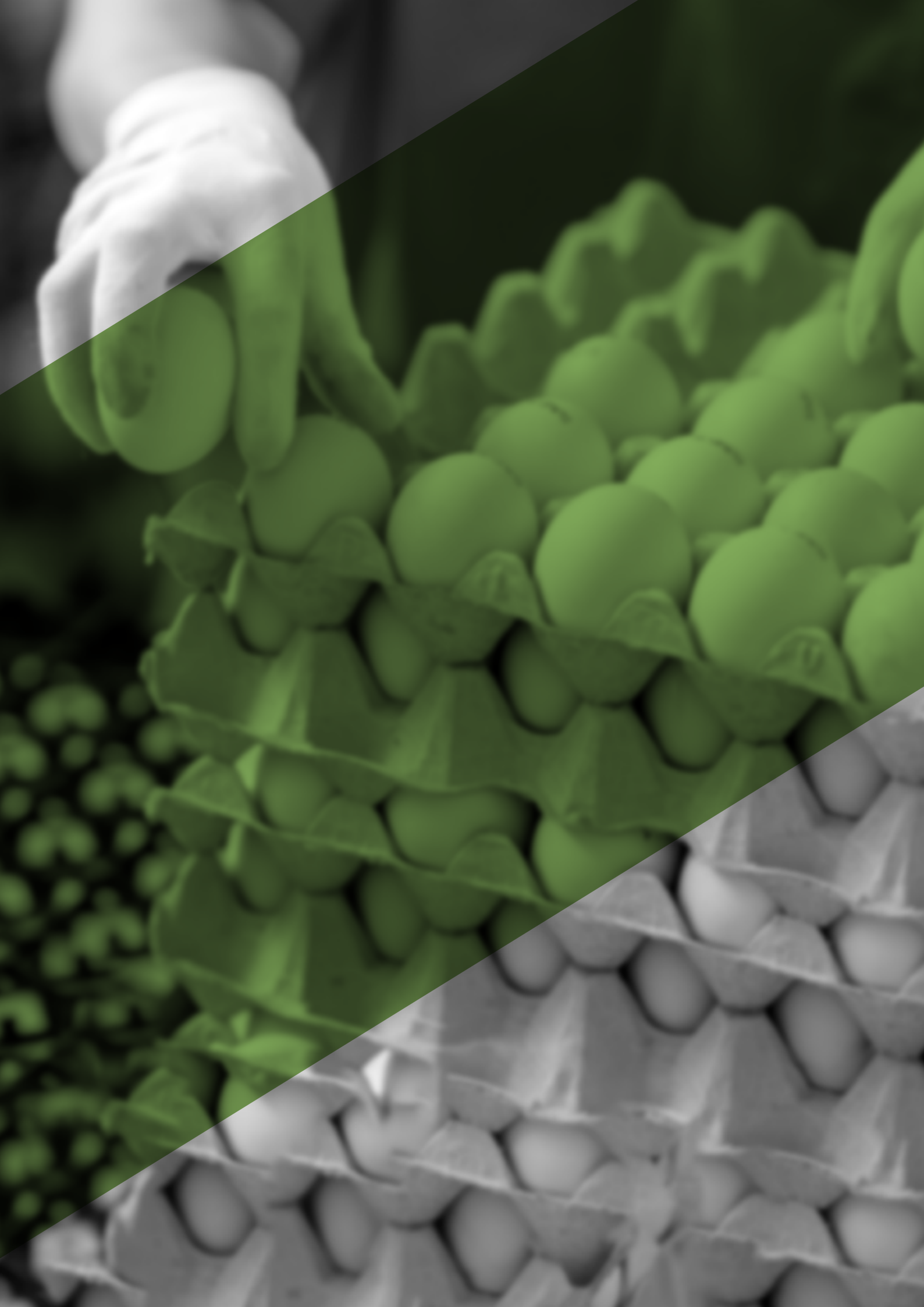
foodsafetyprojectTCc@gmail.com

+90 542 862 3000

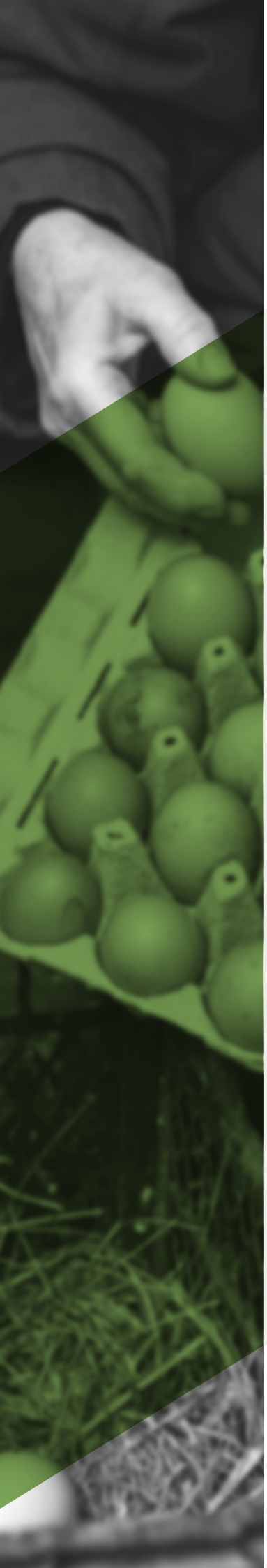
GUIDELINES FOR
GOOD HYGIENE PRACTICES (GHP) AND GOOD MANUFACTURING PRACTICES (GMP) FOR EGGS AND EGGS PRODUCTS

This publication was funded by the European Union. Its contents are the sole responsibility of the NSF Euro Consultants Consortium and do not necessarily reflect the views of the European Union.

EU FOOD SAFETY
AB GIDA GÜVENLİĞİ



CONTENTS



1. BACKGROUND

The "TCc Food Safety Project" executed under Contract 2021/423-933 - "Technical assistance to improve implementation of food safety standards and disease crisis preparedness" strives to support a faster social and institutional development of the Turkish Cypriot community (TCc) and a higher economic growth of its agri-food chain sector.

The project aims to achieve improved food safety, public health, animal health and protection of the environment, and to mitigate the impact of an imminent threat of potential exotic animal diseases.

This document was produced within the following project activity:

Prepare guidelines for stakeholders to complement the input delivered in specific trainings, workshops and other capacity building activities.

2. INTENDED AUDIENCE

The intended audience of this guidance are the food business operators dealing with production of eggs and/or processing egg products.

3. AIM OF THE GUIDELINES

These guidelines aim to assist the food business operators in the egg sector regarding Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP) through all stages - from primary production to placing of the end product on the market.

These guidelines concern egg production as primary product and also egg products such as liquid, concentrated, frozen and dried egg products.

The guidelines are also available to the public on the project's online Food Safety Platform: http://tccfoodsafetyproject.eu/. All parties involved in the food and catering sector should find them a valuable tool in their day-to-day operations.

