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**AMPMSY411**

 **Perform ante and post-mortem inspection – Alpacas or Llamas**

**Training support materials**

**Australian Meat Processing Training Package**

**Certificate III in Meat Processing**

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**Training support materials for AMPMSY411 Perform ante and post-mortem inspection – Alpacas or Llamas**

**Alpaca farming in Australia[[1]](#footnote-1)**

Alpacas have long represented a major food source for South America peoples; they have been called the ‘sheep of the Andes’. Though mostly farmed for their fleece in Australia, the industry here is waking up to the further offerings of alpacas.

Some Australian farms have blazed the trail for large scale farming using well-established breeding and husbandry principles to produce high-quality lean meat and fleece from their alpacas, as well as quality pelts. Selective breeding and advances in reproductive technology are being put to effective use. Australia is now well-positioned to lead the international market of high quality alpaca meat, alongside our excellent alpaca fleece industry.

Alpaca meat is highly nutritious, lean and flavoursome. It is an excellent source of protein with little saturated fat or cholesterol, and is environmentally sustainable to produce. Able to withstand dry conditions for longer than most livestock, Alpacas are a great green fit for Australia's farming climate. Their soft feet cause minimal soil disruption and ecosystem damage, far less than Australia's traditional livestock. As most parts of the alpaca can be used for meat, alpacas offer a high yield with little wastage.

**Market requirements for alpacas and llamas**

**What are the distinguishing features of alpacas and llamas?**

Alpacas and Llamas were first imported into Australia from South America in 1987. Alpacas and Llamas are species of the camelidae family. The distinguishing features between the two animals are their size, ear shape, tail set and curvature of their back.

|  |  |  |
| --- | --- | --- |
|  | **Alpaca** | **Llamas** |
| Weight | 60-80kg | 120-200kg |
| Height at the withers | 76-97cm | 102-127cm |
| Ear shape | Spear-shaped | Banana-shaped |
| Back curvature | Slight humping with sloping rear | Straight or level |
| Tail set | Low  | High  |

There are two breeds of alpaca; the Suri alpaca and the Huacaya alpaca – both are bred in Australia.

  

**Suri alpaca Huacaya alpaca**



**Llamas have banana-shaped ears**

**What are the market requirements for alpacas and llamas?**

Although not covered by the AUSMEAT language, market requirements for alpaca and llama meat cuts are similar to those of other livestock including:

* carcase – a full carcase with feet removed at the carpal and tarsal joint, tail and head removed
* hindquarter shank
* leg – Shank on (Bone In) or Shank Off (Boneless)
* leg Cuts Denver includes the topside, silverside, rump and knuckle
* tenderloin
* striploin
* rack
* back strap
* shoulder roll
* forequarter shank
* neck rosettes
* offal – kidney, liver.

**What regulatory requirements affect the processing of alpacas and llamas?**

The AS4696:2023 *Australian Standard for hygienic production and transportation of meat and meat products for human consumption* is main requirement for processing requirements for animals in both domestic and export abattoirs.

In additional to Australian Standard if the product is for export the abattoir must meet the requirements of the export legislation *The Export Control Act 2020.*

The export legislation included federal labelling requirements for the export of meat. Each state in Australia has regulatory requirements on labelling of products including meat. These requirements generally include species, accurate weight of product and date of processing, packaging or best before date.

**Conducting ante-mortem inspection of alpacas and llamas**

**What are the main reasons for ante-mortem inspection?**

The main reason for ante-mortem inspection is to detect those animals that may not be suitable for slaughter due to disease or other reason such as chemical residue that could render the carcase unfit for human consumption.

It is particularly important for those conditions that may not be detectable at post-mortem inspection.

Ante-mortem inspection can be separated into two parts:

* examining animals before slaughter in order to identify and segregate animals that show signs of a disease, condition or abnormality
* deciding what action will be taken with those animals that do have a disease, condition or abnormality.

When carrying out ante-mortem inspections, the inspector must:

* detect the presence of suspected exotic or notifiable diseases
* prevent the slaughter of any animal that shows signs of a condition or disease which would make the carcase or carcase parts unsuitable for human consumption
* segregate animals that show signs of, or are suspected of, having a disease or condition, so they can be slaughtered separately and given detailed post-mortem inspection
* prevent animals that are grossly contaminated with faeces, dirt, dust or other material from entering the slaughter floor
* ensure animal welfare standards are maintained at all times.

Workplaces will have different ways of carrying out ante-mortem inspections. Inspectors must follow workplace procedures and instructions. Quality Assurance (QA) and Hazard Analysis Critical Control Point (HACCP) procedures must also be followed to prevent obviously diseased or contaminated stock entering the slaughter floor.

**What regulatory requirements apply when conducting ante-mortem inspection?**

***Australian Standards***

Part 3 of the AS4696:2023 *Australian Standard for hygienic production and transportation of meat and meat products for human consumption* details the requirements for:

* the supply and admission of animals for slaughter
* animal welfare
* and ante-mortem inspection and disposition.

These requirements apply to all abattoirs, both export and domestic.

The Australian Standard 4696:2023 covers this in Part 3 Clause.

***Clause 6 The supply and admission of animals for slaughter***

The outcome required is:

* animals are sourced from holdings where the management of animals ensures that the wholesomeness of meat and meat products derived from the animals is not jeopardised. Animals affected by a disease or other abnormality does not contaminate other animals or jeopardise the wholesomeness of meat and meat products.

In practice this means that:

* the animals are correctly identified with ear tags so as to identify the property of origin (PIC) or if they are rangeland goats the area in which they were captured can be identified
* vendor declarations show that the animals have not been recently treated with any chemical or drugs
* animals are not from a property that is under quarantine restrictions, without approval from the relevant authority.

On arrival at the abattoir the meat safety inspector is responsible for deciding either not to admit animals that do not meet these requirements, or admitting them under strict controls, until any issues are clarified.

The meat safety inspector is also to check that:

* the animals have not been grazing on sewage affected pastures or fed materials that may recycle human or animal pathogens
* the animals have not got a notifiable or contagious disease.

All of these items are to be checked prior to the physical ante-mortem inspection by an examination of the Vendor Declaration/Waybill.

The collection and inspection of vendor declarations is generally done by the senior stock handler or livestock manager at the abattoir. The meat safety inspector needs to ensure that there is a system in place to advise them of any animals that arrive without a vendor declaration or any animals where the vendor declaration shows that there is some doubt as to the suitability of a lot of animals for slaughter for human consumption.

The usual practice at abattoirs in Australia, both export and domestic, is for the head stockman to provide the meat safety inspector or the veterinarian at export abattoirs with a kill sheet that shows the order of the animals to be slaughtered, the number in each lot, Property Identification Code (PIC) numbers and any other relevant details from the vendor declarations or waybills.

Although it is up to the company to ensure all vendor declarations are correct, it is a requirement on export abattoirs for the veterinarian to check a number of the vendor declarations on a regular basis to ensure that all animals are accounted for, and that particular market eligibilities (such as EU requirements) have been met.

On domestic abattoirs the meat safety inspector will then indicate on the kill sheet those lots that have been inspected and any animals that may have been segregated as suspects or emergency kill by the stockman or the inspector. This kill sheet will then be passed to the meat safety inspectors on the slaughter floor for reference.

On export abattoirs an ante-mortem card is prepared for each lot and accompanies the first animal of each lot to the slaughter floor.

If the meat safety inspector or OPV decides that the animals may be slaughtered, this section of the Australian Standard requires the company to have in place a system of correlation so that if any disease is found, the animal(s) can be traced back to the property of origin. This is achieved by numbering each lot as it enters the slaughter floor and relating that to a PIC.

***Vendor declarations***

The National Vendor Declaration (NVD) form is managed and obtained by the producer from Meat and Livestock Australia (MLA). This form accompanies animals to sale/slaughter and acts as a guarantee from the farmer to the purchaser of the livestock that the conditions detailed on the form have been met. In some states, waybills issued by state authorities are also compulsory.

The basis for a farmer/producer signing the form is participation in an on-farm quality assurance system. For sheep producers this is the Livestock Production Assurance managed by MLA.

The emphasis in the quality systems is mainly on the residue status of livestock, including source of fodder, pastures and any treatments and withholding periods, but they are also designed to offer broader assurance of the status of the animals on a whole range of food safety and commercial issues.

All meat processors have made vendor declarations from the farmer mandatory for the purchase of livestock. The programmes are supported by vendor liability legislation in the states. The programmes require producers to follow certain best practice procedures including:

* stock identification records
* staff training
* transaction and movement records
* proper labelling, storage and use of chemicals
* treatment records
* good husbandry practices including care with loading, handling and transport
* conducting internal audits of their system on a regular basis.

***Correlation on the slaughter floor***

Correlation is the requirement to identify all parts of a particular animal during slaughter until after all the parts have passed post-mortem inspection. This includes carcases, hides, offal and heads.

Routine correlation is achieved by recording the property identification against the lot number allocated at slaughter. With the introduction of Electronic Identification Devices to the national flock the movement of each animal will be able to be recorded. Until that is universal sheep and goats will be moved as mobs and ear tags in sheep will in theory give some guide to properties of origin.

If a carcase is to be retained correlation is achieved by the use of either temporary tags attached to the carcase at the point of inspection.

The carcase and all its parts must be able to be retrieved and correlated to the animal’s property identification code (PIC of origin).

***Export requirements***

Export workplace ante-mortem practices differ only marginally from the Australian Standard requirements, depending on the importing country's requirements. For example animals which are to be processed for the European market must be slaughtered first in the day or shift.

Also most overseas countries insist on veterinary ante-mortem inspection.

The *Export Control (Meat & Meat Products) Rules* and overseas countries' requirements must be followed. You will find details of these in the company workplace instructions.

***Clause 8 Ante-mortem inspection and disposition***

Chapter XI of the Australian Food Inspection Instructions and procedures outlines the procedures for conducting ante- mortem.

The outcome required is:

* Only animals fit for slaughter for the purpose of producing meat and meat products for human consumption are slaughtered.

This clause basically states the following:

* ante-mortem inspection must be carried out by a meat safety inspector
* the meat safety inspector must carry out the inspection within 24 hours of slaughter
* the meat business must supply the inspector with all the relevant information about the animals to be slaughtered as specified in clause 6.

The dispositions of animals after inspection are:

* passed for unconditional slaughter
* passed for slaughter subject to conditions set by the meat safety inspector (suspect and emergency kill animals)
* withheld from slaughter
* condemned.

This clause also specifies the action to be taken when disease or abnormality is suspected in that all dispositions are to be in according to Schedule 3 of the Standard.

**What are the principles and procedures for the humane handling of alpacas and llamas?**

The principles and procedures for the humane handling of alpacas and llamas are detailed in The AS4696:2023 *Australian Standard for hygienic production and transportation of meat and meat products for human consumption Clause 7.*

***Clause 7 Animal welfare***

The outcome required is:

*The minimisation of the risk of injury, pain and suffering and the least practical disturbance of animals.*

The AS4696:2023 *Australian Standard for hygienic production and transportation of meat and meat products for human consumption* requires meat companies to have an ‘Approved Arrangement’ with their relevant controlling authority for all aspects of meat production. This Approved Arrangement requires a meat company to include animal welfare as a policy objective in their Approved Arrangement and to demonstrate commitment to this policy.

To meet this requirement it is recommended that the provisions of the ***National Animal Welfare Standards for Livestock Processing Establishments Preparing Meat for Human Consumption (2nd Edition-2010)*** need to be followed.

This Standard is based on the animal welfare codes, international standards and the ‘five freedoms’.

