

Controls to Manage Identified Hazards

1. Introduction

SD 3 describes the controls that prevent, reduce or eliminate hazards in meat. They are based on sources including the Guide to Good Practices in the Meat Industry (FAO 2004), Codex Code of Hygienic Practice for Meat¹, Food Safety Controls in the Australian Meat Industry², Codes of Practice for the Welfare of Animals and other Australian information. Information in this document forms the basis for the main report and therefore there will be some repetition.

Meat production is divided into general categories:

- on-farm production of animals;
- transport to saleyards, between properties and to the abattoir;
- holding the animals at the saleyards ;
- processing – lairage, slaughter and dressing (and boning);
- further processing into non-ready-to-eat products such as natural casings and rendered products.

2. On-farm controls

The objective of production (from a food safety perspective) is to ensure that animals are healthy and are not presenting symptoms of disease, or conditions, or to the extent practicable, do not carry pathogens that affect the safety and suitability³ of meat and meat products.

On-farm the hazards that can be controlled arise from:

- inputs such as pasture, feed, feed supplements, water for drinking and use of agricultural and veterinary chemicals such as medicines, cleaning chemicals, fertilisers and pest control chemicals;
- contact with other animals (wild and domestic) and people who may transmit pathogens to the animals. The importance of this transmission route is likely to increase with the intensity of the production system used;
- environmental sources such as buildings, pens, yards, ramps and equipment which may be sources of pathogens, insects that may attack animals (leading to infection) and vermin which may transmit pathogens to feed; and
- animal injury and increased susceptibility to disease due to stress from poor handling during interventions such as drenching, mustering and confinement.

¹ Code of Hygienic Practice for Meat CAC/RCP 58-2005

² Report prepared for FSANZ by SafeFood Queensland 2008.

³ The definitions of unsafe and unsuitable are important in relation to meat. The term 'unsafe and unsuitable' covers hazards that could affect the health of consumers and meat affected by diseases and conditions that consumers prefer not to eat but which do not necessarily cause them illness. The definition of unsuitable also covers levels of contaminants and residues which, while not unsafe, are in excess of the limits in the Code (Standard 3.1.1)

Table 1 Inputs, hazards and general control measures

Input	Hazards ⁴	General control measures
Pasture	<p>Animals ingest pathogens from manure from animals, fertiliser slurries or from water used to irrigate the pasture.</p> <p>Examples relevant to meat safety are include <i>Salmonella</i>, Path. <i>E coli</i> and <i>Taenia saginata</i>.</p> <p>Examples of animal disease (suitability) and not usually food borne are Blackleg, Malignant oedema caused by clostridia and Johne's disease.</p>	<p>Minimise the risk of infection by good pasture management and good grazing management particularly following treatment of pasture with manures or slurries for example, by observing adequate periods between grazing rotations and before allowing animals to graze on treated pasture.</p> <p>Ensure that pasture is not overstocked.</p>
Feed including manufactured feed, licks and supplements and fodder (including silage)	<p>Animals ingest pathogens introduced into feed during manufacture or by for example, contamination from vermin or domestic animals such as cats. Changes in feed availability and or type may affect gut flora which predisposes to various conditions.</p> <p>Examples of pathogens relevant to meat safety are <i>Salmonella</i>, <i>Toxoplasma</i> (mainly sheep because they graze closer to the ground and pigs if cats contaminate feed with their faeces) and <i>Listeria</i> particularly in silage</p> <p>Example of animal disease (suitability) are various gastro-intestinal parasites (goats are particularly sensitive apparently).</p> <p>Changes in feed availability - pregnancy toxaemia in ewes (post-mortem fatty degeneration of the liver).</p>	<p>Produce animal feeds, licks and supplements in accordance with good practice and ensure storage conditions prevent access by vermin and domestic animals.</p> <p>Source feed from reputable manufacturers and follow manufacturer's instructions as to storage and use.</p> <p>Access feed that is certified as to micro (and chemical status).</p> <p>Manage feed availability and type and changes in feed.</p>
Water	<p>Animals ingest pathogens in drinking water</p> <p>Examples of pathogens relevant to meat safety are <i>Cryptosporidium</i> (particularly calves), <i>Salmonella</i> and <i>Campylobacter</i></p> <p>Example of animal disease (suitability) is Leptospirosis</p>	<p>Obtain drinking water from sources that are protected from seepage from drains, sewerage, septic systems, manure pits and other sources of contamination.</p> <p>Ensure water is of a microbiological quality that minimises animal contamination and if there is doubt, treat the water.</p>