4. TERMS RELEVANT TO THE PRODUCTION OF EGGS AND EGG PRODUCTS

Breaking: The process of intentionally cracking the egg shell and separating its pieces to remove the egg contents.

Cracked egg: An egg with a damaged shell, but with intact membrane.

Dirty egg: An egg with foreign matter on the shell surface, including egg yolk, manure or soil.

Egg products: Processed products resulting from the processing of eggs, or of various components or mixtures of eggs, or from the further processing of such processed products. In particular, they can be presented as liquid, or frozen, or dried or concentrated form.

Eggs: Eggs in shell – other than broken, incubated or cooked eggs – that are produced by farmed birds and are fit for direct human consumption or for the preparation of egg products.

Food hygiene: The measures and conditions necessary to control hazards and to ensure fitness for human consumption of a foodstuff taking into account its intended use.

GAHP: Good Animal Husbandry Practices

GAP: Good Agricultural Practices

GHP: Good Hygiene Practices

GMP: Good Manufacturing Practices

HACCP: Hazard Analysis Critical Control Points

Incubator egg: An egg that has been set in an incubator.

Liquid egg: Unprocessed egg contents after removal of the shell.

Liquid egg products: Processed liquid products resulting from the processing of eggs, or of various components or mixtures of eggs, or from the further processing of such processed products.

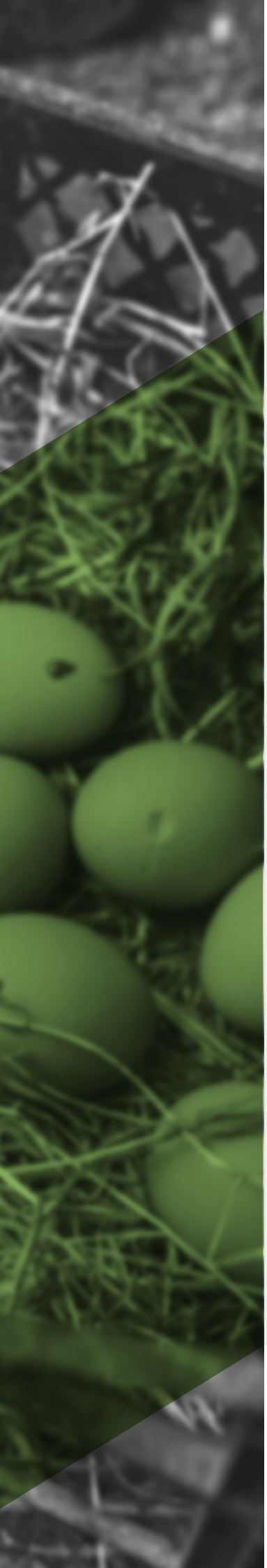
Microbiocidal treatment: A control measure that practically eliminates the number of microorganisms, including pathogenic microorganisms present in a food, or reduces them to a level at which they do not constitute a health hazard.

Pasteurization: A microbiocidal control measure where eggs or egg products are subjected to a process, using heat to reduce the load of pathogenic microorganisms to an acceptable level to ensure safety.

Processed products: Foodstuffs resulting from the processing of unprocessed products. These products may contain ingredients that are necessary for their manufacture or to give them specific characteristics.

Processing: Any action that substantially alters the initial product, including heating, smoking, curing, maturing, drying, marinating, extraction, extrusion or a combination of those processes.

Unprocessed products: Foodstuffs that have not undergone processing, and include products that have been divided, parted, severed, sliced, boned, minced, skinned, ground, cut, cleaned, trimmed, husked, milled, chilled, frozen, deep-frozen or thawed.



5. INTRODUCTION

Eggs are a very important food of animal origin for human nutrition and an excellent source of protein. However, if eggs are not produced from healthy animals in a healthy environment, then handled and processed hygienically, eggs can become contaminated with various physical, chemical, and microbiological hazards. For example, *Salmonella* is an important foodborne bacterial pathogen in egg production. Contaminated eggs with these hazards can cause food poisoning when consumed.

In this context, it is stated that the application of Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP) play an important role in the production of healthy and safe eggs and egg products.

Good Hygiene Practices (GHP) ensure that foodstuffs are safe and not harmful to human health, necessary controls are made and measures are taken at the stages of purchasing, production, preservation, and presentation. In short, GHP provide all the conditions necessary to produce safe food. Its purpose is to determine the rules that the food business operator must comply with from the primary production stage to the consumption in order to ensure the protection of the consumer in terms of food safety. GHP, which is the prerequisite of the food safety management, is a system that includes applications such as:

- the design and configuration of food production facilities
- cleaning and disinfection methods
- hygienic operation in all processes

Good Manufacturing Practices (GMP) are practices that include protective measures regarding internal and external conditions related to the organization in order to prevent or reduce the possibility of contamination of the food product from internal and external sources. This application is one of the basic approaches in the production and distribution of food products, and it is a series of techniques that must be applied uninterruptedly in order to ensure quality in products in the stages of:

- raw materials
- processing
- product development
- production
- packaging
- storage
- distribution

6. RELATIVE ROLES OF EGG PRODUCERS, PROCESSORS AND TRANSPORTERS

Primary producers and those involved in egg production chain such as handling, grading, packaging, processing, supplying, distributing of eggs and egg products for human consumption share responsibility for food safety.

In order to ensure food safety in eggs and egg products:

- All stakeholders should have communication and interaction to ensure and apply appropriate hygiene practices at each stage of the egg production chain.
- Egg producers (primary producers) should apply Good Hygiene Practices (GHP), Good Agricultural Practices (GAP) and Good Animal Husbandry Practices (GAHP) to ensure food safety.
- Processors and manufacturers should apply Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP) including Hazard Analysis Critical Control Points (HACCP).
- Distributors, transporters, wholesalers, and retailers should ensure that eggs and egg products are handled and stored according to the instructions and legal texts.
- Therefore, national and international legal texts relevant for the production of eggs and egg products should be known and applied by the stakeholders.

7. PRIMARY PRODUCTION

Primary production has an important effect on the safety of eggs and egg products. Bacterial contamination of eggs can occur during production. At this stage, GHP can play an important role to reduce the potential risk of eggs being contaminated by microorganisms.

Pathogens can be contaminated both from the environment and during breeding and also by laying flocks themselves. *Salmonella,* which is the most important pathogen for egg safety, can be transmitted vertically from breeder flocks to commercial laying flocks, and horizontally from other layers, feed and/or environment and hence to eggs. It should be keep in mind that, the occurrence of *Salmonella* in the laying or breeding flock increases the possibility of *Salmonella* in the egg.

Therefore, the preventative role of GHP and GAP in the primary production of eggs is critically important and should be implemented.

GAHP should also be respected and care should be taken to assure that proper health of the breeding and laying flocks is maintained.

The lack of good agricultural, animal feeding and veterinary practices and inadequate general hygiene by personnel and equipment during egg handling, and/or collection may lead to unacceptable levels of bacterial and other contamination (such as physical and chemical) during primary production.