The *Animal Welfare Standard* has six required outcomes:

* planning and contingencies
* maintenance and design of equipment and facilities
* staff competency
* management and humane destruction of weak, ill or injured livestock:
* management of livestock to minimise stress and injuries
* humane slaughter procedures.

This guideline is based on the following codes:

* *Australian Model Code of Practice for the Welfare of Animals, Number 10: Animals at Slaughtering Establishments*
* Operational Guidelines for the Welfare of Animals at Abattoirs and Slaughterhouses.

Alpacas and Llamas are group or herding animals, a single animal should not be segregated by itself at any time as this will result in undue stress for the animal.

Animal welfare is described in greater detail in the following animal welfare unit:

AMPA3002 *Handle animals humanely while conducting ante-mortem*

*Inspection*.

**What are the signs of common conditions responsible for abnormalities at ante-mortem and how can they be detected?**

There are two types of abnormalities that need to be detected at ante-mortem inspection.

* invisible abnormalities such as chemical residues
* visible physical abnormalities.

***Invisible abnormalities***

The invisible abnormalities that may be present at ante-mortem inspection such as chemical residues can only be assessed by a detailed inspection of the paper work accompanying the animals such a waybills and vendor declarations, or by individual testing of samples from slaughtered animals.

Individual testing of animals is only conducted if there are some doubts as to the chemical residue status of animals. For routine processing the vendor declarations are considered sufficient.

It is vital that the management of the abattoir supply this vendor declaration information either by hard copy or by electronic means to the meat safety inspector or veterinarian prior to ante-mortem inspection.

This is an essential part of the ante-mortem inspection process.

***Visible abnormalities***

In order to maximize the ability to detect common visible conditions responsible for abnormalities at ante-mortem inspection it is important that effective procedures are carried out. The AS4696:2023 *Australian Standard for hygienic production and transportation of meat and meat products for human consumption* does not specify how ante-mortem inspection is to be conducted, but there are ‘best practice’ procedures that should be followed.

The meat safety inspector can vary these procedures according to:

* regulatory requirements e.g. ante-mortem at export plants must be conducted under direct veterinary supervision
* company requirements
* type of animal e.g. lambs and other young animals are less likely to have disease than older animals
* lines of uniform animals such as pigs from a single source where documentation indicates that the farmer has inspected the animals and identified suspects, under these circumstances only a representative number of animals need be inspected.

When carrying out ante-mortem inspection, the animals should firstly be examined when at rest. This is because some signs of sickness or disease will not be seen when the animals are being moved. It is also very important to look for any animal that is not displaying ‘normal’ behaviour i.e. if it is doing something different to the rest of the mob. For example pigs tend to separate themselves from other pigs.

After observing the animals at rest, the inspector must then examine them when they are moving. When doing this the inspector should observe the sides, head and rear of the animals. This is so any abnormality, disease or condition can be detected.

***Humane handling***

It is very important that any handling or moving of animals is done quietly and humanely.

Animals that are not handled or moved correctly may become stressed. Stress can affect meat quality. A stressed, flighty or nervous animal can also cause injury or stir up other animals in the same pen, resulting in injury to stock.

***Signs of common conditions***

Signs which may indicate disease, conditions or abnormality in livestock include:

* separating themselves from the rest of the stock
* lying down when the rest are standing
* dullness, listlessness, head down, not alert
* drooping ears
* very poor condition – emaciated
* short, shallow, rapid or loud breathing
* hunched up
* scouring, bloody diarrhoea i.e. dysentery
* excessive salivation
* tongue protruding
* enlargement of jaw bones
* excitement, i.e. excessively active and erratic behaviour
* lameness and/or swollen joints
* lesions in or around eye, i.e. cancer eye
* blood, pus or other abnormal discharges from nose, mouth, anus, vulva or penis
* enlargement or abnormality of scrotum, anus, vulva, penis or udder
* swelling cysts, abscesses or abnormal growths
* skin irritation in pigs
* skin blotching
* abnormal enlargement of belly
* broken limbs
* wounds
* faecal contamination.

**What are the procedures for humane destruction?**

If animals are suffering it is vital that they are humanely killed as soon as possible.

Suffering animals include animals with severe injuries such as broken legs. These need to be put up for emergency slaughter.

Other animals that may be suffering include animals that are moribund or near death, these need to be destroyed immediately and the body condemned.

At abattoirs animals a humane kill in the lairage, is usually achieved by use of a firearm. Only suitably trained and licenced people may use a firearm.

Workplace instructions must be followed for this procedure.

**What are the procedures for emergency and suspect slaughter?**

Emergency slaughter animals are slaughtered as soon as possible. They are usually killed in the lairage and enter the slaughter floor through the emergency slaughter door close to the knocking box. Only injured animals should be handled in this way.

Sick animals should be rejected from slaughter and either killed of humanely or withheld from slaughter for treatment.

Animals that are to be treated may not leave the abattoir premises for treatment as abattoirs are considered by all state authorities to be quarantine areas.

After successful treatment particular care needs to be taken to ensure that no chemical residues are present in the animals. This is achieved by ensuring withholding periods for drugs administered are strictly met.

Some animals may be considered for suspect slaughter. These include animals with a tumour where the inspecting officer believes that spread beyond the initial site is minimal.

Animals showing evidence of heavy faecal contamination should also be put up as a lot at the end of the shift so that special procedures can be put in place to ensure cross contamination is minimised.

All suspects should be put up for slaughter at the end of a shift/day, or be last up before lunch. A clear space of one animal must be left between the normal animals and the suspect.

Workplace instructions must be followed for these procedures.

**What WHS requirements apply when conducting ante-mortem inspection?**

The WHS principles for the meat industry are explained in the training material for AMPCOR204 *Follow safe work policies and practices*.

Possible WHS hazards when conducting ante-mortem inspection could be:

* zoonotic diseases i.e. diseases transmissible from animals to humans (including orf, ringworm, Q fever, pathogenic E. coli infections, cryptosporidiosis, among others)
* slips, trips and falls
* injury from animals
* severe weather, cold or hot.

Ways of preventing or controlling these hazards are contained in workplace WHS policies and procedures. Some examples of these may be:

* wearing and using appropriate Personal Protective Equipment (PPE)
* vaccination against zoonotic diseases
* wearing appropriate footwear
* using walkways where provided
* being aware of the behaviour of animals at all times
* being aware of the location of animals at all times
* knowing the location of exit gates, ladders and steps.

**What are the QA aspects of ante-mortem inspection?**

The QA practices that apply to the meat industry are explained in the training material for AMPCOR203 *Apply quality assurance practices*.

All personnel conducting ante-mortem inspections and making dispositions must have a good understanding of and follow instructions detailed in the company quality assurance manual and Hazard Analysis Critical Control Points (HACCP) plan. Some of these could include:

* identification of hazards, such as faecal contamination
* preventative action
* control methods
* record keeping
* ante-mortem cards
* traceback to property of origin
* compliance with tattoo, ear tag or tail tag requirements
* delivery dockets
* vendor declarations.

**Making an ante-mortem disposition**

**What are common diseases and conditions responsible for abnormalities in alpacas and llamas?**

The identification of different diseases and conditions that can affect an animal's suitability for human consumption is the first step in producing safe meat products. It is essential that these conditions are identified and the correct disposition made as to whether to slaughter the animal.

Alpacas and llamas are normal health animals showing few clinical signs of disease although they can be affected be the diseases that affect other ruminants especially if reared on the same land. The main diseases to be conscious of are Johne’s disease and parasite infections.

There are two types of abnormalities that need to be handled at ante-mortem inspection.

* visible physical abnormalities
* invisible abnormalities such as chemical residues.

***Visible abnormalities***

Schedule 3 of the AS4696:2023 Australian *Standard for hygienic production and transportation of meat and meat products for human consumption* details the diseases and conditions and dispositions.

It includes conditions that may be detected at ante-mortem and at post-mortem inspection.

The ante- mortem conditions are reproduced below.

|  |  |
| --- | --- |
| **Column 1** | **Column 2** |
| **Diseases and other abnormalities** | **Dispositions for animals, carcases and carcase parts**The symbol [1] means carcase or carcase parts unfit for human consumption may be recovered for animal food subject to heat sterilisation. The symbol [2] means carcase or carcase parts unfit for human consumption may be saved either for animal food subject to heat sterilisation or for animal food subject to staining. |
| **1. General findings** |
| Abnormal odour caused by metabolic conditions, feedstuff, chemicals or sexual odourPronounced odour Slight odour | Carcase and all its carcase parts condemned[1]Hold overnight, if odour dissipates it is fit for human consumption. May do a cooking test. |
| Advanced chronic conditions with generalised signs such as cachexia or loathsome appearance  | Animal condemned  |
| Dead animal  | Animal condemned. If anthrax suspected see 2.1.  |
| Dying animal or moribund state with subnormal temperature, weak pulse and disturbed senses. | Animal condemned |
| Excitement, exhaustion without signs of acute disease  | Animal withheld from slaughter and ante-mortem repeated after adequate rest |
| Fever, debility and general signs indicating acute disease  | Animal condemned. Alternatively, withhold the animal from slaughter until it has recovered provided there is no risk of spread of disease; no undue suffering and recovery considered likely with treatment. When detected at post-mortem, carcase and all its carcase parts condemned |
| Generalised disease conditions such as emaciation, anaemia, oedema or degeneration of organs  | Carcase and all its carcase parts condemned.  |
| Injury or accidental trauma during transport to or while in vicinity of abattoir  | Animal subject to emergency slaughter or condemned |
| **2. Aetiological listing** |
| 2.1 Bacterial and related diseases  |  |
| Anthrax  | Affected animals should not be admitted to an abattoir. When detected at ante-mortem, affected animal condemned. Companion animals isolated and withheld from slaughter |
| Cutaneous lesions  | Affected areas of skin condemned |
| Ephemeral fever  | Animals withheld from slaughter for treatment. Resubmitted for ante-mortem after recovery. |
| Metabolic disorders (transit tetany, ketosis, etc)  | Animal condemned in severe cases. Withheld from slaughter in milder cases and resubmitted for ante-mortem after recovery. |
| Myiasis  | Animal condemned in severe cases with sepsis or necrosis. Otherwise withhold from slaughter for treatment and resubmit for ante-mortem after recovery. |

**Faecal contamination**

There is a high human health risk of faecal contamination containing pathogenic bacteria such as *E.coli* and *Salmonella*. Only stock that can be slaughtered without risk of faecal contamination should be processed.

***Invisible abnormalities***

The Australian Standard requires the abattoir operator to advise the OPV/meat safety inspector if any animals have been exposed to chemical residues or require testing under any official residue-testing programme.

The vendor declaration forms accompanying animals should detail any restrictions such as animals having been treated or exposed to chemical and drugs and the relevant withholding period not having been met.

In addition, some animals may require to be tested as part of the National Residue Survey.

The National Residue Survey is a survey managed by the Department of Agriculture Fisheries and Forestry (DAFF) where a range of foodstuffs that may be exported, including meat are surveyed for chemical residues.

There are two types of survey conducted:

* random monitoring of a range of chemicals
* targeted monitoring of specific problem chemicals.

***Random survey***

The random survey is conducted at all abattoirs in Australia. Meat safety inspectors collect samples in a randomised manner from a range of animals. The samples are sent to specific laboratories where they are tested for a range of chemical residues.

The results are collated to develop a picture of residue contamination in food across Australia.

If residues of a particular chemical appear to be a problem a targeted testing programme is initiated for that problem chemical.

***Targeted survey***

A targeted survey is initiated when a particular chemical appears to be a problem. The main targeted chemical at the moment is organochlorines in meat.

Unacceptable levels were found in beef in 1987 and this chemical has been continually targeted since that date.

The long half-life of the chemical means that it may take some years for the chemical to disappear from the environment even though the chemical itself has been banned for some years.

