



# manual

## GOOD PRACTICES FOR THE MEAT INDUSTRY



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












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# Foreword

The FAO/WHO Codex Alimentarius Commission is in the final stages of negotiation of a new Code of hygienic practice for meat. The Code implies a transition from meat inspection towards a risk-based approach covering the entire food chain. The manual on good practices for the meat industry aims to assist the industry to prepare itself for compliance with the new regulatory framework, which is expected to come into force when the Code is approved in 2005.

To help facilitate this transition, the Fondation Internationale Carrefour has provided FAO with financial support in the preparation of this manual. FAO wishes to extend its thanks to the Fondation Internationale Carrefour for supporting this important step in the implementation of the new Code of Practice for an industry that is growing globally at an unprecedented rate.

This manual is targeted at the meat industry in developing countries and in emerging economies in their endeavour to meet the rising quality and safety requirements of both the export industry and domestic markets, with the increasing participation of large-scale retailers.

Section 1 of the manual deals with the application of risk analysis principles to the meat sector starting from the point of production, i.e. in the animal population from which the meat is sourced. Standards and practices in primary production are covered in Section 2. Section 3 covers animal identification and Section 4 product traceability.

The following section (5) focuses on transport of animals to the slaughter facilities, duly taking into account growing animal welfare considerations. This is followed by Sections 6, 7, 8 and 9 on ante-mortem inspection; preslaughter handling, stunning and slaughter methods; post-mortem examination; and hygiene, dressing and carcass handling. The sections on stunning and slaughter methods benefit from the experience gained in the reduction of the risk of BSE (bovine spongiform encephalopathy). Those on ante- and post-mortem inspection are built on the substantial historical experience of the global meat sector, and are largely documented from FAO resources.

There are sections on design, facilities and equipment (10) and personal hygiene (11). Section 12 of the manual describes the implementation of a Hazard Analysis and Critical Control Point (HACCP) plan for the meat industry. Finally, there is a section (13) on the role of governments and other regulatory authorities in meat hygiene.

The manual is prepared in such a way that it can be updated flexibly once the Code is adopted by the Codex Commission. An effort will also be made to incorporate feedback from the industry on the use of the manual when preparing such updates. It is hoped that the collaboration initiated between FAO and the private sector in the preparation of this manual will be extended and deepened in this process.

Rome, July 2004

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Sections 6 and 8 are updated and reprinted from FAO Animal Production and Health Paper No. 119, *Manual on meat inspection for developing countries* (1994). The original publication was planned, coordinated and edited by Dr G. Heinz and Mr K. Amamoto of FAO. The principal author of this publication was Dr D. Herenda, Canada; Dr P.G. Chambers, Zimbabwe, Dr P. Seneviratna, Australia, Prof. Dr T.J. da Silva, Brazil, and Prof. Dr A. Ettriqui, Tunisia, all contributed.

# CODEX ALIMENTARIUS

## General principles of meat hygiene

1. Meat must be safe and suitable for human consumption and all interested parties including government, industry and consumers have a role in achieving this outcome.<sup>1</sup>
2. The competent authority should have the legal power to set and enforce regulatory meat hygiene requirements, and have final responsibility for verifying that regulatory meat hygiene requirements are met. It should be the responsibility of the establishment operator to produce meat that is safe and suitable in accordance with regulatory meat hygiene requirements. There should be a legal obligation on relevant parties to provide any information and assistance as may be required by the competent authority.
3. Meat hygiene programmes should have as their primary goal the protection of public health and should be based on a scientific evaluation of meat-borne risks to human health and take into account all relevant food safety hazards, as identified by research, monitoring and other relevant activities.
4. The principles of food safety risk analysis should be incorporated wherever possible and appropriate in the design and implementation of meat hygiene programmes.<sup>2</sup>
5. Wherever possible and practical, competent authorities should formulate food safety objectives (FSOs) according to a risk-based approach so as to objectively express the level of hazard control that is required to meet public health goals.
6. Meat hygiene requirements should control hazards to the greatest extent practicable throughout the entire food chain. Information available from primary production should be taken into account so as to tailor meat hygiene requirements to the spectrum and prevalence of hazards in the animal population from which the meat is sourced.
7. The establishment operator should apply HACCP principles. To the greatest extent practicable, the HACCP principles should also be applied in the design and implementation of hygiene measures throughout the entire food chain.
8. The competent authority should define the role of those personnel involved in meat hygiene activities where appropriate, including the specific role of the veterinary inspector.