Laying flock management is key to safe primary production of eggs. In each egg laying establishment it is necessary to consider the particular agricultural practices that promote the safe production of eggs, the type of products (e.g., unsorted eggs, eggs for the table egg market, eggs strictly for breaking) and production methods used.

The microbial load of eggs should be as low as achievable, using good egg production practices (GEPP), taking into account the requirements for subsequent processing. Measures should be implemented at the primary production level to reduce as much as possible the initial load of pathogenic microorganisms affecting safety and suitability.

GHP and GMP recommended to be applied for hygienic egg production are briefly explained in the relevant sub-chapters.

7.1. ENVIRONMENTAL HYGIENE

Potential sources of contamination -in the egg laying establishment, including the immediate environment, should be identified. This could include contamination associated with previous uses of the land, presence of contaminants, polluted surface water, potential microbial and chemical hazards from contamination by faeces, and other organic waste that could be introduced into the egg laying establishment.

Primary production should not be carried out in areas where the presence of potentially harmful substances in the egg laying establishment would lead to an unacceptable level of such substances in or on eggs.

The potential risk of contamination with agricultural chemicals and hazardous wastes should be considered as well as the potential risk of introduction of diseases from wild birds and animals.

The evaluation process could include the following:

- Previous and present usage of the primary production area should be evaluated for the potential microbial, chemical and physical hazards. Also, potential contamination sources should be determined and eliminated.
- Access points to the egg production area of domestic and wild animals should be determined and necessary precautions should be taken.
- The system should be reviewed to prevent the uncontrolled deposit of faeces and its contact with the eggs.
- Other domestic and wild animals, including birds and rodents should be prevented from entering egg laying establishments.
- Potential contamination points to egg laying establishments should be identified. In particular, contamination caused by leakage from manure storage areas and overflow of polluted surface waters should be prevented.

7.2. HYGIENIC PRODUCTION OF EGGS

7.2.1. Flock Management and Animal Health

Good Animal Husbandry Practices (GAHP) including appropriate preventive measures such as biosecurity and vaccination should be used to maintain flock health and contribute to the prevention of colonization of pathogenic organisms.

Flock management is critical in reducing the risk of human illness from the consumption of eggs.

- Healthy birds should be used.
- To ensure food safety, preventive measures should be taken, including managing human access, to reduce the risk of transmission of microorganisms to and between flocks.
- Appropriate vaccines should be used as part of an overall flock management program.
- Suspicious or unknown causes of disease should be investigated in order to prevent the increase in the number of cases. Dead and sick birds should be checked regularly in the flock.
- Dead birds should be disposed in order to prevent re-infection of the egg flock by pests or handlers.
- Birds should be administered veterinary medications only when permitted, as prescribed by a veterinarian and which do not adversely affect the safety and suitability of the eggs.
- *Salmonella* and other pathogens that were mentioned by the legal texts should be monitored.
- Disposing of eggs from infected flocks still in production that represent a risk to human or flock health in a safe manner or specifically diverting them to a process that ensures elimination of a hazard.
- *Salmonella* positive flocks should be treated in accordance with the provisions of the legal texts.
- Visitor entries and exits should be kept under control in order to minimize the possibility of transmission of pathogens from other sources. In order to reduce the risk of disease transmission to the herd, visitors should be provided with appropriate protective clothing, footwear and head covering when necessary.

7.2.2. Areas and Establishments for Egg Laying Systems

Improperly protected and maintained areas and premises for the housing of flocks and laying of eggs, particularly for free range and barn production systems may contribute to the contamination of eggs.

- The internal design and layout of housing should not adversely affect the health of the birds and should be in compliance with GHP.
- The facilities used to house flocks should be cleaned and disinfected in a way that reduces the risk of transfer of pathogens to the next flock.
- A plan should be in place to detect any failure in cleaning and disinfection programs and to ensure corrective actions are taken.
- Use of litter should be managed to reduce the risk of introducing or spreading hazards.
- Water delivery systems should be protected, maintained, and cleaned, to prevent microbial contamination of water.
- All drainage and manure removal systems should be designed, constructed, and maintained to prevent egg contamination.
- Access to egg laying establishments by other animal species should be limited to access the laying establishment.
- The egg laying establishments should be kept clean.

7.2.3. General Hygienic Practices

7.2.3.1. Water Hygiene

Water used in primary production operations should be suitable for its intended purpose and should not contribute to the introduction of microbiological or chemical hazards to eggs.

- Potable water should be used, or if potable water is not available for some or all purposes, water should be of a quality that does not introduce hazards to humans consuming the eggs.
- Potential contamination sources of water from chemical run off or improperly managed faeces should be identified and controlled.
- Water should be regularly tested to ensure that water supplied to the birds is of a quality that does not introduce hazards in or on the egg. Water should be managed in accordance with HACCP principles.

7.2.3.2. Feed Hygiene

The improper procurement, manufacturing and handling of animal feed may result in the introduction of pathogens and spoilage organisms to the breeding and laying flock and the introduction of chemical hazards, such as pesticide residues and other contaminants, which can affect the safety and suitability of eggs and egg products.

Producers should take care where appropriate, during production, transportation, preparation, processing, procurement, storage, and delivery of feed to reduce the likelihood of introducing hazards into the production system.

- To minimize the risk associated with hazards in the feed, good purchasing practices for feed and feed ingredients should be employed.
- Feed should be managed so it is not contaminated from waste including faeces.
- As feed can be a source of contamination, heat, or other treatment of feed to reduce or eliminate pathogens including *Salmonella* should be considered.
- When the egg producer processes their own feed, information should be kept about its composition, the origin of the ingredients, relevant processing parameters and where practicable, the results of any analyses of the finished feed.
- The owner should keep a record of relevant information concerning feed.

7.2.3.3. Pest Control

Pests such as insects and rodents are known vectors for the introduction of zoonotic pathogens into the egg laying establishment and environment. Also improper application of chemicals used to control these pests may introduce chemical hazards into the production environment. A properly designed pest control program should be used.

7.2.3.4. Agricultural and Veterinary Chemicals

- Transport, storage and use of agricultural and veterinary chemicals should be in accordance with the manufacturer's instructions.
- Storage and use of agricultural and veterinary chemicals on the egg laying establishment should be evaluated and managed to avoid contamination to the eggs and flock.
- Agricultural and veterinary chemical residues should be used according to the limits set by the legal texts.
- Agricultural and veterinary chemicals should be kept in their original labelled containers.
- Empty agricultural and veterinary containers should be disposed of according to applicable legal texts and/or the manufacturer's directions and should not be used for other purposes.
- Producers should keep records of agricultural and veterinary chemical applications

7.3. COLLECTION, HANDLING, STORAGE AND TRANSPORT OF EGGS

Proper collection (manual or automated methods), handling, storage and transport of eggs are important elements of the system of controls necessary to produce safe and suitable eggs and egg products. Contact with unsanitary equipment and foreign materials or methods that cause damage to the shell, may contribute to egg contamination.

Whether manual or automated methods are used to collect eggs, producers should minimize the time between egg laying and further handling or processing. In particular, the time between egg laying and controlled temperature storage should be minimized.