Note: The half-life of a chemical is the length of time it takes for the quantity of the chemical in the environment to break down to half the original level.

In this targeted programme all properties have been classed into seven different categories according to the risk of organochlorin contamination on the property.

Most properties are in class C (clear) and require no targeted testing. The rest are graded according to risk:

* T1: require only one in ten animals to be tested
* T2: require one in five testing
* T3-T5: require all animals to be tested.

The latter are generally under state-controlled quarantine and require specific approval from the authorities for animals to be sent to slaughter.

In 1988 there were thousands of properties in the T5 category. There are now very few.

The Commonwealth Department of Agriculture and Water Resources maintains a database of properties requiring targeted testing.

Management of the company are required to access the database, prior to animals being slaughtered, to see if the property identification number is one where testing is required.

Although it is the responsibility of the company to collect samples, they must inform the relevant veterinarian or meat safety inspector of the testing requirement.

If the animals come from T1-T2 properties the carcases are sampled and released.

If the animals come from T3-T5 properties the carcases are held pending the results.

**What dispositions can be made at ante-mortem?**

The disposition for diseases is described in Schedule 3 of the AS4696:2023 *Australian Standard for hygienic production and transportation of meat and meat products for human consumption.*

After ante-mortem inspection, one of the following dispositions will be made about each animal. The animal will be:

* passed as fit for routine processing
* withheld from processing pending treatment for or recovery from an abnormal condition. These animals may be resubmitted for another ante-mortem inspection at a time specified by an inspector. Note: on export abattoirs suspect animals must be held for veterinary inspection
* subjected to immediate emergency slaughter to prevent deterioration of an abnormal condition, provided the condition would allow all or part to be passed for human consumption and processing would not jeopardise the hygienic production of meat
* processed under restrictions which prevent unacceptable contamination of the processing floor and which permit more detailed post-mortem inspection
* rejected as unfit for processing and destroyed by humane means and then disposed of in an approved manner.

The AS4696:2023 Australian *Standard for hygienic production and transportation of meat and meat products for human consumption* requires the following actions to be taken after ante-mortem inspection:

* a record of ante-mortem inspection of animals rejected for human consumption or passed as suspect or emergency slaughter must be maintained
* animals that are deemed to be affected by diseases or conditions should be segregated from healthy animals while awaiting slaughter
* groups of stock that exhibit signs or symptoms of stress must be rested before slaughter
* animals that are known to have been treated with, or exposed to a drug, chemical or biological substance, shall not be slaughtered unless any withholding period recommended on the product label has lapsed
* animals that are condemned must be humanely slaughtered
* dead animals are removed quickly for disposal.

**What are the requirements for segregating stock?**

It is important for humane reasons that various categories of animals are segregated during transport and in the lairage. For example:

* males should not be placed with females
* ideally males should be segregated into individual pens as they will tend to fight
* cria should be penned separately to adult animals
* alpacas should be maintained in their lots from the farm(s) as different groups may fight if mixed in the lairage.

After performing ante-mortem inspection, any animals that are showing signs of a disease, condition or abnormality must be segregated from the healthy animals for further detailed inspection. This will also include animals with faecal contamination. The veterinary officer, inspector or authorised person must then make a disposition and decide what action to take. Animals are segregated in four ways after ante-mortem inspection:

* injured animals are identified for immediate emergency slaughter
* the bulk of the animals will be passed as fit for human consumption
* animals with localized disease e.g. lameness or with a vendor declaration that indicates exposure to chemicals are identified as suspect for separate slaughter preferably at the end of the shift. these animals may also be withheld from slaughter until their condition improves or their chemical residue status is confirmed or abated i.e. after the relevant withholding period has passed
* animals with generalized disease that render them unfit for human consumption are condemned.

**What are the notification procedures for emergency o notifiable diseases?**

The identification and notification procedures that apply for emergency animal diseases are explained in the training material for ***AMPMSY302 Recognise signs of emergency and notifiable animal diseases.***

The procedures for identification and reporting on each abattoir should be detailed in the abattoir Emergency Animal Disease Preparedness (EADP) plan.

There should be an Emergency Animal Disease Preparedness (EADP) plan on every abattoir in Australia. Check the plan at the workplace. This plan should detail the notification procedures for emergency or notifiable diseases

This plan should be based on the meat-processing manual of AUSVETPLAN.

AUSVETPLAN is the master plan for dealing with exotic disease. It has been designed by experts from state and commonwealth departments responsible for animal health in Australia.

The EADP plan on the abattoir should contain the following:

* action measures detailed as job cards for all responsible key personnel
* a map showing perimeter fences, drainage, yards, adjoining properties, suitable areas for burial and ponds and waste water disposal
* an up to date list of notifiable diseases
* phone numbers both home and at work of key personnel e.g. on-plant vet, senior meat safety inspector, plant manager, engineer, stock person
* location and condition of a supply of soda ash and decontamination equipment
* instructions on how disinfectants and chemicals on site may be used for disinfecting people, equipment and vehicles
* where there are reasonable grounds to suspect an exotic or notifiable disease has been found, the qualified person, i.e. a veterinarian or meat safety inspector, must implement the control procedures detailed in the plan until the State or Territory animal health authority advises otherwise, or takes control of the situation.

The first step when an exotic or notifiable disease is suspected, is to immediately notify the state or territory animal health authority, e.g. the state department of agriculture.

The District Veterinary Officer, Regional Veterinary Officer or Chief Veterinary Officer in that state will take control of the situation. **The national hotline number for emergency animal diseases is 1800 675 888.**

Once the authority has been notified they will explain what to do. The following is the standard procedure to gain control of a suspected exotic or notifiable disease at an abattoir.

***Slaughtering/dressing***

All slaughtering and dressing procedures may cease depending on the advice from the State veterinarian. It is sometimes preferable to keep slaughtering to keep people occupied otherwise they will want to go home and may spread the disease. All carcases and parts that might have been affected or contaminated must be secured and isolated in secure storage areas and kept separate from all unaffected carcases and parts.

There may be times when the relevant authority may not be available or able to reach the establishment within two hours. If this is the case, in consultation with the authority, the veterinarian or inspector in charge can permit the dressing of unaffected carcases, provided their identity can be maintained and all parts of the carcases can be isolated in a secure area. The veterinarian or inspector in charge may also allow the slaughtering of carcases that might have been affected, provided the carcases and parts can be also held in a secure location and readily identified.

***Access and movement***

The plant manager must control the access to and movement within the abattoir. This includes preventing the movement of animals, vehicles, people, working animals and meat products onto or off the abattoir. Animals must be prevented from being moved around the abattoir. Access to all affected animals must also be prevented and strictly controlled.

Any animal, meat product, vehicle or person that may have left the abattoir since the suspected animals came into the abattoir must be identified and their location known.

***Inspection***

Carcases that have been slaughtered, but not had a post-mortem inspection, must be inspected immediately. An ante-mortem inspection must also be carried out on all other animals awaiting slaughter on the abattoir.

***Isolation and trace back***

The veterinarian or inspector must then identify all affected animals, carcases and carcase parts. These must be isolated and secured to prevent them from being interfered with. The origin of the animals must then be determined.

All animals that are suspected of having an exotic or notifiable disease, or any that may have been in contact with these animals, must be isolated and secured.

***Decontamination***

The identification of any personnel who may have been exposed to the affected animal is essential. These personnel must be kept within their workplace so that their decontamination can take place. All possibly contaminated equipment must be identified and disinfected.

***Water usage***

The plant manager must minimise and control the water use in the abattoir. Waste water from all areas in the abattoir must be contained.

All these control measures must be in place until the State or Territory authority takes control of the suspected situation or advises that control measures may cease.

These are only guidelines and will vary according to the disease. The Chief Veterinary Officer in each State or Territory has the final say on what and how control measures are to be implemented.

**Monitoring the stunning and slaughter of alpacas and llamas**

**What are the types of stunning equipment are used on alpacas and llamas?**

A range of equipment can be used to stun animals. The type of equipment used at each site will depend on the type and size of stock or species being processed.

It is important that the correct workplace procedures for using the stunning equipment at the site are followed.

There are four main categories of stunning equipment used:

* mechanical (captive bolt) stunners
* electrical stunners
* controlled atmosphere or gas stunners.
* firearms.

Gas stunners are mainly used on pigs and so are not detailed in these training materials.

Electric stunning is the mainly used on small stock including calves, sheep, goats and farmed game such as deer and ratites.

The Humane Slaughter Association has endorsed the use of captive bolt guns for the stunning of camelids.

Captive bolt stunners are the main type of stunners used on camels in Australia. However, they are also used as backup stunners in small stock abattoirs. There are two types

* penetrating captive bolt
* non-penetrating captive bolt.

***Penetrating captive bolt stunners***

Penetrating captive bolts cause physical damage to the brain (by penetration) in addition to the concussion caused by the impact of the bolt onto the skull. Penetrating captive bolt stunning is therefore an effective stunning method that can result in the death of the animal when carried out correctly. However, this effect should not be relied upon and the method still requires proper bleeding of the animal to ensure its death. The use of penetrating captive bolts for the casualty slaughter of animals allows pithing (insertion of a rod through the bolt hole to destroy the brain) in the absence of sticking.

***Non-penetrating captive bolt stunners***

Non-penetrating captive bolts are designed to transfer their entire kinetic energy into movement of the skull and the resulting concussion (concussive stunning). This is achieved by using a bolt with a larger surface area or a steel plate at the tip of the bolt. The tip is convex in shape, which is why they are also called ‘mushroom head stunners’. Subsequent destruction of brain tissue is not a primary feature of concussive stunning, although this sometimes happens by bone fragments from the skull being driven into the brain or the sheer force of the impact. An effective stun results in a temporary loss of consciousness, which requires a fast and effective bleeding of the animal in order to prevent recovery.

Non-penetrating captive bolt stunners have a number of drawbacks in comparison with penetrating ones: There is a smaller margin for error in the application – due to its larger footprint more care needs to be taken to apply the stunner at a 90 degree angle to the forehead. Fracture to the skull during stunning (for example in young cattle, older cows) can absorb some of the energy of the impact, which can in turn have an effective on the success of the stun. If the skull is too thick (old bulls, buffalo) or has bony ridges over the area of the brain (sheep, goats) or is covered by thick, matted hair, then percussive forces may not be transferred effectively.

***Captive bolt power types***

The vast majority of the captive bolt stunners in use are cartridge powered. They are usually powered by blank cartridges (.22 or .25 calibre) with a gunpowder load but no bullet. Cartridges of varying power loads (resulting in different bolt speeds) are used for different classes of stock. As a rule of thumb heavier powder loads are used for heavier/bigger animals with larger skulls.

The advantages of cartridge powered captive bolt stunners are that they are relatively cheap, easy to handle and maintain, and most importantly very portable. They are therefore very flexible and can be used in almost any environment. This has made them the stunner of choice for small to medium sized cattle slaughter plants, for any application outside (yards, trucks, etc.), and as a back-up device for other stunning equipment.

The preferred method for stunning alpacas is the captive bolt gun with the bolt going through the crown of the skull to deliver complete insensibility.

***Electrical stunning***

Small stock including alpaca and llama can also be stunned electrically. If a reversible stun is required (eg for Halal ) then a head only the two pin type stunner can be used.