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<sup>1</sup> Specific meat hygiene requirements should address biological, chemical and physical hazards, and pathophysiological and other characteristics associated with suitability for human consumption.

<sup>2</sup> Codex Committee on Food Hygiene, proposed draft Principles and Guidelines for the Conduct of Microbiological Risk Management (CX/FH 03/7 and ALINORM 03/13A paras. 78–98); Codex Committee on General Principles, proposed draft Working Principles for Risk Analysis (CX/GP 02/3); Report of a Joint FAO/WHO Consultation on Principles and Guidelines for Incorporating Microbiological Risk Assessment in the Development of Food Safety Standards, Guidelines and Related Texts; Kiel, Germany, 18–22 March 2002 (ALINORM 03/16A – Appendix II, p. 30).

9. The range of activities involved in meat hygiene should be carried out by personnel with the appropriate training, knowledge, skills and ability as and where defined by the competent authority.
10. The competent authority should verify that the establishment operator has adequate systems in place to trace and withdraw meat from the food chain. Communication with consumers and other interested parties should be considered and undertaken where appropriate.
11. As appropriate to the circumstances, the results of monitoring and surveillance of animal and human populations should be considered with subsequent review and/or modification of meat hygiene requirements whenever necessary.
12. Competent authorities should recognize the equivalence of alternative hygiene measures where appropriate, and promulgate meat hygiene measures that achieve required outcomes in terms of safety and suitability and facilitate fair practices in the trading of meat.

# Glossary and abbreviations

## GLOSSARY TERMS

### Abattoir

Any establishment where specified animals are slaughtered and dressed for human consumption and that is approved, registered and/or listed by the competent authority for such purposes.

### Animal

Animals of the following types:

- domestic ungulates;
- domestic solipeds;
- domestic birds, i.e. poultry;
- lagomorphs;
- farmed game;
- farmed game birds, including ratites;
- wild game, i.e. wild land mammals and birds that are hunted (including those living in enclosed territory under conditions of freedom similar to those of wild game);
- animals as otherwise specified by the competent authority.

### Ante-mortem inspection

Any procedure or test conducted by a competent person on live animals for the purpose of judgement of safety and suitability and disposition.



### Carcass

The body of an animal after dressing.

### Chemical residues

Residues of veterinary drugs and pesticides as described in the Definitions for the Purpose of the Codex Alimentarius (FAO/WHO, 2001).

### Cleaning

The removal of soil, food residue, dirt, grease or other objectionable matter.

### Clonic phase

Kicking/convulsive period after pre-slaughter stunning (see also *Tonic phase*).

### Codex maximum residue limit (MRL) for pesticides

The maximum concentration of a pesticide residue (expressed as mg/kg) recommended by the Codex Alimentarius Commission to be legally permitted in or on food commodities and animal feeds. MRLs are based on good agricultural practice (GAP) data, and foods derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable.

### Codex maximum residue limit (MRL) for veterinary drugs

The maximum concentration of residue resulting from the use of a veterinary drug (expressed in mg/kg or µg/kg on a fresh weight basis) that is recommended by the Codex Alimentarius Commission to be legally permitted or recognized as acceptable in or on a food.

**Commensal**

An organism that lives in or on the body and does not cause illness. Some of these can cause illness if they are transferred to foods.

**Competent authority**

The official authority charged by the government with the control of meat hygiene, including setting and enforcing regulatory meat hygiene requirements.

**Competent body**

A body officially recognized and overseen by the competent authority to undertake specified meat hygiene activities.

**Competent person**

A person who has the training, knowledge, skills and ability to perform an assigned task, and who is subject to requirements specified by the competent authority.