⁴ There may be several sources and modes of transmission – these are examples. Also some animal conditions may be occupational hazards for meat workers and vets but are not usually transmitted through undercooked meat or handling meat at the consume end of the chain. Chemical hazards are addressed as a separate line – ‘veterinary and agricultural chemicals’

Input	Hazards ⁴	General control measures
Veterinary and agricultural chemicals (including in feed and water)	Animals ingest harmful/undesirable/illegal chemicals which could accumulate in the meat. Residues from veterinary medicines etc accumulate in the meat.	Use only those veterinary medicines and other chemicals used in animal husbandry that are legal to use and are used within technical recommendations. Apply pesticides, weed control chemicals and fertilisers only when necessary and in accordance with manufacturers' instructions and good agricultural practice. Adhere to after-treatment withdrawal periods from feed, medicines, pasture treatments etc,. Do not graze animals where environmental chemical contamination has occurred for example, water sources affected by mining. Do not allow animals to access stored chemicals.
The environment – premises and equipment and where relevant bedding	Animals may ingest pathogens from environmental sources such as accumulations of manure, dead rodents, dirty sheds and yards and dirty bedding materials. Examples of pathogens relevant to meat safety are <i>Salmonella</i> , <i>Campylobacter</i> and <i>Toxoplasma</i> (bedding for pigs). Examples of animal disease (suitability) are Melioidosis, Q fever and Caseous lymphadenitis.	Design and construct premises and equipment so as to facilitate cleaning and are maintained in a clean condition (in accordance with their use). Control pests and domestic animals.
Injuries sustained during handling or from accidents or through insect bites and parasites. e.g. through damage to the skin/fleece/hide. Stress	Examples of animal disease (suitability) and not food borne are tick borne diseases such as Anaplasmosis. Foot rot and lumpy jaw (Actinomycosis) may result from infection of wounds. Stress may impact on the animals natural defence mechanisms resulting in increased susceptibility to pathogens, increased shedding in faeces and also distress the animal making it more likely to fall or panic and be injured.	Ensure grazing land is free (as far as practical) from sites that could cause accidental injury or ensure hazardous sites are fenced off. Ensure veterinary practices are carried out so that animals are not unnecessarily injured and measures are implemented to protect animals from insects and other parasites that could affect the safety of the meat. Handle animals in ways that cause the least disturbance, stress and to avoid injury.

3. Transport

It is estimated that approximately 99,197,000 cattle, calves, lambs, sheep, pigs and goats are transported by rail or road over 104,000,000 km across Australia per year from the farms

or feedlots to other properties, saleyards export facilities or abattoir. This means that animals have to be loaded and unloaded and may spend considerable periods of time in transit. The issues in regard to limiting stress and travel fatigue are complex⁵. The aim is to ensure that the animals arrive in as good a condition as when they left to prevent any disease, injury or other issues that could affect the meat. Control measures implemented prior to travel include:

- mustering and handling animals so that they are not unduly stressed;
- ensuring the animals are fit to travel;
- ensuring animals are as clean as practicable;
- ensuring feed curfews do not have unintentional adverse effects on meat safety;
- loading onto clean vehicles; and
- not overcrowding the vehicle.

The transporter can contribute to managing hazards by:

- ensuring vehicles are clean prior to loading;
- ensuring animals are not unduly stressed due to feed and water deprivation, mixing with unfamiliar animals or because of heat or distance; and
- careful loading and unloading (and driving manner) to avoid injury.