The current applied is critical and varies according to the size of the animal. The AMIC Australian Industry Animal Welfare Standard recommends the following minimum current levels and all currents should be applied for a minimum of 3 seconds as being necessary to elicit an epileptic fit and cause reversible unconsciousness (head only stun).

|  |  |
| --- | --- |
| **Species** | **Minimum current levels** |
| Cattle | 1.5 A |
| Calves | 1.0 A |
| Pigs | 1.25 A |
| Sheep & Goats | 1.0 A |
| Lambs | 0.7 A |

The AMIC Industry Animal Welfare Standard provides no guidance on minimum current levels for llamas and alpacas nor does the UK Humane Slaughter Association. However from the ranges above and based on body wight the amperage the minimum amperage should be between 1.5 and 1 Amp. Guidance from the equipment manufacturer should be sought but the stun achieved should always be monitored for effectiveness. The stun period should be 3 seconds.

The stunning equipment should be provided with adequate power to continuously achieve the minimum current levels recommended for stunning and it is essential to follow the established workplace procedures to achieve an effective stun.

Electrical stunning has a number of advantages:

* the stun is reversible as recovery can be demonstrated for halal purposes
* the equipment is designed to be semi-automatic so operator error with respect to placement is reduced.

But it also has the drawback that recovery can occur very quickly i.e. within 3 minutes, so it is important that the halal stick by cutting across the throat and the stun stick period should be no more than 15 seconds.

***Firearms***

In some circumstances, firearms are the preferred method of destruction e.g. emergency kill in stockyards, paddocks or stock transports.

Firearms work on the same principal as captive bolts except that the mass of the projectile is smaller, the projectile is not restrained and the velocity is higher than a captive bolt. The firearm delivers far more impact than the captive bolt and is thus considered the most effective means of killing livestock. However, WHS issues preclude its routine use in abattoirs.

Animals killed by firearm must have heads and associated offal condemned.

The bullet has both a concussive and a destructive effect on the brain and effectively kills the animal. There is no stipulated maximum stun–stick interval for animals shot by firearm, as the animal is effectively already dead. However, a stick as soon as possible after shooting is considered best practice to achieve a good bleed if the carcase is to be salvaged.

**What are the requirements for effective electric stunning and slaughter?**

The stunning operations at each site will be governed by the site workplace procedures. These workplace procedures and policies will depend on the species and category of stock being processed.

To achieve an effective stun, workers need to have an understanding of the stunning process and be trained in the correct use of the stunning equipment.

There are a number of factors that affect the proper operation of electric stunners:

* voltage and amperage
* duration and frequency of electric charge
* proper placement of electrodes
* training of operator
* age of animal.

In order to ensure that the equipment is operating correctly the operator should check the amp and voltmeter regularly.

Never attempt to stun animals if the equipment is not working to the specifications in the work instruction or operating procedures.

Common causes of an ineffective stun or early return to sensibility after electrical stun (head only) include:

* wrong positioning of the electrode (brain not spanned by current)
* amperage (current) that is too low
* dirty wool and skin (increases resistance)
* stray current (electric shocks)
* poor electrode contact with the animal (interrupted current flow and electric shocks)
* dirty electrodes (increases resistance)
* insufficient wetness (increases resistance)
* electrode contact areas that are too small (increases resistance)
* animal dehydration (increases resistance)
* long hair or wool (increases resistance, interrupts contact)
* interrupted contact during a stun (insufficient current flow and electric shocks).

**How is the effectiveness of stunning assessed?**

***Electric stunning***

Certain physical signs should be observed in the stunned animal in order to satisfy the operator that the stun has been effective.

These are:

* the animal collapses immediately
* a tonic and clonic phase can be observed – at first the legs are all tucked under, and then the front legs will extend, but the hind legs will remain tucked under, and only slowly extend. This is the ‘tonic phase’. Over a period of time, the animal will start to convulse and the legs may kick violently. This is the ‘clonic phase’. Note that in pigs, the tonic phase is very short, and the violent kicking starts almost immediately
* no rhythmic breathing
* fixed, glazed expression in the eyes
* no corneal reflex
* relaxed jaw
* tongue hanging out – mainly observed in cattle.

In animals shot with a free projectile there may be additional signs:

* profuse bleeding from mouth, nose and/or entry wound
* after first being completely still, violent convulsions of the carcase may occur up to one minute after the shot (clonic phase).

***Captive bolt gun***

Effective stunning depends on five main factors:

1. trained and competent operatives
2. accurate positioning of the equipment over the target area
3. use of the correct strength of cartridge/air pressure for the animal being stunned
4. the velocity and diameter of the bolt
5. proper maintenance and daily cleaning of the equipment.

The main cause of improper stunning is incorrect positioning of the equipment. This is often due to the animal moving its head at the last moment so that the bolt is not in the correct spot when fired. To overcome this problem, operators must be adequately trained and the restraining equipment must be constructed so as to:

* prevent substantial movement of the animal forwards, backwards and sideways
* restrict movement of the animal's head
* allow for the stunning device to be applied to the target area on the animal’s head.

The use of the correct strength of cartridge is vital for proper stunning and the manufacturer’s specific instructions should be followed at all times.

The explosive materials used in the cartridge powered captive bolt stunners will cause a residue that can reduce the performance of the device and will, if not removed, result in ineffective stunning and excessive wear of the equipment.

So, daily checking and cleaning of the equipment is vital for proper use. If all these elements are addressed, stunning should be routinely effective.

**What corrective action must be taken in the event of ineffective stunning or bleeding?**

Animals may suffer when stunning procedures fail.

There must be provision for appropriate back-up stunning equipment to be available to minimise pain, distress or suffering to the animals.

If the initial stun is not fully effective then a number of actions have to be taken. These will be described in the work instructions. They must cover both corrective action (i.e. resolving the immediate issue) and preventive action (i.e. preventing it from happening again).

The immediate action, upon the discovery of an ineffectively stunned animal or an animal showing signs of sensibility on the bleed-line, must be to re-stun. Animals showing signs of sensibility on the bleed-line must also be re-stuck after re-stunning.

If ineffective stunning becomes a recurring or consistent problem then it is important to:

* report this to the supervisor
* check the voltage/charges/air pressure being used
* check the placement of the stunner
* check the routine maintenance of the stunner.

In most plants, stunning is monitored daily to ensure:

* that the animals are being stunned effectively first time
* that the stun/stick intervals are observed
* that excessive numbers do not build up in the stun/stick areas
* the use of incorrect voltages, cartridges, air pressure or gas levels or the incorrect placement of stunning equipment.

The AS4696:2023 *Australian Standard for Hygienic Production and Transportation of Meat and Meat Products for Human Consumption* requires meat companies to have an Approved Arrangement with their relevant controlling authority for all aspects of meat production. This Approved Arrangement requires a meat company to include animal welfare as a policy objective in their Approved Arrangement and to demonstrate commitment to this policy.

To meet this requirement many abattoirs are implementing the provisions of the ***AMIC Industry Animal Welfare Standards for Livestock Processing Establishments Preparing Meat for Human Consumption (3rd Edition)***.

This Standard is based on the Australian animal welfare codes and international best practice standards.

The AMIC *Animal Welfare Standard* has four requirements in terms of:

* management
* resources
* management and care of livestock
* humane stunning and sticking processes.

The Standard is supported by an Implementation Guide. The Guide identifies welfare considerations at the various steps in the slaughtering process. It provides guidance on how plants can provide evidence that they are achieving animal welfare requirements and target or animal welfare outcomes and processes.

This guideline is based on the following codes:

* Australian Model Code of Practice for the Welfare of Animals, Number 10: Animals at Slaughtering Establishments
* *Operational Guidelines for the Welfare of Animals at Abattoirs and Slaughterhouses*

Animal welfare is described in greater detail in the following animal welfare module, which is a core module and co-requisite for this training module AMPA3002 *Handle animals humanely while conducting ante-mortem inspection*.

***Stun/stick interval***

An important part of the slaughter process from a humane point of view is the stun/stick interval.

Most animals are stunned by reversible means, so the stun/stick interval needs to be such that animal has no time to recover. The operational guidelines for the welfare of animals at abattoirs and slaughterhouses specifies the following stun to stick intervals.

|  |  |  |
| --- | --- | --- |
| **Species** | **Type of stun** | **Maximum Stun/stick interval** |
| Cattle / buffalo | Non-penetrating captive bolt (reversible) | 20 seconds |
| Calves | Electric (reversible) | 10 seconds  |
| Sheep | Electric stun (reversible) | 10 seconds |
| Pigs | Electric head only (reversible) | 15 seconds |

**Anatomical structure of alpacas and llamas**

**Identify the basic skeletal structure of alpacas and llamas species relevant to post-mortem inspection**

The core unit AMPA3119 *Apply food animal anatomy and physiology to inspection processes* details the anatomical and physiological elements that apply to all species.

The skeletal structure is similar to other ruminants. Although they have a long neck this does not mean that they have more vertebrae in their neck it means they are elongated. In the bovine animal there are more than two hundred bones in the skeleton. The skeleton provides the basic structure of the animal, and helps to protect the delicate internal organs. The bones articulate with one another at joints. They are joined at these joints by strong bonds of fibrous tissue and are held in place by a system of ligaments and muscles. The skeleton of animals can be divided into two major parts:

* The axial skeleton, which includes the vertebral column, the ribs, the sternum and the skull
* The appendicular skeleton, which includes all the bones of the limbs:
	+ in the fore limb, the scapula, humerus, radius and ulna, carpus, metacarpus and phalanges
	+ in the hind limb, the pelvis (ilium, ischium, pubis, acetabulum), the femur, tibia and fibula, tarsus, metatarsus and phalanges.



|  |  |  |
| --- | --- | --- |
| A. Eye Socket (orbit) | J. Shank (cannon) | S. Hip |
| B. Jaw (mandible) | K. Fetlock | T. Leg Bone (femur) |
| C Cervical Vertebrae  | L. Pastern | U. Knee cap (patella) |
| D. Shoulder blade (scapula) | M. Breastbone (sternum)  | V. Stifle |
| E. Shoulder | N. Ribs | W. Tibia |
| F. Arm (humerus) | O. Loin (lumbar vertebrae) | X. Hock |
| G. Elbow | P. Sacrum | Y. Sesamoid Bone |
| H. Forearm (radius) | Q. Tail (coccygeal vertebrae) |  |
| I. Knee (carpus) | R. Pelvis. |  |

**Skeletal structure of an alpaca**

*Source: ALSA breeders and owners show clinic (2001)*

At slaughter the head is removed and the fore and hind legs are removed at the carpal and tarsal joints respectively. The carcase is also split in half prior to meat inspection.

This skeletal framework carries the muscle systems that form the complete carcase. In addition the half carcase or side at inspection includes blood vessels and the lymphatic system.

The lymphatic system is probably the most important part of the carcase as any disease causing organisms or abnormalities such as cancerous tumours will tend to show up there. For this reason the lymph nodes should get particular attention during post-mortem inspection.

The internal organs of the animal (viscera) will have been removed during slaughter and will need to be inspected separately.

**The features of the lymphatic, circulatory, digestive, urinary, nervous and respiratory systems of alpacas and llamas relevant to post-mortem inspection**

***The lymphatic system***

The lymphatic system is a system of ducts, vessels and nodes that run parallel to the venous blood circulatory system. The lymphatic system can be likened to a drainage system that drains away excess body fluids. Because blood, under pressure due to the pumping of the heart, passes through the capillaries, part of the plasma is constantly leaving the circulatory system and moving into the tissue spaces, carrying nutrients etc. to the tissues. Very little of this fluid is reabsorbed by the capillaries, so a system is needed to drain the excess tissue fluid. This need is filled by the lymphatic system.

The lymphatic system:

* drains excess fluid from tissues
* filters and kills bacteria
* produces white blood cells that are part of the body’s defence
* absorbs and transports fats from the intestines to the blood stream.

The lymphatic system is made up of:

* lymph capillaries
* lymph ducts and lymph vessels
* lymph nodes
* tonsils
* haemolymph nodes
* spleen.