**Condemned**

Examined and judged by a competent person, or otherwise determined by the competent authority, as being unsafe or unsuitable for human consumption and requiring appropriate disposal.

**Contaminant**

Any biological or chemical agent, foreign matter or other substance not intentionally added to food that may compromise food safety or suitability.

**Contamination**

The introduction or occurrence of a contaminant in food or the food environment.

**Corneal reflex**

A reflex/blinking movement elicited by touching the eyeball; a brain-stem reflex whose presence indicates brain-stem function.

**Corrective action**

Procedures to be followed when a deviation occurs.

**Critical control point (CCP)**

A point, step or procedure in a food process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated or reduced to acceptable levels.

**Critical limit**

The maximum or minimum value to which a physical, biological or chemical hazard must be controlled at a critical control point to prevent, eliminate or reduce to an acceptable level the occurrence of the identified food safety hazard.

**Disease or defect**

Any abnormality affecting safety and/or suitability.

**Disinfection**

The reduction, by means of chemical agents and/or physical methods, of the number of micro-organisms in the environment, to a level that does not compromise food safety or suitability.

**Dressing**

The progressive separation of the body of an animal into a carcass and other edible and inedible parts.

**Emergency slaughter**

The immediate slaughter of an animal for reasons of meat hygiene or animal welfare, or to prevent the spread of disease.

**Epileptic activity/seizure**

Activity seen in an electrically stunned animal.

**Equivalence**

The capability of different meat hygiene systems to meet the same food safety and/or suitability objectives.

**Establishment**

A building or area used for performing meat hygiene activities that is approved, registered and/or listed by the competent authority for such purposes.

**Establishment operator**

The person in control of an establishment who is responsible for ensuring that the regulatory meat hygiene requirements are met.

**Evisceration**

Removal of the internal organs from the abdominal and thoracic cavities of a carcass.

**Examination**

Detailed investigation, using clinical instruments such as a stethoscope or thermometer.

**Feed (feedingstuff)**

Any single or multiple materials, whether processed, semi-processed or raw, which are intended to be fed directly to food-producing animals.

**Feed additives**

Any intentionally added ingredient not normally consumed as feed by itself, whether or not it has a nutritional value, which affects the characteristics of feed or animal products.

**Feed ingredient**

A component part or constituent of any combination or mixture making up a feed, whether or not it has a nutritional value in the animal's diet, including feed additives. Ingredients are of plant, animal or aquatic origin, or other organic or inorganic substances.

**Food hygiene**

All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

**Food safety**

Assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

**Food safety objective (FSO)**

The maximum frequency and/or concentration of a hazard in a food at the time of consumption that provides the appropriate level of protection.

**Food suitability**

Assurance that food is acceptable for human consumption according to its intended use.

**Fresh meat**

Meat that apart from refrigeration has not been treated for the purpose of preservation other than through protective packaging and which retains its natural characteristics.

**Good hygienic practice (GHP)**

All practices regarding the conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

**HACCP (Hazard Analysis and Critical Control Point) system**

A system that identifies, evaluates and controls hazards that are significant for food safety.

**Hazard**

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

**Hazard characterization**

The qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with biological, chemical and physical agents that may be present in food. For chemical agents, a dose-response assessment should be performed if the data are obtainable.

**Hazard identification**

The identification of biological, chemical and physical agents capable of causing adverse health effects and which may be present in a particular food or group of foods.

**Head-to-back stunning**

Electrical stunning that induces an effective stun and a cardiac arrest.

**Inedible**

Examined and judged by a competent person, or otherwise determined by the competent authority, to be unsuitable for human consumption.

**Inspection**

Visual process of observation; the aim is to screen for animals that may then require examination.

**Isolation pens**

Special pens in which animals can be held, separated from their congeners, to facilitate veterinary inspection or treatment.

**Loading dock**

A raised area level with the deck of a vehicle to facilitate easy loading of animals on to the vehicle.

**Maximum residue limits**

see *Codex maximum residue limit for pesticides* and *Codex maximum residue limit for veterinary drugs*.