- Cracked and/or dirty eggs should be excluded from the table egg trade.
- Cracked and/or dirty eggs should be directed to a processing or packing establishment, as appropriate, as soon as possible after collection.
- Hygienic practices, which take into account time and temperature factors, should be used to protect the egg from surface moisture in order to minimize microbial growth.
- Broken eggs and incubator eggs should not be used for human consumption and be disposed of in a safe manner.

7.3.1. Egg Collection Equipment

It is important to prevent any damage to the eggshells by collecting equipment since such damage can lead to contamination. Consequently, it adversely affects the safety and suitability of eggs and egg products.

Egg collecting equipment and containers should be cleaned and disinfected regularly to avoid or minimize contamination of microorganisms to egg. Single use containers should not be reused.

7.3.2. Packaging and storage

Any egg packaging, storage or associated equipment should not transfer substances to eggs that will present health risk to consumers.

Materials should be corrosion resistant and easy to clean and disinfect.

Storage temperatures, times and humidity should not have a detrimental effect on the safety and suitability of eggs.

The time and temperature conditions and humidity for egg storage at the farm should be established taking into account the hygienic condition of the eggs.

7.3.3. Transport, Delivery Procedures and Equipment

Personnel and vehicular access should be adequate for the hygienic handling of eggs, so that contamination is not introduced into the farm and thus in or on eggs.

Lorries, trucks or other vehicles or equipment, which carry the eggs, should be cleaned at a frequency necessary to prevent contamination flow between farms or premises and thus of eggs.

The time and temperature conditions for transport and delivery of eggs from the producer should be established considering the hygienic condition of the eggs, the hazards that are reasonably likely to occur, the end use of the eggs, and the intended duration of storage. Most of these conditions are specified in the legal texts.

7.4. CLEANING, MAINTENANCE AND PERSONNEL HYGIENE AT PRIMARY PRODUCTION

7.4.1. Cleaning and Maintenance of Egg Laying Establishments

Cleaning and disinfection programs should be in place, and their efficacy should be periodically verified. An environmental monitoring program should be implemented where possible and practicable.

These programs should include procedures for routine cleaning while birds are in the poultry house. Full cleaning and disinfection programmes should be applied when poultry houses are empty.

7.4.2 Personnel Hygiene, Health, and Sanitary Facilities

Personnel should understand and follow preventative measures specifically related to the handling of birds and/or eggs, so as to prevent the introduction of hazards from one to the other, from other facilities or from cross contamination of birds from personnel.

Personnel should be adequately instructed and/or trained to handle eggs and domesticated birds to ensure the use of Good Hygienic Practices (GHP) that will minimize the risk of egg or flock contamination.

People known, or suspected, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted to birds or through eggs, should not be allowed to enter any bird facility or egg collection or handling area.

Personnel should wash their hands before starting work that involves the handling of eggs, each time they return to handling areas after a break, immediately after using the toilet, and after handling anything which may contaminate eggs.

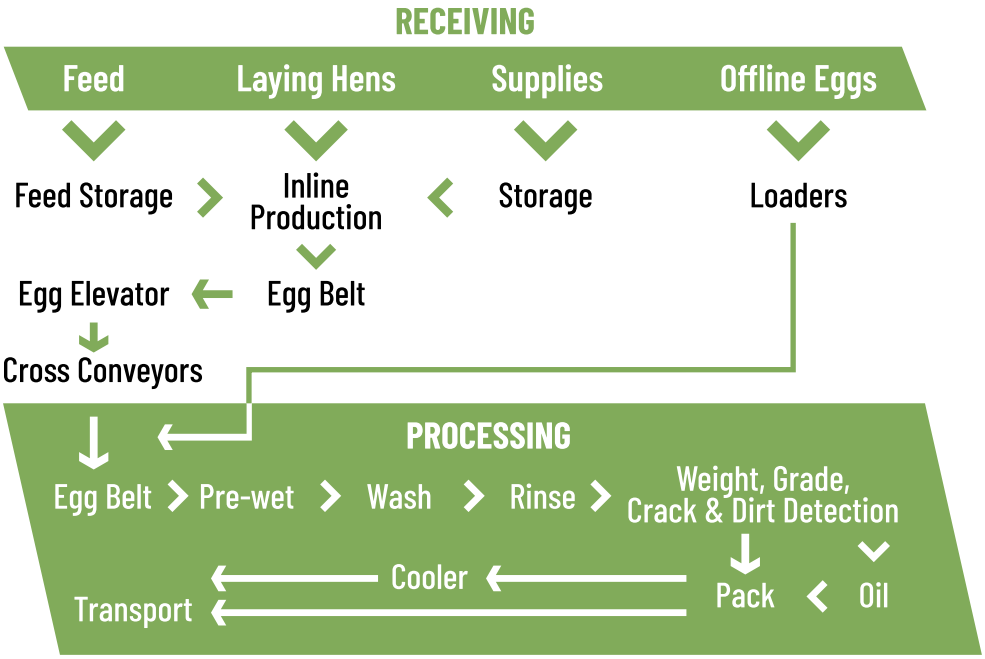
7.5. DOCUMENTATION AND RECORD KEEPING

Records should be kept on:

- Prevention and control of avian diseases with an impact on public health
- Identification and movement of birds and eggs
- Use of agricultural and pest control chemicals
- Nature and source of feed, feed ingredients and water
- Use of veterinary drugs/medicines
- Results of testing where testing is performed
- Health status of personnel
- Cleaning and disinfection
- Traceability/product tracing and recall

8. EGG PRODUCTS AND MANUFACTURING PROCESS

Shell Egg Plant Processing System



8.1. STEPS OF THE COMMON PROCESS

1. Shell eggs
2. Reception of shell eggs
3. Storage of shell eggs
4. Unpacking the eggs (waste: trays, cardboard boxes, pallets, etc.)
5. Visual selection of eggs (waste: eggs unfit for human consumption)
6. Washing eggs
7. Breaking eggs (waste: egg shell)
8. Freezing for frozen egg products or producing liquid eggs

8.2. PROCESS STEPS OF LIQUID EGG AND DEHYDRATED EGG PRODUCTS

Liquid Egg Producing Steps	Dehydrated Egg Producing Steps
1. Liquid eggs	1. Liquid eggs
2. Filtration	2. Filtration
3. Cooling	3. Cooling
4. Standardization	4. Standardization
5. Filtration	5. Lysozyme extraction from egg white
6. Heat treatment	6. Concentration
7. Homogenization	7. Filtration
8. Cooling	8. Heat treatment
9. Storage	9. Homogenization
10. Packaging	10. Cooling
11. Storage Ambient temperature (stabilized egg products) Chilled storage (liquid egg products) Freezing or deep frozen storage (frozen egg prodcts)	11. Desugaring
	12. Centrifugation or filtration
	13. Storage
	14. Drying
	15. Heat treatment
	16. Sieving
	17. Magnets and/or metal detector
	18. Packaging
	19. Heat treatment
	20. Storage ambient temperature (egg powder)

8.3. HACCP: DEFINITIONS AND PRINCIPLES

8.3.1. Definitions for HACCP

Control (verb): To take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan.