3.1 Control measures

Ensuring animals are fit to travel

'Fit to travel' is important in Australia where transport times may be long⁶, due to distance and delays due to adverse weather, and weather conditions may be extreme for example, very hot.

Animals may be selected for sale or slaughter based on factors in addition to their 'readiness' for sale as meat for example, culling for economic reasons, surplus to requirements or as part of breeding programs.

Animals (under general circumstances) should not be selected that show symptoms or conditions that indicate that they are unlikely to survive transport, will go down during transport and be injured or trampled, or will be unduly stressed for some reason or are otherwise not 'fit for travel'. These animals may be suffering diseases or conditions such as injuries, or sustain such injuries during transport, that could adversely affect the safety or suitability of the meat from that animal, or which could spread to other animals and subsequently be important for meat safety.

As a general principle the following categories of animals should not be consigned:

- ill or injured animals or animals that are in pain, cannot walk normally, are lame or are

⁵ Regulatory Impact Statement, Australian standards and guidelines for the welfare of animals - Land Transport of Livestock, Primary Industries Ministerial Council, March 2008 – public consultation document for the development of the standards and guidelines for the welfare standard for land transport. .

⁶ A review and Analysis of Saleyard Marketing in Australia states that the trend is to increase the distances that stock moves to saleyards because smaller ones are closing and large regional ones being established. The report states that 'Anecdotal evidence from the Forbes complex indicates that the drawing area has expanded some 30% since the yards were completed'. Also, cattle are moved greater distances to finish them at specialist feedlot facilities However, the report also notes that in the future (with on-line selling) and increased activity by the larger players (Woolworths and Coles) farmers may by-pass yards and sell more stock direct.

injured with burns, cuts or broken bones. Animals in these conditions should be identified and suitability assessed for transport with welfare requirements being a priority;

- animals suffering from scouring should not be transported as they foul themselves, other animals in the consignment and may lead to higher rates of carcass contamination;
- pregnant and near to giving birth or have recently given birth;
- newborn or very young animals; and
- weak, stressed or unsteady animals that could go down during transport (and possibly drag sound animals with them).

The Codex Code of Hygienic Practice for Meat states that animals should not be loaded for transport to the abattoir when:

- information is available to suggest that animals may compromise the production of meat which is safe and suitable for human consumption e.g. presence of specific disease conditions or recent administration of veterinary drugs. In some situations transport may proceed if the animal has been specifically identified and is to be slaughtered under special supervision; or
- conditions causing animal stress may exist or arise that are likely to result in an adverse impact on the safety and suitability of meat.

The following section discusses the main control measures generally, and there may be specific controls for the different species of meat animals not mentioned below.

Ensuring animals are as clean as practicable prior to loading

The animal may carry pathogenic microorganisms on its skin and hide/fleece. Dirty animals may increase the likelihood of pathogen contamination onto carcasses for hides/fleeces during the slaughter and dressing processes. The risk of these pathogens contaminating the meat increases where levels of faecal contamination on the hide/fleece are high.

The hide dirtiness is influenced by a number of factors such as whether the animal is intensively or extensively farmed (including whether it is housed), the age, coat length, whether clipped or shorn and the time of year.

The Codex Code of Hygienic Practice for Meat states that animals should not be loaded for transfer to the abattoir when the degree of contamination of the external surfaces of the animal is likely to compromise hygienic slaughter and dressing and suitable interventions such as washing and shearing are not available.

Implementing feed curfews prior to loading

Feed and water curfews are applied to animals going to saleyards or to slaughter to reduce soiling of animals and slippery surfaces in trucks. There is potential for conflict between the length of the curfew to empty out the animal prior to transporting and welfare issues for animals deprived of water and feed. There are different optimum curfew times for water and feed, for different animals, for different journey lengths and total withdrawal time from mustering to slaughter.