***Lymph nodes***

Lymph nodes filter harmful bacteria from the lymph. They are also one of the body’s major sources of white blood cells.

The characteristics of lymph nodes are that:

* afferent lymph vessels deliver lymph to a lymph node
* efferent lymph vessels drain lymph away from a lymph node
* regional lymph nodes drain specific areas of the body
* terminal lymph nodes receive lymph from other lymph nodes and empty lymph into a major lymph duct or trunk
* evidence of infection in a specific lymph node indicates infection in the area that node drains
* lymph nodes are a major indicator of the health of an animal at post-mortem inspection
* all lymph passes through at least one lymph node.

Lymph nodes vary greatly in size and shape, colour and texture between species and within species and within individual animals.

The inspection of lymph nodes is an essential part of meat inspection. Lymph nodes in all species are found in roughly the same position.

The following diagram shows the approximate position of key lymph nodes in the carcase and viscera of cattle, sheep, goats, pigs, horse, deer and camelids.

There is some variation in size and precise location between the species due to anatomical differences. For example because pigs have a short neck the lymph nodes of the head and neck are difficult to separate.

These differences are detailed in the ante-mortem and post-mortem inspection modules for each species.

***Tonsils***

The tonsils are the first line of defence against incoming harmful bacteria.

The characteristics of tonsils are that:

* they are an accumulation of lymphoid tissue
* they are situated in pairs at the back of the throat, with a duct leading directly to the outside environment
* 85% of tonsils contain pathogenic or disease causing bacteria.

***Haemolymph nodes***

The primary function of haemolymph nodes is to break down old red blood cells.

Haemolymph nodes are:

* smaller than normal lymph nodes
* red through purple to black in colour
* have an arterial blood supply.

***Spleen***

The spleen is a reservoir for blood and a site for destruction of aged red blood cells.

The characteristics of the spleen are that:

* it is reddish brown in young animals but becomes bluish as the animal ages
* in cattle it is elongated and strap-like
* in sheep it is roughly triangular
* in sheep and cattle the spleen is located on the rumen, the first and largest compartment of the stomach
* in pigs it is located on the stomach, and is elongated and tongue-like with a flattened triangular cross-section.



**The principal lymph nodes in the body of domestic animals**



**The Lymph system**

*Courtesy Ira Strapp, New Zealand*

***The Alpaca Digestive System***



*Source: alpacasofmontana.blogpsot.com.au*

Alpacas are modified ruminants. Their forestomachs are made up of three compartments rather than the true ruminants’ (sheep, goats, cattle, deer) four. Whether 3 or 4 compartments, ruminants’ digestive systems are very unlike those of simple-stomached species such as horses, carnivores and humans. The three sections of alpacas’ forestomachs are called C-1, C-2 and C-3; and each compartment has a specialized job to perform.

* **C-1**, located on the animals left side, is the largest (and first) compartment; it makes up roughly 80% of the stomach’s total volume. C-1 secretes no digestive enzymes – it’s essentially a fermentation vat housing a horde of friendly microorganisms that convert cellulose into digestible nutrients. Newly eaten feed liberally mixed with saliva comes into C-1 by way of the esophagus, then fermentation begins. Corse bits of feed are periodically regurgitate, rechewed and then reswallowed, a process know as rumination or chewing the cud. Additional chewing reduces particle size and churns in more saliva, important because saliva adds bicarbonate and phosphate buffers to combat acid production during fermentation. The average healthy alpaca ruminates about 8 hours a day.

Ingested material stays in C-1 for roughly sixty hours, where it is continually mixed by strong, spontaneous contractions of the forestomach.

* The material next moves into **C-2,** where some absorption of nutrient occurs, and then on it goes into compartment C-3.
* C-3 is a tubular organ running along-side C-1 on the right side of the abdomen; it holds 11% of the forestomach volume. The last 1/5 of this tube contains true gastric glands, so C-3 is sometimes called the true stomach. Stressed alpacas frequently develop [ulcers](http://alpacasofmontana.blogspot.com/2012/06/alpacas-ulcers.html) in C-3.

Further digestion occurs in the small intestine. Material then presses on to the cecum and spiral colon, where vitamins, minerals and water are absorbed and faecal pellets are formed of the remaining waste and eventually eliminated.

Camelids, particularly llamas, are far more efficient rough-pasture feeders than are cattle, sheep, and even goats. They consume 20 to 40 percent less feed per unit of metabolic body weight that sheep do on the same diet, primarily because alpacas produce more saliva in relationship to foregut volume than sheep and goats do. The pH of C-1 is closer to neutral which favors cellulose-friendly microbes and enhances fiber digestion. Digestive matter remains in C-2 longer, allowing microbes to process more fiber; blood nitrogen is extracted from the kidneys and used more efficiently in llamas and alpacas; and liquid passes more rapidly through the camelid gut.

***Accessory organs of digestion***

The accessory organs which aid digestion are:

* salivary glands
* pancreas
* liver.

***Salivary glands***

The salivary glands produce saliva, a lubricant for food thus assisting the animal in chewing and swallowing.

Characteristics of salivary glands are that:

* they are located in the mouth
* all species have three paired sets of salivary glands:
* parotid
* sub-mandibular
* sub-lingual.

***Pancreas***

The primary digestive function of the pancreas is to secrete three powerful digestive enzymes to assist in the digestion of proteins, fats and carbohydrates. The pancreas also produces the hormone insulin. This regulates the level of sugar in the blood.

Characteristics of the pancreas are that it:

* is located near the liver
* discharges its enzymes into the duodenum
* is pale brown in colour and lobulated in appearance.

***Liver***

The liver has many functions, including:

* converting excess sugar into glycogen, storing it for later use
* breaking down surplus proteins and manufacturing others when required
* detoxifying poisons
* breaking down fats, and assembling others for storage
* storing iron for blood production
* producing bile that assists the digestion of fats and also the neutralisation of gastric juice.

The alpaca and llama have a liver with multiple fissures on the visceral surface and a smooth parietal surface. Lobation is indistinct and there is no gallbladder.

The salivary glands are all in the head and can be visually inspected during head inspection.

The pancreas is inspected during viscera inspection.

The liver is also inspected during viscera inspection. Due to its role as a filter of blood the liver will frequently show a range of abnormalities.

***The circulatory system***

The function of the circulatory system is to distribute blood through the body.

The circulatory system of the body is a bit like the road system of a rural community. The community is usually centred round a town or city and the roads radiate out from it into the surrounding countryside. Produce from the countryside is brought into the city, via roads, to be processed. Processed goods are taken from the city, via roads, out into the country. In this analogy, the city’s businesses can be likened to the heart, providing the force to keep the blood/goods flowing along the arteries and veins, the roads.

**Blood:**

* carries oxygen from the lungs to tissues
* carries nutrients around the body
* carries the body’s waste products from tissues to lungs and kidneys
* helps the body’s defence system
* regulates body temperature and heat distribution.

Blood is a red, opaque, somewhat viscous liquid. It is made up of two distinct parts.

* plasma
* cells.

Plasma is a straw-coloured fluid that makes up about 65% of the total blood. It consists of water, minerals, nutrients, cell waste products and a mixture of three proteins. One of the three proteins fibrinogen, is needed to form clots. The other two, albumin and globulin help with the body’s immune system.

The cellular material is the red blood cells, white blood cells and platelets.

The primary function of red blood cells (or erythrocytes) is to transport oxygen from the lungs to the cells of the body for cellular respiration, and to transport carbon dioxide, the waste product of cellular respiration, from the cells of the body to the lungs for excretion.

Oxygen and CO2 are carried in the blood by a red pigment called haemoglobin. The body requires iron to make haemoglobin.

The primary function of the white blood cells is to produce anti-bodies and to defend the body against invading, disease-causing pathogens. White blood cells which destroy pathogens are called phagocytes.

Neutrophils and monocytes are the principal phagocytic white blood cells.

The primary function of platelets is to aid the clotting of blood.

The circulatory system moves blood around the body. It consists of:

* the heart
* the arteries and arterioles
* the veins and venules
* the capillaries.

***The heart***

The heart is situated in the centre of the thoracic cavity between the lungs. It is enclosed within a sac called the pericardium. Its primary function is to act as a pump that pushes the blood around the body.

The heart in bovines has three ventricular furrows on the surface. There are generally two ossa cordi, which are irregularly Y-shaped bones at the base of the heart near the aorta. The bovine heart weighs between 1.8 and 2.2 kg.

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Legend: a-Aorta b- Pulmonary artery c- Left Auricle d-Apex of the heart

**The bovine heart**

***Arteries and arterioles***

The primary function of arteries and arterioles is to transport the blood from the heart to the other regions of the body. The largest artery is called the aorta.

Characteristics of an artery are:

* their walls are much thicker than veins
* their walls contain smooth muscle and elastic tissue
* they do not collapse – the hole or lumen is always evident
* their blood flow is under positive pressure due to the action of the heart.

***Veins and venules***

The primary function of veins and venules is to transport blood from the body back to the heart. The largest vein is the vena cava.

Characteristics of veins are that they:

* have thin walls, without a smooth muscle layer and very little elastic tissue
* collapse when empty
* contain one-way valves that prevent the backflow of blood
* are situated closer to the skin surface than arteries
* have blood flow which is passive; the flow is caused by the movement of muscle against the veins and the action of the one-way valves in the extremities (limbs) and by the suction (negative pressure) of the thorax (chest), particularly during inspiration in the torso.

***Capillaries***

In the capillaries, the oxygen and the nutrients are transferred from the blood to the tissues, and the carbon dioxide and metabolic waste products are transferred from the tissues to the blood.

The characteristics of capillaries are that:

* they form the interconnecting link between arterioles and venules
* their walls are only one cell thick
* they form networks through the tissues, ensuring uniform distribution of blood
* the smallest capillaries have a diameter approximately the same as a red blood cell.

Since the circulatory system distributes blood around the body any disease in the blood is also distributed around the body. If there are bacterial toxins in the body the circulatory system will increase the blood supply to the affected areas, in order to deliver white blood cells to control the infection, so those areas with an increased blood supply will be redder than normal.

If the whole body is affected the whole carcase will be redder than normal- this is called fever.

***The renal system***

The renal system consists of the kidneys, ureters bladder and urethra. The purpose of the system is to eliminate the by-products of metabolism from the body.

The kidneys are often left in the carcase for inspection but they should be enucleated from their outer capsule so that the tissues can be properly inspected. Any infection in the blood stream can show itself in the kidneys.

***The nervous system***

The nervous system consists of the brain, the spinal cord and all the nerves that come from there. The nerves travel along the same path and next to the blood vessels as they spread throughout the body.

The nerves have three main functions. They transmit bodily sensation, activate the limbs and control the various internal organs.

Diseases of the nervous system are not common at post-mortem inspection. The only disease that may be detected at post-mortem inspection in cattle is neurofibroma in older cows.

***The respiratory system***

The respiratory system and the lungs in particular, is the common primary or first sites of infection. This is because it is:

* in direct contact with the external environment
* a moist and warm environment
* made up of a fine, tubular network in which bacteria and foreign materials can become lodged to set up sites of irritation, inflammation and bacterial infection.

The respiratory system is made up of:

* nostrils, nasal cavities and mouth
* pharynx
* epiglottis
* larynx
* trachea
* lungs.

The lungs in all species contain the following lymph nodes which are associated with the relevant bronchi:

* right bronchial lymph node
* right anterior bronchial lymph node
* middle bronchial lymph node (middle mediastinal lymph node)
* posterior mediastinal lymph node
* left bronchial lymph node.

Inspection of these nodes is an essential part of meat inspection of the lungs.