Control (noun): The state wherein correct procedures are being followed and criteria are being met.

Control measure: Any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Corrective action: Any action to be taken when the results of monitoring at the CCP indicate a loss of control.

Critical Control Point (CCP): A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Critical limit: A criterion which separates acceptability from unacceptability.

Deviation: Failure to meet a critical limit.

Flow diagram: A systematic representation of the sequence of steps or operations used in the production or manufacture of a particular food item.

HACCP: Hazard Analysis and Critical Control Points. A system which identifies, evaluates, and controls hazards which are significant for food safety.

HACCP plan: A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.

Hazard: A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

8.3.2. Principles

The general principles of food hygiene:

- Identify the essential principles of food hygiene applicable throughout the whole food chain (from primary production to the final consumer), to ensure the food is safe and suitable for human consumption.
- Recommend a HACCP-based approach as a means to enhance food safety.
- Indicate how to implement those principles.
- Provide a guidance for specific codes which may be needed for - sectors of the food chain, processes, or commodities to amplify the hygiene requirements specific to those areas.

THE HACCP SYSTEM BREAKS DOWN INTO 12 STEPS AND 7 PRINCIPLES

1. Assemble HACCP team
2. Describe product
3. Identify intended use
4. Construct flow diagram
5. On-site confirmation of flow diagram
6. List all potential hazards associated with each step — **Principle 1**
   - Conduct a hazard analysis
   - Consider any measures to control identified hazards
7. Determine Critical Control Points — **Principle 2**
8. Establish critical limits for each CCP — **Principle 3**
9. Establish a monitoring system for each CCP — **Principle 4**
10. Establish corrective actions — **Principle 5**
11. Establish verification procedures — **Principle 6**
12. Establish Documentation and Record Keeping — **Principle 7**

8.4. HAZARDS

Different types of hazards selected are:

- Microbiological
- Foreign bodies
- Chemicals

8.4.1. Microbiological Hazards

Salmonella is one of the most important foodborne bacterial pathogens that should not be detected in any eggs and egg products.

Microbiological criteria should be applied according to the local legal texts.

8.4.2. Foreign Bodies

Materials that cannot be in the food such as egg shells, insects, glass, plastics, metals, wood, etc are defined as foreign bodies.

8.4.3. Chemicals Hazards

Chemical hazards are:

- Cleaning and disinfection products
- Fluids: cooling liquid, steam, warm water, compressed air grease
- Pesticides, heavy metals, medicine residues, mycotoxins

8.5. HAZARDS ANALYSIS

Hazard evaluation includes an evaluation of each hazard whether they represent a CCP.

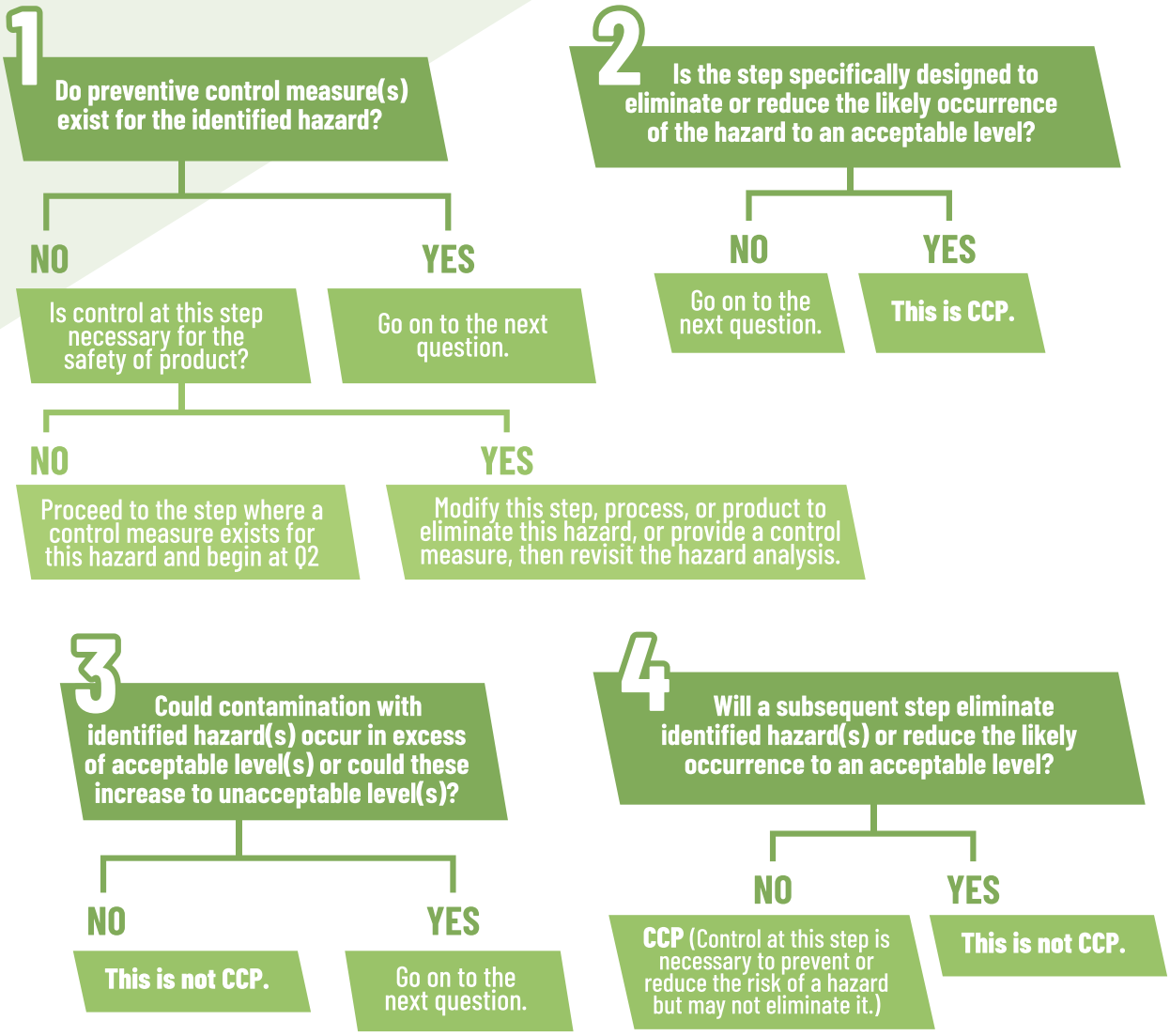
8.6. RISKS EVALUATION

The risk evaluation per hazard should be determined by the combination of severity, frequency and detectability. It is important to determine if a hazard is significant or not (major or minor).

8.7. CCP DETERMINATION

Decision tree of Codex Alimentarius is relevant to identify CCP at each step of production for MAJOR hazards.