**Meat**

All parts of an animal that are intended for, or have been judged as safe and suitable for, human consumption.

**Meat hygiene**

All conditions and measures necessary to ensure the safety and suitability of meat at all stages of the food chain.

**Minced meat**

Boneless meat that has been reduced to fragments.

**Notifiable disease**

A disease that must be reported to the competent authority when its existence is known or suspected (e.g. anthrax with sudden death, foot-and-mouth disease, rinderpest, swine fever).

**Official inspector**

A competent person who is appointed, accredited or otherwise recognized by the competent authority to perform official meat hygiene activities on behalf of, or under the supervision of, the competent authority.

**Organoleptic inspection**

Using the senses of sight, touch, taste and smell for identification of diseases and defects.

**Pathogen**

A specific causative agent (usually a bacterium) of disease.

**Pelt-burn**

Burn on skin on the back of sheep caused by localized contact by the rear electrode (electrical stunning). It can be overcome by application of copious amounts of water.

**Performance criteria**

The required outcome of one or more control measures at a step or a combination of steps that contribute to assuring the safety of a food.

**Polishing**

Rubbing (e.g. by brush) or scraping (e.g. by knife) the skin of pig carcasses after singeing to remove all remnants of bristle.

**Post-mortem inspection**

Any procedure or test conducted by a competent person on all relevant parts of slaughtered/killed animals for the purpose of judgement of safety, suitability and disposition.

**Post-stun convulsions**

Uncontrollable physical/kicking activity of limbs after electrical or captive bolt stunning.

**Pre-slaughter handling**

All handling of animals from their selection for slaughter on the farm to their point of stun at the abattoir.

**Preventive measure**

Physical, chemical or other means that can be used to control an identified food safety hazard.

**Primary production**

All those steps in the food chain constituting animal production and transport of animals to the abattoir, or hunting and transporting wild game to a game depot.

**Process control**

All conditions and measures applied during the production process that are necessary to achieve safety and suitability of meat.

**Process criteria**

The process control parameters (e.g. time, temperature, dose) at a specified step that can be applied to achieve performance criteria.

**Prolapse**

The condition where an organ has fallen or become displaced from its normal position and may subsequently protrude from the body.

**Quality assurance (QA)**

All the planned and systematic activities implemented within the quality system and demonstrated as needed to provide adequate confidence that an entity will fulfil requirements for quality.

**Quality assurance (QA) system**

The organizational structure, procedures, processes and resources needed to implement quality assurance.

**Raw meat**

Fresh meat, minced meat or mechanically separated meat.

**Ready-to-eat (RTE) products**

Products that are intended to be consumed without any further biocidal steps.

**Reaming tool**

A special metal device used for scraping off the carbon deposits and cleaning inside the barrel of a captive bolt gun.

**Responsible establishment official**

The individual with overall authority on site or a higher-level official of the establishment.

**Rhythmic breathing**

Brain-stem reflex whose presence indicates brain-stem function.

**Risk**

A function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard or hazards in food.

**Risk analysis**

A process consisting of three components: risk assessment, risk management and risk communication.

**Risk assessment**

A scientifically based process consisting of the following steps: (i) hazard identification, (ii) hazard characterization, (iii) exposure assessment, and (iv) risk characterization.

### **Risk characterization**

The qualitative and/or quantitative estimation, including attendant uncertainties, of the probability of occurrence and severity of known or potential adverse health effects in a given population, based on hazard identification, hazard characterization and exposure assessment.

### **Risk communication**

The interactive exchange of information and opinions throughout the risk analysis process concerning hazards and risks, risk-related factors and risk perceptions among risk assessors, risk managers, consumers, industry, the academic community and other interested parties, including the explanation of risk assessment findings and the basis of risk management decisions.

### **Risk management**

The process, distinct from risk assessment, of weighing policy alternatives, in consultation with all interested parties, considering risk assessment and other factors relevant for the health protection of consumers and for the promotion of fair trade practices and, if needed, selecting appropriate prevention and control options.

### **Risk-based**

Containing performance and/or process criteria developed according to risk analysis principles.