**Bovine lung showing relevant lymph nodes**

**Conducting post-mortem inspection of alpacas and llamas**

**What are the main reasons for post-mortem inspection?**

The main reason for post-mortem inspection is to identify those conditions that can affect the suitability of a carcase and its parts for human consumption.

It is an organoleptic inspection i.e. it is an inspection by physical means of a carcase and all its parts using all of an inspectors senses, including:

* visual inspection (observation)
* palpation
* incision and
* smell where appropriate.

If any doubts arise as to the suitability of the meat for human consumption the carcase and its parts can be retained and samples taken and sent to a laboratory for analysis.

**What are regulatory requirements associated with post-mortem inspection?**

Schedule 2 of the AS4696:2023 *Australian Standard for the hygienic production and transportation of meat and meat products for human consumption* details the basic post-mortem inspection procedures that must be applied to all animals slaughtered at abattoirs in Australia, both export and domestic. Some export markets have additional requirements. These are detailed later.

In Schedule 2:

* *buffalo* means any bubaline greater than 50kg dressed weight
* *calf* means a young bovine or bubaline no greater than 50kg dressed weight
* *cattle* means any bovine greater than 50kg dressed weight
* *incise* means to examine by observation and multiple slicing
* *palpate* means to examine by observation and palpation.

Note #1: Equivalent procedures are simpler procedures that can be used when either product is not being kept for human consumption or certain diseases have been officially declared as not present in the particular State or Territory.

Note #2: Additional procedures are procedures carried out when disease is detected or suspected. It also includes procedures for product that is not normally kept for human consumption.

**What are the procedures for conducting post-mortem inspection?**

The precise procedure for what has to be inspected during a post-mortem inspection will depend on whether the plant is domestic or export-registered. However, the general requirements that the meat safety officer must meet when carrying out the inspection are:

* ensuring only animals that have undergone ante-mortem inspection are presented for post-mortem inspection
* ensuring carcases and carcase parts are correctly identified and correlated for post-mortem inspection
* ensuring carcases and carcase parts are correctly presented for post-mortem inspection
* ensuring the resources and conditions necessary to effectively conduct post-mortem inspection are provided
* undertaking post-mortem inspection of carcases and/or carcase parts as directed
* making a disposition to the suitability of the carcase and its parts for human consumption
* retaining carcases and carcase parts for veterinary examination (export plants only) or laboratory examination
* ensuring, where appropriate, the quality and integrity of the product is maintained.

There are four basic procedures used in meat inspection: observation, smell, incision and palpation.

Note: observation is sometimes referred to as visual inspection.

***Observation***

The Department of Agriculture and Fisheries and Forestry (DAFF) definition of **observation** is *To visually inspect a carcase and its parts in such a manner that abnormalities capable of being located are detected. In all instances observation refers to each surface of the item being observed. Observation may require the physical handling and/or incision of the carcase and/or carcase parts to allow complete observation of all surfaces. Observation also includes the use of the sense of smell to detect abnormal odours.*

All parts of an animal must at least be visually observed. It is important to look for changes in colour and symmetry and variations to the norm. The importance of this aspect of inspection is the main reason why people with colour blindness are generally not accepted as meat inspectors.

Visual inspection cannot be done from a distance. Since all surfaces of the carcase and organs need to be visually inspected it is necessary as part of the inspection procedure to handle and turn organs and parts as appropriate. Carcases must be carefully observed, paying particular attention to:

* colour
* odour
* symmetry
* general condition
* age.

In the case of the internal surfaces particular attention should be paid to:

* the pelvic cavity
* the peritoneum and pleura
* the thoracic and abdominal surfaces of the thick and thin skirts
* the cut surfaces of the sternum and spine
* the ribs.

In the case of external surfaces particular attention should be paid to:

* the foreshanks
* the tail
* the sticking area
* the axillary regions
* the anus.

All surfaces of offal presented for inspection must be visually inspected, this means offal must be turned during inspection.

***Incision***

It may be for access purposes to improve observation or it may be a specific incision required by legislation to detect disease. It is essential that proper equipment be used for incision. Such equipment includes a keen knife, a safety hook and a well-dressed steel. Lymph nodes that require incision should be carefully sliced such that the cut surfaces are laid open for examination like the leaves of a book.

Unnecessary mutilation must be avoided and to facilitate a tidy `job', different knives may be used for different inspection procedures, for example a short thin blade may be used for pig-head inspection, whilst a long broad blade may be preferred for cattle-carcase inspection.

***Palpation***

Palpation is equally as important as observation and incision and must be carried out diligently. Organ palpation requires firm pressure by the fingers and palms of the hand over the entire organ surface. Organs palpated include the kidneys, liver, spleen and lungs.

Lymph-node palpation requires firm pressure with the fingers and thumbs, rolling the nodes between them.

***Laboratory analysis***

Sometimes samples may need to be sent to a laboratory for diagnosis. This may be:

* because the cause of the condition is unknown
* for laboratory confirmation of notifiable diseases such as hydatids in Tasmania
* as part of routine sampling for residue sampling programmes etc.

**What is the process for identifying and detecting abnormalities?**

*The* AS4696:2023 *Australian Standard for the hygienic production and transportation of meat and meat products for human consumption* specifies the inspection requirements for animals slaughtered in domestic and export abattoirs in Australia.

The following tables from that standard detail the procedures that must be conducted to identify and detect abnormalities in all the relevant species.

In addition there are further procedures that need to be followed specifically for certain export markets. These are detailed after the tables.

**Table 1. Carcase**

|  | **Cattle & buffalo** | **Calves** | **Sheep & goats** | **Lambs** | **Pigs** | **Horses** | **Deer** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **All carcases**  | Observe internal and external surfaces of carcase (including tail, musculature, exposed bone, joints, serous membranes). |
| **Lymph nodes** |
| Superficial Inguinal | See note #1 | Observe | See note #2 | Observe | See note #3 | Incise | Observe |
| Internal iliac | See note #1 | Observe | Palpate | Observe | Observe | Observe | Observe |
| Lumbar | — | — | Palpate | Observe | Observe | — | — |
| Ischiatic | — | — | Palpate | Observe | — | — | — |
| Precrural | — | — | See note #2 | Observe | — | Palpate | — |
| Superficial cervical | — | — | See note #2 | Observe | — | Palpate | — |
| Popliteal | — | — | Palpate | Observe | — | — | — |
| Prepectoral | — | — | — | — | — | Incise | — |

**Equivalent procedures**

Note #1: **Cattle and buffalo** – Palpate the superficial inguinal and internal iliac lymph nodes or, for animals in an area in relation to which the relevant Commonwealth, State or Territory Authority requires minimal risk inspection for tuberculosis (other than animals subject to conditional slaughter or emergency slaughter), an equivalent procedure is to observe the nodes (other than in bulls and mature females).

Note #2: **Sheep and goats** – Palpate the superficial cervical, precrural and superficial inguinal lymph nodes or, other than animals subject to conditional slaughter or emergency slaughter, an equivalent procedure is to excise and discard these nodes without inspection.

Note #3: **Pigs** – Observe the superficial inguinal lymph nodes or, other than animals subject to conditional slaughter or emergency slaughter, an equivalent procedure is to excise and discard these nodes without inspection.

**Table 2. Viscera**

|  | **Cattle & buffalo** | **Calves** | **Sheep & goats** | **Lambs** | **Pigs** | **Horses** | **Deer** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Lymph nodes**  |
| Bronchial & mediastinal  | See note #1  | Palpate | Palpate | Observe | Palpate | Incise | Palpate |
| Portal  | Palpate | Palpate | Observe | Observe | Palpate | Palpate | Observe |
| **Mesenteric**  | Observe | Observe | Observe | Observe | Observe | Observe | Observe |
| **Lungs**  | Palpate, except in lambs where observe. Additionally, bronchi opened and internal surfaces observed when saved for human consumption.  |
| **Heart**  | Palpate. Incise internal musculature 3-4 times in cattle and buffalo. |
| **Liver**  | Palpate, except in lambs where observe. Incise main bile ducts transversely and observe contents, except in pigs where inspection of bile ducts not required (see note #2 for option).  |
| **Gastrointestinal tract**  | Observe. Observation of oesophagus not required in cattle, buffalo, calves or deer unless recovered for human consumption.  |
| **Spleen** | Observe | Observe | Palpate | Observe | Observe | Palpate | Observe |
| **Kidney (enucleated)**  | Palpate | Palpate | Observe | Observe | Palpate | Palpate | Palpate |
| **Other tissues and organs**  | Thymus, pancreas, non-gravid uterus, bladder, testicles and penis observed when recovered for human consumption.  |

**Equivalent procedures**

Note #1: **Cattle and buffalo** – Incise bronchial and mediastinal lymph nodes or, for animals in an area in relation to which the relevant Commonwealth, State or Territory Authority requires minimal risk inspection for tuberculosis (other than animals subject to conditional slaughter or emergency slaughter), an equivalent procedure is to observe the nodes.

Note #2 : **All animals** – Procedures for the incision of main bile ducts and observation of contents may not be required at a meat business by the controlling authority.

**Table 3. Head**

|  | **Cattle & buffalo (see note #3)** | **Calves (see note #1)** | **Sheep & goats (see note #1)** | **Lambs (see note #1)** | **Pigs (see note #1)** | **Horses (see note #1)** | **Deer (see note #1)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| All carcases | Observe external surfaces. For cattle, buffalo and horses observe the oral, buccal and nasal cavities.  |
| **Lymph nodes** |  |
| **Submaxillary** | See note #2 | — | — | — | See note #4 | Incise | — |
| **Parotid** | See note #2 | — | — | — | — | Incise | — |
| **Retropharyngeal** | See note #2 | — | — | — | — | Incise | — |
| **Cervical** | — | — | — | — | See note #4 | — | — |
| **Masticatory muscles (internal and external)** | Incise | — | — | — | — | — | — |
| **Tongue** | Palpate | — | — | — | — | Palpate | — |
| **Gutteral pouch** | — | — | — | — | — | Palpate | — |
| **Other tissues** | Tongue roots in cattle, buffalo and horses observed when recovered for human consumption |

**Equivalent procedures**

Note #1: **All animals** – Other than cattle, buffalo, horses and animals subject to conditional slaughter or emergency slaughter, an equivalent procedure is to remove and discard the head without inspection where tissues, including tongue, are not recovered for human consumption.

Note #2: **Cattle and buffalo** – Incise submaxillary, parotid and retropharyngeal lymph nodes or, for animals in an area in relation to which the relevant Commonwealth, State or Territory Authority requires minimal risk inspection for tuberculosis (other than animals subject to conditional slaughter or emergency slaughter), equivalent procedures are:

1. observe only, or

2. excise and discard these nodes without inspection.

Note #3: **Cattle and buffalo** – Other than animals subject to conditional slaughter or emergency slaughter, for animals in an area in relation to which the relevant Commonwealth, State or Territory Authority requires minimal risk inspection for tuberculosis, an equivalent procedure is to discard the head without inspection when tissues, including tongue, are not recovered for human consumption.

Note #4: **Pigs** – Incise and observe submaxillary and cervical lymph nodes or, other than animals subject to conditional slaughter or emergency slaughter, equivalent procedures are:

1. observe only, or

2. excise and discard these nodes without inspection.