CODEX ALIMENTARIUS: DECISION TREE TO IDENTIFY CCPS



8.8. ADDITIONAL (HORIZONTAL) MEASURES

8.8.1. Factory Environment

The establishment should be kept reasonably free of objectionable odours, smoke, dust or other contamination and in an area which is not subject to flooding.

8.8.2. Infrastructural and Equipment Requirements, Maintenance, Calibration

Food plants should be kept clean and maintained in good repair and condition. The layout, design, construction, siting and size of food plants are to:

- permit adequate maintenance, cleaning and/or disinfection, avoid or minimize air-borne contamination, and provide adequate working space to allow for the hygienic performance,
- be such as to protect against the accumulation of dirt, contact with toxic materials, the shedding of particles into food and the formation of condensation or undesirable mould on surfaces,
- permit good food hygiene practices, including protection against contamination and pest control,
- where necessary, provide suitable temperature-controlled handling and storage conditions of sufficient capacity for maintaining foodstuffs at appropriate temperatures (temperatures should be monitored and recorded).

Plants can be ventilated both naturally and mechanically. Mechanical airflow from a contaminated area to a clean area is to be avoided. Ventilation systems should have filters and can be cleaned.

Food plants should have adequate natural and/or artificial lighting.

Drainage facilities should be adequate for the intended purpose. They should be designed and constructed to avoid the risk of contamination.

Where and as necessary, adequate changing facilities for personnel should be provided. Cleaning agents and disinfectants should not be stored in areas where food is handled.

In rooms where food is prepared, treated, or processed, the design and layout should allow good food hygiene practices, including protection against cross-contamination between and during operations.

- Floor and wall surfaces should be easy to clean and disinfect.
- Ceilings, overhead structures and the inner surfaces of roofs should be constructed to prevent the accumulation of dirt and reduce condensation, the growth of undesirable moulds and the shedding of particles.
- Windows and other openings should be constructed to prevent the accumulation of dirt. Those which can be opened to the outside environment should be fitted with insect-proof screens which can be easily removed for cleaning.
- Doors should be easy to clean and disinfect.

8.8.3. Establishment: Design and Facilities

According to the production separate areas should be allocated for:

- Storage of egg and untreated egg product
- Breaking and microbiocidal treatment of eggs
- Packing of microbiocidally treated egg product
- Storage of microbiocidally treated liquid and frozen egg products and other liquid or frozen
- Storage of microbiocidally treated dried egg product and other dry ingredients as appropriate
- Storage of cleaning and sanitizing materials
- Work areas for raw and treated product should be separated via physical barriers

Establishments for the manufacture of egg products should have areas and equipment for:

- Washing, drying and disinfecting dirty eggs
- Breaking eggs, collecting their contents and removing parts of shells and membranes

The actual contents of pre-packages should be measured directly by weighing instruments or volumetric instruments or, in the case of liquids, indirectly, by weighing the pre-packed product and measuring its density.

8.8.4. Toilet Facilities

- An adequate number of flush lavatories should be available and connected to an effective drainage system.
- Lavatories should not open directly into rooms in which food is handled.
- An adequate number of washbasins should be available in a suitable location and designated for cleaning hands.
- Washbasins for cleaning hands should be provided with hot and cold running water, materials for cleaning hands and for hygienic drying.
- Sanitary conveniences should have adequate natural or mechanical ventilation.

8.8.5. Personnel Requirements

- Every person working in a food-handling area should have a high degree of personal cleanliness and should wear suitable, clean, and necessary protective clothing.
- A person suffering from a disease or wounds (infected wounds, skin infections, sores, or diarrhoea) that can be transmitted to food should not be permitted to handle food or enter any food-handling area if direct or indirect contamination is possible.
- Staff who are affected and likely to come into contact with food should report immediately the illness or symptoms, and causes, to the food business operator.

8.8.6. Personal Training

Producers have to ensure that food handlers are supervised and instructed and/or trained in food hygiene matters commensurate with their work activity.

8.8.7. Cleaning and Disinfection and Cleaning in Place (CIP)

- Floor surfaces should be easy to clean and disinfect.
- Adequate facilities should be provided for the cleaning, disinfecting and storage of working utensils and equipment.
- These facilities should be constructed of corrosion-resistant materials, be easy to clean and have an adequate supply of hot and cold water.
- Adequate provision should be made for washing the food (if necessary).
- An adequate supply of hot and/or cold potable water should be provided for these facilities.
- Where non-potable water is used, for example for fire control, steam production, refrigeration, and other similar purposes, it should be circulated in a separate duly identified system. Non-potable water should not be connected with, or allow reflux into, potable water systems.
- Cleaning agents and disinfectants should not be stored in areas where food is handled.
- The products used for cleaning and disinfection must be chosen with regard to their use:
    - Nature and level of soiling
    - Water quality / hardness
    - Type of fabric being cleaned
    - Method of cleaning
    - Food contact agreement

The following should be taken into account in the selection of the disinfecting product:

- The effective spectrum of the disinfectant (bacterial, fungicidal, sporicidal and/or antiviral)
- The contact time for effectiveness
- The level and type of soiling
- The risk of corrosion of the fabrications
- The stability (to storage, to heat, to light)
- The residues after rinsing (for food and/or environment)
- The safety for the user (low toxicity, easy handling)
- Food contact agreement

8.8.8. Hygiene of Mobile Materials and Equipment

All the mobile equipment and tools could cross-contaminate the liquid eggs or egg products. They should only be used for specifically defined operations and there should be defined hygiene procedures for their use and operation.

8.8.9. Management of Used Trays, Waste and Animal By-Products

- Adequate arrangements and facilities for the hygienic storage and disposal of hazardous or inedible substances and waste should be available.
- Food waste, non-edible by-products and other refuse should be removed quickly from rooms where food is present.
- Food waste, non-edible by-products and other wastes should be deposited in closable containers. These containers should be easy to clean and disinfect.
- Adequate provision should be made for the storage and disposal of food waste, non-edible by-products, and other wastes.
- Refuse stores should be designed and kept clean and free of animals and pests.
- All waste should be eliminated in a hygienic and environmentally friendly way.
- Drainage facilities should be adequate for the intended purpose. They should be designed and constructed to avoid the risk of contamination.

8.8.10. Pest Control System

Pest control

Pests should be controlled as they are recognized as vectors for pathogenic organisms.

Any pest control measures should not result in unacceptable levels of residues, such as pesticides, in or on eggs.

Pests such as insects and rodents are known vectors for the introduction of human and animal pathogens into the production environment.

Improper application of chemicals used to control these pests may introduce chemical hazards into the production environment.

A properly designed pest control program should be used.

- Before pesticides or rodenticides are used, all efforts should be made to minimize the presence of insects, rats and mice and reduce or remove places which could harbour pests.
- As cages/pens/enclosures/coops attract such pests, measures such as proper design, construction and maintenance of buildings, effective cleaning procedures and removal of faecal waste should be used to minimize pests.