Stress in livestock occurs more frequently when the animals are deprived of feed and water prior to transport.

Feed deprivation, both reduced and interrupted, may trigger the growth of pathogens in the

rumen of livestock, change microflora in the rumen and lower digestive tract (e.g. the colon) due to changed pH level and decrease the animal's ability to eliminate the bacteria from the rumen.

Feed curfews are an important in Australia because of the long distances travelled and therefore the length of the journey. Water is an issue because animals require large amounts of water in hot weather.

Ensuring vehicles are clean prior to loading

Pathogens in vehicles contaminated from previous loads may contaminate animals. Food borne pathogens have been identified in transport vehicles prior to loading and prevalence on the animals may be affected by whether it's a single or double deck, the floor type and whether bedding is in the vehicle.

The Codex Code of Hygienic Practice for Meat states that transport of slaughter animals should be carried out in a manner that does not have an adverse impact on the safety and suitability of the meat. Codex control measures also include that animals should be protected from contamination from decks above and that transport vehicles and any crates used should be cleaned and if necessary sanitised as soon as practicable after animals have been unloaded.

Ensuring animals are not unduly stressed due to feed and water deprivation, mixing with unfamiliar animals or because of heat or distance

The Welfare Code of Practice for Land Transport of Cattle and Codes for other animals have requirements in relation to mixing species, loading densities and ways in which stress due to weather conditions may be minimised; the aim being to start and finish the journey with animals that are minimally stressed. These factors were extensively considered in the development of the new Australian welfare standard for land transport of livestock as part of the Australian Animal Welfare Strategy⁷.

Codex Code of Hygienic Practice for Meat recommends that consideration is given to avoiding undue stress that may adversely impact on the safety of meat (such as stress-induced shedding of pathogens). It requires journey distance and time to be as short as possible and rest and water should be provided.

Careful loading and unloading (and driving manner) to avoid injury.

The Codex Code of Hygienic Practice for Meat contains requirements for careful driving to avoid animals being injured.

4. Saleyards

Saleyards receive animals from large areas and disperse them over large distances. There are approximately 210 saleyards across Australia with 194 of these with sales usually on a regular basis and with significant numbers of animals. Forty percent of these saleyards are in NSW and 40 % in Qld and Vic. The average number of animals passing through saleyards in an average year is 19 million sheep and 6 million cattle. Pigs are traded through saleyards in much smaller numbers. The majority of animals go through NSW and Vic saleyards.⁸

⁷ For information on the Animal Welfare Strategy contact the Department of Agriculture, Fisheries and Forestry www.daff.gov.au email animalwelfare@daff.gov.au.

⁸ A Review and Analysis of Saleyard Marketing in Australia, Report prepared for DAFF by Hassall & Associates Pty Ltd. May 2007

There is a tendency for smaller saleyards to close and be replaced by larger saleyards taking animals from a wider area. Some buyers prefer larger saleyards because they have more choice to fill orders within a given budget without moving to other saleyards. Some buyers and sellers prefer saleyards with a good reputation in regard to the facilities to ensure welfare of livestock (e.g. soft flooring in new yards) as this reduces deaths and improves carcass quality. They will transport animals further to use these saleyards.

On-line selling is increasing. It has the advantage that the buyer knows where stock is from and they can go direct from farm to the buyer⁹.

Table 2 Control of hazards at the saleyard

Source of hazard	Control
Inputs - pathogens and chemical contaminants in feed and water and use of veterinary chemicals	Ensuring water is of appropriate quality – water must be available and at all times in paddocks, yards and pens (with some minor exceptions) in line with industry good practice/welfare. Ensuring feed is 'of known status' and is free of contaminants – feed is likely to be available if the animals are remaining more than 24 hours in line with industry good practice/welfare. Use of chemicals is controlled
Transfer of pathogens due to mixing animals from multiple sources	Keeping yards and pens clean, segregating diseased or injured animals ¹⁰ , discouraging supply of dirty stock. Ensuring that effluent and dead animals are disposed of appropriately.
Injuries that could affect safety and suitability	Ensuring design and construction are such that likelihood of injuries is minimised.
Stress that could affect safety and suitability – e.g. herding with unfamiliar animals in unfamiliar surroundings	The operations of the saleyard are managed to ensure the well being of the animals are maintained.