**Table 4. Additional procedures when specific diseases are detected or suspected**

| **Disease** | **Inspection procedure** |
| --- | --- |
| **Tuberculosis in cattle and buffalo**  | Incise atlantal, prescapular, prepectoral, suprasternal, superficial inguinal, iliacs, ischiatic, precrural, portal and mesenteric lymph nodes. Incise popliteal lymph node where necessary to determine the extent of infection. All viscera, serous membranes, spinal cord and severed vertebral column inspected by observation, palpation and, where necessary, incision. Udders incised and observed.  |
| **Tuberculosis in pigs** | Incise retropharyngeal, parotid, bronchial, mediastinal, portal, gastric, mesenteric, superficial inguinal, , lumbar, precrural, prescapular and deep inguinal lymph nodes. Viscera and serous membranes inspected as above for cattle.  |
| **Tuberculosis in horses**  | As above for cattle.  |
| **Tuberculosis in deer** | Incise submaxillary, retropharyngeal, parotid, bronchial, mediastinal, mesenteric, portal, superficial inguinal, iliac, ischiatic and suprasternal lymph nodes. Incise popliteal lymph node where necessary to determine the extent of infection. Viscera and serous membranes inspected as above for cattle.  |
| ***Cysticercus bovis* In cattle, buffalo and deer**  | Incise masseter and heart muscles, incise tongue, incise diaphragm after removal of serous membranes and observe all exposed muscle surfaces.  |
| ***Cysticercus celluosae* in pigs**  | As above for *C. bovis.*  |
| **Sparganosis in pigs**  | Observe retro-peritoneal tissues after removal of the peritoneum. Where further evidence of infestation revealed, also observe main muscle seams of the hind limbs. Incise as necessary to determine extent of infection.  |

***Export inspection procedures***

*The* AS4696:2023 *Australian Standard for the hygienic production and transportation of meat and meat products for human consumption* specifies the inspection requirements for animals slaughtered in domestic and export abattoirs in Australia. These have been described above.

These requirements form the minimum standard of inspection. However, the inspection procedures at export registered plants may vary quite considerably from those specified in the *Standard*, as they have been negotiated with overseas countries over a number of years.

The United States of America’s procedures are required to be performed **at all times** in US listed establishments.

European Union procedures are required to be performed **when EU production** **is occurring**, i.e. only when production is destined for the EU market and in EU listed plants.

It is worth noting that many markets insist on either the US or the EU standard for access to their markets. For example Canada, Puerto Rico and Mexico require US listing before they will list an establishment. EU listing is required by dependencies of most EU countries e.g. the Canary Islands a dependency of Spain requires EU listing before product will be accepted. Some EU membership hopefuls, such Romania and Croatia also require EU listing. Other countries that require EU listing before product will be accepted or listing approved include Namibia, Switzerland and Mayotte.

**What WHS, hygiene and sanitation requirements apply when conducting post-mortem inspection?**

The company work instructions will set down all the WHS and hygiene and sanitation requirements for working on the slaughter floor and when conducting post-mortem inspections.

These will require the inspector to:

* wash hands between carcases or when contaminated
* wear PPE such as aprons and boots which can be cleaned regularly and easily
* follow the sanitary sequence which is to handle edible product (heart, lung, kidney) before handling inedible materials (intestines)
* sterilise knife between carcases and when contaminated and after steeling
* change uniform if it is grossly contaminated
* wash hands before and after work.

These practices will protect health and minimise cross contamination.

Inspectors should always wear the Personal Protective Equipment (PPE) set down in the company work instructions or WHS policy.

PPE will include:

* hand protection like mesh and cut-resistant gloves
* hearing protection
* footwear
* aprons
* uniforms
* hair net.

It is important to handle diseased or contaminated product that may require trimming in a way that avoids contamination of clean parts of the carcase. This may involve holding the affected parts with a hook and trimming from a clean area to remove offending material.

The workplace will also have a ‘dropped meat policy’ for product that accidently contacts the floor. This will need to be followed if product is dropped.

**What QA issues relate to post-mortem inspection?**

There are a number of quality assurance issues that relate to post-mortem inspection. They will be detailed in the Company’s Quality Assurance program and in the work instructions. Issues that will be covered include:

* ensuring carcases and carcase parts are correctly presented for post-mortem inspection
* performing the correct procedure according to the Australian Standard and export market requirements if applicable
* ensuring only wholesome product is passed for human consumption
* ensuring trace-back requirements to ante-mortem inspection is maintained
* ensuring correlation is maintained between head, carcase and viscera until after disposition has been made
* retaining carcases and carcase parts for veterinary examination (export plants only) or laboratory examination when required
* limiting cross contamination during inspection
* ensuring, where appropriate, the quality and integrity of the product is maintained
* the maintenance of records as required by the workplace instructions.

**What are the signs of common conditions responsible for abnormalities at post-mortem and how are they detected?**

There are a range of conditions and abnormalities that can affect the wholesomeness of a carcase and its parts for human consumption. When passing judgement on a carcase and its parts during post-mortem inspection, several points must be taken into consideration. They are:

* the nature of any abnormality
* whether it is localised or generalised
* the possible cause of the condition/disease
* the possible risk to human health from any abnormal condition.

The list of abnormalities and the disposition to be taken at post-mortem inspection is detailed in the tables below reproduced from Schedule 3 of the AS4696:2023 *Australian Standard for the hygienic production and transportation of meat and meat products for human consumption*.

Note: words in *italics* have been added by the author for clarity

Detection of these abnormalities is by following the stated procedures detailed previously.