### **Safe for human consumption**

Safe for human consumption according to the following criteria:

- has been produced by applying all food safety requirements appropriate to its intended end-use;
- meets risk-based performance and process criteria for specified hazards; and
- does not contain hazards at levels that are harmful to human health.

### **Shackling**

Coupling the hind limbs of a stunned animal using a chain or similar to enable hoisting and sticking.

### **Specified risk material (SRM)**

These are the animal tissues that are most at risk of harbouring the transmissible spongiform encephalopathy (TSE) agent. These tissues must be removed from the food and feed chains to avoid the risk of recycling the TSE agent. They are separately collected at slaughterhouses and disposed of by direct incineration or after pre-processing. Countries define SRM differently, although all include the brain and spinal cord of cattle over 30 months old. In the European Union the following organs are considered SRM: skull (including brain and eyes), spinal cord and vertebral column (including dorsal root ganglia but **not** vertebrae of tail nor transverse processes of lumbar and thoracic vertebrae) from cattle older than 12 months, tonsils and intestines and mesentery from cattle of all ages.

### **Sterilize**

Use physical or chemical procedure to destroy all microbial life, including highly resistant bacterial endospores.

### **Sticking/exsanguination**

Severance of blood vessels in the neck or in the chest.

### **Stockman/stock handler**

Anybody who is involved with the care, health and welfare of animals.

### Suitable for human consumption

Suitable for human consumption according to the following criteria:

- has been produced under hygienic conditions as outlined in the *Draft code of hygienic practice for meat*;
- is appropriate to its intended use; and
- meets outcome-based parameters for specified diseases or defects as established by the competent authority.



### Tonic phase

Rigid period during and/or immediately after pre-slaughter stunning (see also *Clonic phase*).

### Traceability

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.



### Undesirable substances

Contaminants and other substances that are present in and/or on feed and feed ingredients and constitute a risk to the health of the consumer, including food safety-related animal health issues.



### Verification

Activities performed by the competent authority and/or competent body to determine compliance with regulatory requirements.

### Verification (operator)

The continual review of process control systems, including corrective and preventive actions, to ensure that regulatory and/or specified requirements are met.

### Veterinary inspector

An official inspector who is professionally qualified as a veterinarian and officially carries out meat hygiene activities as specified by the competent authority.



### Zoonosis/zoonotic disease

Animal disease that can be transmitted to humans.

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## ABBREVIATIONS AND ACRONYMS

### Animal diseases

<b>BHD</b>	bovine herpes dermophatic disease
<b>BSE</b>	bovine spongiform encephalopathy
<b>BVD</b>	bovine viral diarrhoea
<b>CBPP</b>	contagious bovine pleuropneumonia
<b>COPD</b>	chronic obstructive pulmonary disease
<b>CWD</b>	chronic wasting disease
<b>FMD</b>	foot-and-mouth disease
<b>IBR</b>	infectious bovine rhinotracheitis
<b>MCF</b>	malignant catarrhal fever
<b>NWS</b>	New World screwworm
<b>OWS</b>	Old World screwworm
<b>RP</b>	rinderpest
<b>TME</b>	transmissible mink encephalopathy
<b>TRP</b>	traumatic reticuloperitonitis
<b>TSEs</b>	transmissible spongiform encephalopathies
<b>vCJD</b>	variant Creutzfeldt-Jakob disease
<b>VS</b>	vesicular stomatitis

### Institutions and organizations

<b>CAC</b>	Codex Alimentarius Commission
<b>CCFH</b>	Codex Committee on Food Hygiene

<b>EC</b>	European Commission
<b>FDA/CFSAN</b>	United States Food and Drug Administration Center for Food Safety and Applied Nutrition
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>FSIS USDA</b>	Food Safety and Inspection Service of the United States Department of Agriculture
<b>JECFA</b>	Joint Expert Committee on Food Additives
<b>OIE</b>	World Organisation for Animal Health
<b>WHO</b>	World Health Organization
<b>WTO</b>	World Trade Organization