5. Processing

The main controls that can be implemented at processing are:

- ensuring the condition (or fitness) of animals is in accordance with specified criteria as to the animals health and exposure to chemicals to the extent that safety and suitability can be assessed visually in the live animal and from documentation accompanying the animal;
- preventing hazards that could occur while animals are in the lairage such as injury and stress;
- ensuring hygiene during the slaughter and dressing process; and

⁹ The above reference has information on increased use of on-line sales and the drivers for producers and buyers to use on-line and also to use larger saleyards.

¹⁰ Some animals are sold at the saleyard under the 'vendor's risk' approach – the buyer purchases the animals but the risk is with the seller if the animals is condemned – i.e. the purchase price will be adjusted if the animal or carcass is downgraded or condemned at the abattoir. A consequence of this is that some animals (potentially) are sent to the saleyard and then for slaughter when they are not fit for slaughter.

- disposing of meat that has been assessed (mainly visually) as not fit for human consumption for purposes other than human consumption.

Table 3 General controls at processing (cattle)

Step¹¹	General control measures
Lairage	The cattle are sourced from cattle producers/saleyards that meet requirements as to the production and management practices that assure that diseased animals are not presented at the abattoir.
	Animals are not slaughtered unless they have been passed as fit for slaughter (i.e. satisfies ante-mortem inspection).
	Animals that are dead before slaughter or are known or suspected of being diseased, injured or otherwise unfit or unsuitable for slaughter are identified as such, separated and kept separated until disposed of. (ante-mortem inspection)
	Animals are identifiable on admission so that if a problem is identified after receipt at the lairage, the animal can be identified and separated.
	Animals are not injured or stressed while in the lairage so as to make them unfit for slaughter.
	Cleaning and sanitation programs are in place to ensure that the lairage is maintained to an adequate level of cleanliness to prevent cross contamination of cattle.
	Premises are provided with adequate facilities and suitable supplies of water to enable cleaning to take place.
	Access by animals e.g. dogs, horses, other than cattle is restricted.
Assessment of animal cleanliness	Animals that are excessively dirty are not accepted for slaughter or are accepted subject to conditions that ensure they will not cause contamination of meat.
Stunning and bleeding	Stunning and bleeding are carried out in such a manner so as to avoid contamination of the slaughtering and processing environment and of the carcass. Adequate measures are taken during collection and disposal of blood which avoids it contaminating the environment and other carcasses
Carcass hide washing, legging, hide clearing and removing	If necessary carcasses are washed post stunning and bleeding. Hides are removed in such a manner as to avoid, as far as practicable, contamination of the carcass and carcasses are kept separate to minimise the opportunities for cross contamination.
Bunging	Discharge from the intestines, rectum etc is prevented
Evisceration	Evisceration is carried out so as to prevent rupture or breakage of the internal organs.
Trimming	Evidence of faecal contamination, lesions etc that can be trimmed are removed from the carcass/parts. Trimming is carried out with clean and sanitised equipment.
Post mortem	Carcasses (or parts) that are visibly affected by conditions that make them unfit for further processing are identified (through the post mortem inspection), segregated and disposed of.
Storage	Delays between dressing and further processing of the carcasses are avoided to prevent growth of any spoilage organisms or pathogens on the carcass and to limit the opportunities for contamination.
	Carcasses are rapidly chilled to temperatures that prevent the growth of pathogens as soon as processing, including any hot boning is completed.
	Chilled carcasses in chillers are not adversely affected by the addition of

¹¹ These steps correspond with those identified in the flow charts and hazard identification tables.