- Feed should be kept in pest proof containers. Mice, rats and wild birds are attracted to stored feed. Any feed stores should be located, designed, constructed, and maintained so as to be, where practicable, inaccessible to pests.
- Bait should be placed in "bait stations" so that they are obvious, cannot be accessed by animals or insects they are not intended for and can be identifiable and found easily for checking.
- If it is necessary to resort to chemical pest control measures, the chemicals should be approved for use in food premises and used in accordance with the manufacturer's instructions.
- Any pest control chemicals should be stored in a manner that will not contaminate the laying environment. Such chemicals should be stored in a safe manner. They should not be stored in wet areas or close to feed stores or be accessible by birds. It is preferable to use solid baits, wherever possible.

8.9. STAGES OF MANUFACTURE

8.9.1. Reception of Shell Eggs, Ingredients, and Packaging

- A food business operator should not accept raw materials or ingredients, other than live animals, or any other material used in processing products, if they are known to be or expected to be, contaminated with parasites, pathogenic microorganisms or toxic.
- Wrapping and packaging operations should be carried out so as to avoid contamination of the products.
- Wrapping and packaging material re-used for foodstuffs should be easy to clean and disinfect (if necessary).

8.9.2. Collection, Handling, Storage and Transportof Eggs

Methods used to collect, handle, store and transport eggs should minimize damage to the shell, and avoid contamination.

- Cracked and/or dirty eggs should be directed to a processing or packing establishment, as appropriate, as soon as possible after collection.
- Hygienic practices, which take into account time and temperature factors, should be used to protect the egg from surface moisture in order to minimize microbial growth.
- Broken eggs and incubator eggs should not be used for human consumption and be disposed of in a safe manner.

8.9.3. Storage of Raw Materials

- Raw materials and all ingredients stored in a food business operator should be kept in appropriate conditions designed to prevent harmful deterioration and protect them from contamination.
- Raw materials, ingredients, intermediate products, and finished products likely to support the reproduction of pathogenic micro-organisms or the formation of toxins should not be kept at temperatures that might result in a risk to health.
- The cold chain should not be interrupted.
- Food businesses manufacturing, handling, and wrapping processed foodstuffs should have suitable rooms, large enough for the separate storage of raw materials from processed materials and sufficient separate refrigerated storage.

8.9.4. Unpacking of Eggs

Establishments for manufacture of egg products should be constructed, laid out and equipped to ensure separation of:

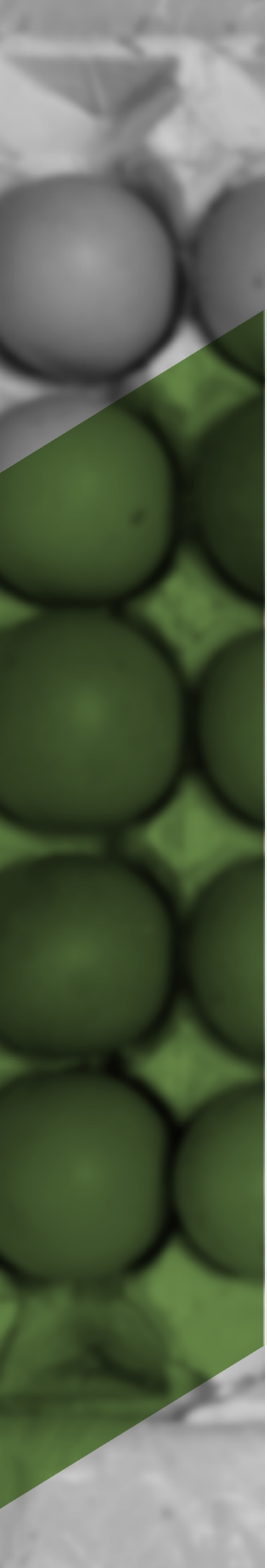
- washing, drying and disinfecting dirty eggs
- breaking eggs, collecting their contents and removing parts of shells and membranes

Unpacking eggs is an important stage in the manufacture of egg products - abnormalities not discovered at the eggs reception stage can be identified.

8.9.5. Washing and Breaking of Eggs

- Eggs for processing should be visibly clean prior to breaking and separation.
- Cracked eggs may be processed.
- Broken eggs should not be processed and should be disposed of in a safe manner.
- Dirty eggs should be disposed of in a safe manner or may be cleaned.
- A dirty egg is an egg which profile is changed by droppings. This dirty egg must be washed before breaking.
- To prevent contamination with washing liquid, the residual washing liquid should not drip from the shell.

All operations should be carried out to avoid any contamination during production, handling and storage of egg products.



- During the egg breaking process, shells and foreign bodies can contaminate the liquid eggs.
- Eggs should not be broken unless they are clean and dry.
- Eggs should be broken in a manner that minimizes contamination, in particular by ensuring adequate separation from other operations. Cracked eggs must be processed as soon as possible.
- Eggs other than those of hens, turkeys, or guinea fowl, should be handled and processed separately.
- All the equipment should be cleaned and disinfected before further processing hens', turkeys', and guinea fowls' eggs.
- Separating the egg content from the shell should be done to avoid cross-contamination between the shell and egg content, avoid contamination by personnel or from equipment.
- Egg content may not be obtained by centrifugation or crushing of eggs.
- Centrifugation may not be used to obtain the remains of egg whites from empty shells for human consumption.

8.9.6. Filtration and Transfer

- After breaking each particle of the egg product should undergo processing quickly to eliminate microbiological hazards or to reduce them to an acceptable level.
- A batch that has been insufficiently processed may immediately undergo processing again in the same establishment, if this processing renders it fit for human consumption.
- When a batch is found to be unfit for human consumption, it should be denatured so as to ensure that it is not used for human consumption.

8.9.7. Physical and Chemical Contamination

- Systems should be in place to prevent contamination of foods by foreign bodies such as glass or metal shards from machinery, dust, harmful fumes, and unwanted chemicals.
- In manufacturing and processing, suitable detection or screening devices should be used where necessary.

8.9.8. Cooling and Intermediate Storage of Liquid Eggs (Standardisation & Preparation)

- If processing is not carried out immediately after breaking, liquid egg should be stored frozen or below 4 °C.
- The storage period before processing at 4 °C should not exceed 48 hours.
- For liquid eggs, it should be declared on the label : "non-pasteurised egg products - to be treated at place of destination", the date and hour of breaking should also be indicated.

8.9.9. Freezing Liquid Egg

To limit microbiological growth in liquid eggs, products should be stored under -12°C. Freezing should be applied maximum within 48 hours after breaking.