### Other

<b>ADI</b>	acceptable daily intake
<b>AI</b>	artificial insemination
<b>ALOP</b>	appropriate level of protection
<b>CBG</b>	captive bolt gun
<b>CCP</b>	critical control point
<b>cfu</b>	colony forming units
<b>CL</b>	critical limit
<b>CNS</b>	central nervous system
<b>DCB</b>	dark cutting beef
<b>DFD</b>	dark, firm, dry (meat)
<b>FSO</b>	food safety objective

<b>GAP</b> good agricultural practice	<b>PSE</b> pale, soft, exudative (pork)
<b>GHP</b> good hygienic practice	<b>QA</b> quality assurance
<b>GMP</b> good manufacturing practice	<b>RFID</b> radio frequency identification device
<b>GVP</b> good veterinary practice	<b>RH</b> relative humidity
<b>HACCP</b> Hazard Analysis and Critical Control Point	<b>SPS</b> Sanitary and Phytosanitary (Agreement)
<b>MPL</b> maximum permissible level	<b>SRM</b> specified risk material
<b>MRA</b> microbiological risk assessment	<b>STEC</b> Shiga toxin-producing <i>Escherichia coli</i>
<b>MRL</b> maximum residue limit	<b>TBT</b> Technical Barriers to Trade (Agreement)
<b>MSQA</b> meat safety quality assurance system	<b>TQM</b> total quality management
<b>PCBs</b> polychlorinated biphenyls	

# Introduction

Meat has traditionally been viewed as the culprit for a significant proportion of human food-borne disease. Although the spectrum of meat-borne diseases of public health importance has changed with changing production and processing systems, in recent years human surveillance studies of specific meat-borne pathogens, such as *Escherichia coli* O157:H7, *Salmonella* spp., *Campylobacter* spp. and *Yersinia enterocolitica*, have shown that the problem continues. In addition to existing biological, chemical and physical hazards, new hazards are also appearing, for example, the agent of bovine spongiform encephalopathy (BSE). Furthermore, consumers increasingly have expectations about suitability issues that are not necessarily of human health significance.

A contemporary risk-based approach to meat hygiene requires that hygiene measures should be applied at those points in the food chain where they will be of greatest value in reducing food-borne risks to consumers. This should be reflected in the application of specific measures that are based on science and risk assessment, and a greater emphasis on prevention and control of contamination during processing. Application of the Hazard Analysis and Critical Control Point (HACCP) principles is an essential element. Risk-based programmes have proved successful in achieving hazard control to the extent required for consumer protection. They are based on the required outcome rather than on detailed and prescriptive measures.

A number of national governments are implementing systems that redefine the respective roles of industry and government in delivering meat hygiene activities. Irrespective of the delivery systems, the competent authority is responsible for defining the role of personnel involved in meat hygiene activities where appropriate, and verifying that all regulatory requirements are met.

The principles of food safety risk management should be incorporated wherever appropriate in the design and implementation of meat hygiene programmes. Further, newly recognized meat-borne risks to human health may require measures in addition to those that are usually applied in meat hygiene; for example, the potential for zoonotic transmission of central nervous system disorders of slaughtered livestock means that additional animal health surveillance programmes may need to be undertaken.

This manual provides updated comprehensive information and practical guidelines for the implementation of the new *Draft code of hygienic practice for meat*, when adopted by the Codex Alimentarius Commission. The publication is intended to guide managers of abattoirs and the meat industry. It will also be of value to veterinarians engaged in meat inspection, with their supervisory roles in meat hygiene. The book is published in detachable modules and can also serve as a training manual.

This manual is not a substitute for any regulations that apply. Rather, it is designed to provide a quick reference to current good practice and avoids lengthy text normally found in regulatory documents. The procedures outlined are recommendations for good practice, based on the new Codex code and on research in the relevant areas. The subject matter covers all the procedures, facilities and personnel considerations that impinge on the safety of meat and on the welfare of the animals – including the risk from BSE-infected animals – commencing with the animals on the farm, to the slaughterhouse/processing plant and extending to post-mortem inspection of carcasses and staff training.