Step ¹¹	General control measures
	warm carcasses (warming and condensation).
	Carcasses are kept separate from each other and from other surfaces to avoid cross contamination

6. Supporting measures

Supporting measures enable businesses to control hazards more effectively. These measures include the business:

- ensuring that personnel involved in food production have skills and knowledge in food safety to carry out the work they do;
- being able to identify its products to ensure rapid and effective recall and investigate the cause of any food safety problem;
- being responsible for ensuring that hazards specific to its business (each business operates slightly differently) are identified and controlled; and
- demonstrating control to others either as part of an industry certification system or to provide assurance to government.

6.1 Skills and knowledge

The Codex Code of Hygienic Practice for Meat states that adequate training of competent personnel is of fundamental importance in the production of meat that is safe and suitable for human consumption. It also states that training specified by the competent authority should be:

- appropriate to the activities and operations;
- proportional to the potential of the particular meat hygiene activity to impact on food-borne risks to human health;
- properly documented, including records of training programme delivery;
- verified as appropriate; and
- subject to recognition by the competent authority where delivered by third parties.

The Codex Code also offers guidance on achieving the above outcomes including that training programmes should:

- provide personnel with the training, knowledge, skills and ability to carry out specified meat hygiene tasks e.g. post-mortem inspection, verification of statistical process control and HACCP;
- provide practical training and arrange for formal testing of personnel;
- ensure that supervisors are skilled;
- recognise professional qualifications; and
- provide for continuing education.

6.2 Traceability

A key safety management measure is traceability or product tracing.

Australia supports the concept of traceability as a tool to improve food safety control across the supply chain. Traceability is the ability to, and the mechanisms designed for, the tracing of an animal product along all steps in the production chain back to the farm from which the product was derived¹². Codex defines traceability/product tracing as the ability to follow the

¹² Good Practices for the Meat Industry FAO 2004

movement of a food through a specified stage(s) of production, processing and distribution¹³.

The purpose of traceability is two-fold; to protect consumers from products that are injurious to health by being able to identify the products and withdraw or recall them from sale, and also to trace the products back through the chain to identify where the food safety problem occurred in order to prevent its re-occurrence. In the case of meat animals, particularly cattle, Foot and Mouth Disease and BSE have increased the need for lifetime tracing to identify where susceptible species have been resident so that animals that were also on the same premises and associated husbandry practices can be identified

Principles applying to primary production, in the Codex Code of Hygienic Practice for Meat, state that animal identification practices should allow trace-back to the place of origin to the extent practicable, to allow regulatory investigation where necessary. It further adds that only appropriately identified animals should be presented for slaughter.

The Codex Code also states that provision of relevant information on animals intended for slaughter facilitates application of risk-based meat hygiene programs. This then allows inspection procedures to be tailor made to the spectrum and prevalence of diseases and defects in the particular animal population. It goes on to say that this is particularly relevant where the presence of zoonotic agents is not going to be detected by routine visual inspection.

The completed primary production and processing standards for seafood and dairy products and the proposed standards for poultry meat include requirements for traceability. For example, the requirement in the dairy products standard (Standard 4.2.4) for primary production of milk specifies that the dairy primary production business must include a tracing or traceability system as part of their food safety program for the inputs used, the milking herd and the milk collected. The intent is to trace the movement one step back and one step forward.

6.3 QA/food safety systems

Development and implementation of food safety systems by businesses reflect a proactive approach to managing safety. The approach is based on the principle that the business, by acknowledging that food safety is an essential part of food production and examining its activities to establish where hazards could arise, will take more active steps to manage hazards. Without such a program, a business could take a reactive approach and wait for hazards to occur before deciding how to control them. By this time the food may have caused a problem and it may be too late to recall it.

Quality assurance for animal production is included in industry accreditation schemes. Quality assurance programs based on the HACCP approach have been introduced by AQIS into the meat export processing sector since the 1990s and are required for the operation of domestic abattoirs by State and Territory governments.

¹³ Principles for traceability/product tracing as a tool within a food inspection and certification system CAC/GL 60-2006