8.9.10. Heat Treatment and Cooling

- After breaking each particle of the egg product (liquid eggs) should undergo processing quickly to eliminate microbiological hazards or to reduce them to an acceptable level.
- A batch that has been insufficiently processed may immediately undergo processing again in the same establishment, if this processing renders it fit for human consumption.
- When a batch is found to be unfit for human consumption, it should be denatured to avoid human consumption.
- Processing should not be required for egg white intended for the manufacture of dried or crystallised albumin destined subsequently to undergo heat treatment.
- Products that have not been suitable to be stored at room temperature should be cooled to 4 °C or lower.
- Products for freezing must be frozen immediately after processing.
- Egg products should be subject to a microbiocidal treatment to ensure that the products are safe and suitable.
- All operations subsequent to the treatment should ensure that the treated product will not become contaminated.
- Hygienic manufacturing and personnel practices should be in place to manage the risk of contamination from the food contact surfaces, equipment, and personnel, packaging material and between raw egg and processed egg products.
- Microbiocidal treatments, including heat treatment, should be validated to show that they achieve the desired reduction in the number of pathogenic microorganisms.
- Where heat treatment is used, consideration should be given to time and temperature combinations.
- Pasteurized liquid egg products should be cooled rapidly immediately after pasteurization and maintained under refrigeration.

8.9.11. Packaging of Liquid Egg Products

- Material used for wrapping and packaging should not be a source of contamination.
- Wrapping materials should be stored to avoid risk of contamination.
- Wrapping and packaging operations should be carried out to avoid contamination of the products.
- Wrapping and packaging material re-used for foodstuffs should be easy to clean and disinfect.

8.9.12. Storage of Wrapped Liquid Egg Products

- Egg products should be stored and transported under conditions that will not adversely affect the safety and suitability of the product.
- Egg products, including those that can be stored at ambient temperatures, should be protected against external agents and contamination:
  - direct sun light
  - excessive heating
  - moisture
  - external contaminants
  - rapid temperature changes which could adversely affect the integrity of the product packaging or the safety and suitability of the product
- For catering products, shelf life validation should be conducted at 4°C for 2/3 of time and 1/3 of time at 6-8°C.

8.9.13. Storage of Egg Products After Treatment and Before Drying or Wrapping

- Products that have not been stabilized to be kept at room temperature should be cooled to not more than 4 °C.
- Products for freezing should be frozen immediately after processing.

8.9.14. Concentration of Liquid Egg Products

- Membranes and filters should be cleaned and disinfected regularly to avoid contamination.
- Temperature and flow rate should be controlled during concentration to avoid microbiological growth.

8.9.15. Drying of Egg Powders

- During de-sugaring process, temperature and pH should be controlled to avoid development of microbiological toxins.
- Renewed yeast and/or bacteria should be used.
- In drying process, equipment (tubes and towers) should be cleaned and disinfected to avoid contamination.
- Regular cleaning programs should be applied for filters to avoid contamination by air.
- Humidity should be avoided during powder transfer to control the microbial growth.
- To avoid chemical contamination, (NOx) combustion should be regularly verified where there is direct combustion heating.
- Validated process should be used to remove water of liquid egg product in order to achieve $a_w < 0.7$.

8.9.16. Packaging of Egg Powders

- Foreign objects should be avoided in the powder.
- The transfer and storage equipment should be cleaned and disinfected to avoid contamination by equipment.
- The rooms should be separated for pasteurized egg powder and for non-pasteurized egg powder to avoid cross contamination.
- The movements of personnel and vehicles used for transferring the product should be restricted to avoid contamination by personnel.

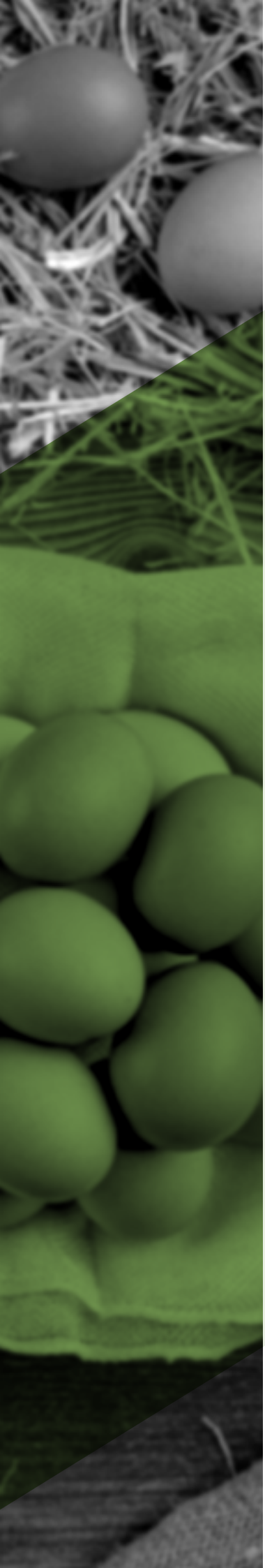
8.9.17. Heat Treatment of Powder

- Two different rooms should be used for pasteurized and non-pasteurized powder to avoid cross contamination.
- Room temperature, room humidity and holding time should be controlled to decrease the microbial levels and to eliminate possible pathogenic bacteria.

8.9.18. Traceability

Traceability means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution.

Therefore, records (country of origin, egg supplier, batches of each ingredient etc.) should be kept during 5 years for traceability of each batch.



9. REFERENCES

Codex Alimentarius CAC/RCP 15 – 1976 : Code of Hygienic Practice For Eggs And Egg Products.

Commission Regulation (EC) No 2073/2005 on Microbiological Criteria for Foodstuffs

Dike, K.S., Göncüoğlu, M., Şahin, G., Akan, M., Gürcan, İ.S., Müştak, H.K., Ayaz, N.D., Sariçam, S., Salar, M.Ö., Açikalin, H.D., Ünal, G., Çöven, F., Dakman, A., Gülaçti, İ., Uzunboy, E.N., Yildirim, Ç., Kesler, K., Birinci, S.A., Sökmen, H., Çifci, M.M. (2020). Base study for the establishment of national Salmonella control program in hatching farms and table eggs in Turkey. Turk J Vet Anim Sci, 44: 343-349.

EEPA (European Egg Processors Association) "Guide to Good Manufacturing Practice for Liquid, Concentrated, Frozen and Dried Egg Products" Belgium 2011

European Commission: Commission Notice on the implementation of food safety management systems covering prerequisite programs (PRPs) and procedures based on the HACCP principles, including the facilitation/flexibility of the implementation in certain food businesses. Official Journal of the European Union 2016/C 278/01

General Food Law Regulation (EC) No 178/2002 Regulation (EC) No 852/2004 On The Hygiene Of Foostuffs

Regulation (EC) No 853/2004 Laying Down Specific Hygiene Rules

Regulation (EC) No 854/2004 Laying Down Specific Rules for the Organisation of Official Controls on Products of Animal Origin Intended for Human Consumption

Regulation (EC) No 2160/2003 on the Control of Salmonella and Other Specified Food-Borne Zoonotic Agents

No: 1/2020, Official Food Control and Hygiene local legal textfor Consumer Protection.

No: 56/2014, General Food and Feed local legal text.

CONTACT

+90 542 862 3000

tccfoodsafety

tccfoodsafetyproject.eu

foodsafetyprojectTCc@gmail.com

Tabak Derviş Street,
No: 3, Nicosia Cyprus

Funded by
the European Union

EU FOOD SAFETY
AB GIDA GÜVENLİĞİ