| **Column 1** | **Column 2** |
| --- | --- |
| **Diseases and other abnormalities** | **Dispositions for animals, carcases and carcase parts**The symbol [1] means carcase or carcase parts unfit for human consumption may be recovered for animal food subject to heat sterilisation. The symbol [2] means carcase or carcase parts unfit for human consumption may be saved either for animal food subject to heat sterilisation or for animal food subject to staining. |
| **1. General findings** |
| Abnormal odour caused by metabolic conditions, feedstuff, chemicals or sexual odourPronounced odour Slight odour | Carcase and all its carcase parts condemned[1]*Hold overnight, if odour dissipates it is fit for human consumption. May do a cooking test.* |
| Advanced chronic conditions with generalised signs such as cachexia or loathsome appearance  | Animal condemned  |
| Dead animal  | Animal condemned. If anthrax suspected see 2.1.  |
| Dying animal or moribund state with subnormal temperature, weak pulse and disturbed senses. | Animal condemned |
| Excitement, exhaustion without signs of acute disease  | Animal withheld from slaughter and ante-mortem repeated after adequate rest |
| Fever, debility and general signs indicating acute disease  | Animal condemned. Alternatively, withhold the animal from slaughter until it has recovered provided there is no risk of spread of disease; no undue suffering and recovery considered likely with treatment. When detected at post-mortem, carcase and all its carcase parts condemned |
| Foetuses and undeveloped neonatal animals  | Carcase and all its carcase parts condemned  |
| Generalised disease conditions such as emaciation, anaemia, oedema or degeneration of organs  | Carcase and all its carcase parts condemned.  |
| Injury or accidental trauma during transport to or while in vicinity of abattoir  | Animal subject to emergency slaughter or condemned |
| Septicaemia, pyaemia or toxaemia  | Carcase and all its carcase parts condemned  |
| **2. Aetiological listing** |
| **2.1 Bacterial and related diseases**  |
| Actinomycosis and Actinobacillosis:* Localised in head
* Evidence of generalisation such as lesions in lungs or other viscera, or other signs such as extreme loss of condition
 | Head and tongue condemnedCarcase and all its carcase parts condemned |
| Anaplasmosis and Babesiosis: * Acute with intense jaundice and other signs of systemic involvement including fever; liver enlargement; and kidney congestion
* Subacute with mild jaundice which dissipates within 24 hours of slaughter
 | Carcase and all its carcase parts condemnedCarcase parts condemned |
| Anthrax  | Affected animals should not be admitted to an abattoir. When detected at ante-mortem, affected animal condemned. Companion animals isolated and withheld from slaughter. When detected at post-mortem, affected carcase and all its parts condemned |
| Blackleg  | Carcase and all its carcase parts condemned |
| Botryomycosis: * Severe cases with evidence of systemic effects such as cachexia
* Less severe cases
 | Carcase and all its carcase parts condemnedAffected carcase parts condemned |
| Botulism | Carcase and all its carcase parts condemned |
| Caseous lymphadenitis: * Generalised involvement in carcase and viscera with evidence of systemic effects such as cachexia
* Less extensive forms of the disease
 | Carcase and all its carcase parts condemnedAffected organs or carcase parts condemned |
| Corynebacterial infections in submaxillary and cervical lymph nodes in pigs  | Affected nodes condemned |
| Enterotoxaemia  | Carcase and all its carcase parts condemned |
| Eperythrozoonosis: * Acute with intense jaundice and other signs of systemic involvement including fever; liver enlargement; and kidney congestion.
* Subacute with mild jaundice which dissipates within 24 hours of slaughter
 | Carcase and all its carcase parts condemnedCarcase parts condemned |
| Foot rot: * Acute with secondary infection of organs or extreme loss of condition
* Chronic with encapsulated abscess in liver or lungs
 | Carcase and all its carcase parts condemnedAffected organs condemned |
| Infectious ovine epididymitis (*B. ovis*) | Affected testicles condemned |
| Johne’s disease  | Intestines and mesentery condemned |
| Leptospirosis:* Acute.
* Chronic, localised
 | Carcase and all its carcase parts condemnedAffected kidneys condemned |
| Listeriosis  | Carcase and all its carcase parts condemned |
| Malignant oedema.  | Carcase and all its carcase parts condemned |
| Melioidosis  | Carcase and all its carcase parts condemned |
| Necrobacillosis: * Acute with lesions in a number of sites or evidence of systemic involvement
* Localised lesion in liver or other organ
 | Carcase and all its carcase parts condemnedAffected liver or organ condemned |
| Purpura haemorrhagica  | Affected carcase parts condemned |
| Salmonellosis  | Carcase and all its carcase parts condemned |
| Strangles | Affected carcase parts condemned |
| Swine erysipelas:* Acute
* Localised arthritis or endocarditis without signs of systemic effects
* Cutaneous lesions
 | Carcase and all its carcase parts condemnedAffected joint and associated lymph node condemned; when affected, heart condemnedAffected areas of skin condemned |
| Tuberculosis:  |  |
| In *cattle* and *buffaloes** Generalised with evidence of systemic involvement; more than one organ affected; miliary lesions in any organ; evidence of active infection or extensive infection of peritoneum or pleura.
* Localised infection
 | Carcase and all its carcase parts condemnedAffected carcase part, including drained part, condemned; or affected organ condemned |
| In *pigs* * Generalised
* Localised in submaxillary or mesenteric lymph nodes (avian type)
 | Carcase and all its carcase parts condemnedAffected carcase part condemned |
| In *horses* and *deer*.  | Carcase and all its carcase parts condemned |
| White scours, omphalophlebitis, polyarthritis and other septicaemic conditions of new-born animals  | Carcase and all its carcase parts condemned |
| **2.2 Parasitic conditions.**  |
| *Cysticercus bovis*: * General infestation
* Light infestation, small number of degenerated cysticerci
 | Carcase and all its carcase parts condemnedAffected viscera condemned. Cysts and surrounding tissue trimmed from carcase and condemned. Remainder of carcase and parts passed conditionally fit for human consumption subject to treatment by freezing (no warmer than –12 °C deep muscle temperature for not less that 10 days in carcases and 20 days in boned meat) |
| *Cysticercus cellulosae:* * General infestation
* Light infestation, small number of degenerated cysticerci
 | Carcase and all its carcase parts condemnedAffected viscera condemned. Cysts and surrounding tissue trimmed from carcase and condemned. Remainder of carcase and parts passed conditionally fit for human consumption subject to treatment by freezing (no warmer than –12 °C deep muscle temperature for not less than 5 days in carcases or boned meat). |
| *Cysticercus ovis*:* General infestation (more than 5 cysts found in musculature)
* Light infestation, small number of degenerated cysticerci
 | Carcase and all its carcase parts condemnedAffected viscera condemned. Cysts and surrounding tissue trimmed from carcase and condemned |
| *Cysticercus tenuicollis* | Cysts and affected serous membranes trimmed from carcase or carcase part and condemned |
| Echinococcosis | Affected organs condemned |
| Myiasis  | Animal condemned in severe cases with sepsis or necrosis. Otherwise withhold from slaughter for treatment and resubmit for ante-mortem after recovery |
| *Oestrus ovis* infestation in sheep  | Infestation removed or affected parts condemned |
| Onchocerciasis  | Lesions and affected tissues trimmed from carcase and condemned |
| Pulmonary and gastrointestinal strongylosis  | Affected organs condemned.[1] in case of lungs. |
| Sparganosis:* General infestation
* Light infestation
 | Carcase and all its carcase parts condemnedTissue trimmed from carcase and condemned. Remainder of carcase and parts passed conditionally fit for human consumption subject to treatment by freezing (no warmer than –12°C deep muscle temperature for not less than 5 days in carcases or boned meat). |
| *Stephanurus dentatus*  | Affected carcase parts condemned |
| **2.3 Protozoal diseases**  |
| Coccidiosis  | Affected intestines condemned |
| Sarcosporidiosis  | Affected carcase parts condemned |
| **2.4 Viral diseases**  |
| Bovine leucosis: * Multiple lesions or lesions in multiple organs
* Localised lesion (e.g. mesentery)
 | Carcase and all its carcase parts condemned.Affected gastrointestinal tract or other organs condemned |
| Bovine para-influenza  | Affected lungs condemned |
| Bovine virus diarrhoea/mucosal disease: * Acute infection with evidence of systemic involvement
* Chronic infection with lesions localised to alimentary tract
 | Carcase and all its carcase parts condemnedAffected intestines condemned |
| Ephemeral fever  | Animals withheld from slaughter for treatment. Resubmitted for ante-mortem after recovery. |
| **2.5 Fungal diseases**  |
| Aflatoxicosis: * Acute with generalised signs including jaundice; swelling of liver; ascites and mesenteric oedema
* Subacute
 | Carcase and all its carcase parts condemnedAffected liver and kidneys condemned |
| Epizootic lymphangitis. | Affected skin and related tissues condemned. Any affected organs condemned. |
| **2.6 Non-infectious conditions**  |
| Delay in Evisceration: * Evidence of deterioration or putrefaction
* Localised changes in viscera
 | Carcase and all its carcase parts condemnedViscera condemned |
| Ecchymosis  | Affected carcase parts condemned[2] |
| Foreign objects, including grass seeds: * Accompanied by generalised signs such as fever or sepsis
* No evidence of generalised signs
 | Carcase and all its carcase parts condemnedForeign object removed; affected tissues trimmed from carcase and condemned |
| Jaundice: * Haemolytic or toxic
* Obstructive (slight, dissipate within 24 hours of slaughter
* Obstructive (severe)
 | Carcase and all its carcase parts condemnedCarcase parts condemnedCarcase and all its carcase parts condemned. |
| **Metabolic disorders (transit tetany, ketosis, etc)**  | Animal condemned in severe cases. Withheld from slaughter in milder cases and resubmitted for ante-mortem after recovery. |
| Residues in excess of nationally established maximum limits  | Carcase and all its carcase parts condemned. Companion animals and carcases tested for residue levels. |
| Tumours: * Circumscribed benign tumours; neurofibromas of intercostals nerves and nerve plexes
* Malignant tumours (carcinoma, sarcoma)
* Multiple tumours (evidence of metastasis or multiple lesions in different organs)
 | Depending on extent, lesion trimmed and condemned or affected carcase part condemned[1]Carcase and all its carcase parts condemned[1]Carcase and all its carcase parts condemned[1]*Note any sign of spread from a primary site is a sign of malignancy* |
| **3. Topographic listing** |
| **3.1 Nervous system**  |
| Acute encephalitis and meningitis  | Carcase and all its carcase parts condemned |
| Brain abscesses: * Associated with pyaemia
* Localised lesion
 | Carcase and all its carcase parts condemnedAffected brain condemned |
| **3.2 Cardiovascular system**  |
| Acute pericarditis with accumulation of exudate; septicaemia; degenerative changes in organs or abnormal odour  | Carcase and all its carcase parts condemned |
| Chronic pericarditis  | Affected heart and pericardium condemned |
| Endocarditis:* Associated with generalised signs
* Without complications
 | Carcase and all its carcase parts condemnedAffected heart condemned |
| Heart lesions of non-infectious nature  | Affected heart condemned |
| Worm aneurisms in horses: * Infarction confined to hind leg
* Peritonitis, circulatory disturbances in mesentery and intestines
 | Affected quarter condemnedCarcase and all its carcase parts condemned |
| **3.3 Respiratory system**  |
| Atelectasis, emphysema, pigmentation, aspiration of blood, scalding water or ingesta  | Affected lungs condemned[1] |
| Bronchitis  | Affected lungs condemned |
| Multiple pulmonary abscesses  | Carcase and all its carcase parts condemned. |
| Peracute pneumonia such as severe purulent bronchopneumonia; gangrene of the lungs; or necrotic pneumonia | Carcase and all its carcase parts condemned |
| Pneumonia or bronchopneumonia  | Affected lungs condemned[1] |
| Sinusitis.  | Affected head condemned |
| **3.4 Pleura**  |
| Adhesions and patches of fibrinous tissue  | Affected serous membranes stripped and affected parts condemned |
| Diffuse serofibrinous, suppurative or gangrenous pleurisy | Carcase and all its carcase parts condemned. |
| **3.5 Gastrointestinal tract**  |
| Acute enteritis:* Septic, diphtheritic or haemorrhagic enteritis’ enlargement of spleen or degeneration of organs
* With congested mesenteric lymph nodes without other signs
 | Carcase and all its carcase parts condemnedAffected intestines condemned |
| Chronic gastro-intestinal catarrh | Affected intestines condemned |
| Emphysema of mesentery in pigs  | Affected mesentery and intestines condemned |
| **3.6 Peritoneum**  |
| Adhesions and patches of fibrinous tissue, localised encapsulated abscesses | Affected parts condemned |
| Peritonitis:* Acute, diffuse or extensive
* Localised
 | Carcase and all its carcase parts condemnedAffected serous membranes stripped and affected parts condemned |
| **3.7 Liver**  |
| Abscesses  | Affected liver condemned |
| Fatty infiltration, parenchymatous infiltration  | Affected liver condemned[1] |
| Hepatitis of toxic, parasitic or non-specific nature  | Affected liver condemned[1] for parasitic and nonspecific causes |
| Miliary necrosis of liver in calves  | Carcase and all its carcase parts condemned |
| Parasitic lesions/nodules  | Affected parts of liver trimmed and condemned |
| Telangiectasis, cyst formation  | Affected liver or part of liver condemned[1] |
| **3.8 Kidney** |
| Bladder rupture | Carcase and all its carcase parts condemned. |
| Calculi, cyst formation, pigmentation  | Affected kidneys condemned[1] |
| Nephritis (including parasitic nephritis):* Acute with evidence of uraemia, oedema or abnormal odour of urine
* Chronic with no systemic effects
 | Carcase and all its carcase parts condemned.Affected kidneys condemned |
| **3.9 Genital tract**  |
| Inflammation of uterus:* Acute metritis (septic or necrotic, putrefied foetus).
* Chronic metritis
 | Carcase and all its carcase parts condemnedAffected uterus condemned |
| Orchitis/epididymitis | Affected organ condemned |
| Prolapse, torsion or rupture of uterus accompanied by fever or peritonitis  | Carcase and all its carcase parts condemned |
| Retention of placenta: * Accompanied by fever or evidence of other systemic effects
* With no signs of systemic effects
 | Carcase and all its carcase parts condemnedAffected uterus condemned |
| **3.10 Udder**  |
| Mastitis:* Septic, gangrenous
* No signs of systemic involvement
 | Carcase and all its carcase parts condemnedUdder condemned |
| Oedema | Udder condemned |
| **3.11 Musculo-skeletal system**  |
| Abnormal pigmentation  | Affected parts condemned[1] |
| Arthritis: * Acute infectious
* Non-infectious, chronic with no systemic effects
 | Carcase and all its carcase parts condemnedAffected part condemned |
| Fractures: * Uncomplicated (recent or healing)
* Infected with signs of generalised effects
 | Fracture trimmed from carcase and condemnedCarcase and all its carcase parts condemned |
| Myositis and Muscular Dystrophy  | Affected parts condemned[1] |
| Osteomyelitis:* Gangrenous, suppurative or accompanied by metastasis
* Localised
 | Carcase and all its carcase parts condemnedAffected part trimmed from carcase and condemned |
| **3.12 Skin**  |
| Bruising: * Generalised or secondary changes in carcase
* Localised
 | Carcase and all its carcase parts condemned[2]Affected tissue trimmed from carcase and condemned. [2] for trimmings |
| Burns: * With extensive oedema or systemic signs such as fever
* Localised
 | Carcase and all its carcase parts condemnedAffected tissue trimmed from carcase and condemned[1] |
| Eczema and chronic dermatitis in pigs  | Affected skin trimmed from carcase and condemned |
| Erythema and acute dermatitis (e.g. photosensitisation): * With systemic effects such as fever
* No evidence of systemic involvement
 | Carcase and all its carcase parts condemnedAffected skin trimmed from carcase and condemned[1] |
| Wounds and Cellulitis: * Infected wounds and discharging lesions accompanied by generalised signs such as fever or sepsis
* Granulating wounds or no evidence of generalised signs
 | Carcase and all its carcase parts condemnedAffected tissues trimmed from carcase and condemned |

**What are the types and symptoms of emergency diseases that can be detected at post-mortem?**

The range of emergency diseases that should be considered during ante-mortem and post-mortem inspection has been detailed earlier in this document. Most emergency diseases are more readily detectable at ante-mortem inspection rather than post-mortem inspection. Most emergency diseases have been identified at abattoirs.

If at post-mortem inspection a number of animals from one lot showing symptoms of fever are noted, serious consideration should be given to the suspicion of an emergency disease. The disease may be an endemic disease such as anthrax but it could also be an exotic disease.

The holding of carcases while a decision is made is an important part of the process.

The identification and notification procedures that apply of emergency animal diseases are explained in the training material for *AMPMSY302 Recognise signs of emergency and notifiable animal diseases.*

**What regulatory requirements apply when handling an affected carcase?**

Carcases may be identified at post-mortem inspection as having:

* a pathological condition
* gross contamination
* another abnormality requiring further treatment and/or a more detailed inspection.

They may be directed to the retain rail to undergo further treatment and inspection. The post-mortem inspector marks these carcases or carcase parts with the relevant retain tag, as per workplace procedures.

There needs to be an area set aside for re-inspection purposes. It should only be used for this purpose. The equipment needed is:

* lighting, to 600 lux
* handwash and equipment sterilisation facilities and liquid soap
* condemned meat bin/barrow/chute
* cutting equipment – saw, knife etc.
* product wash facilities
* quartering facilities.

The requirements to be met when retaining a carcase will depend on whether the plant is domestic-registered or export-registered. The requirements are generally as follows.

|  |  |
| --- | --- |
| **Action** | **Explanatory notes** |
| **Supervise** | retain rail personnel in the detection and removal of pathology, contamination or other abnormality requiring treatment. |
| **Inspect** | all external and internal carcase surfaces, including cut muscle, to ascertain if the reason for retaining has been rectifiedall carcase parts (viscera) that have been retained to assist with disposition. |
| **Palpate** | lymph nodes and suspect lesions and, where necessary, incise to detect disease conditions and/or pathological change. |
| **Sanitary sequence** | observepalpateincise.NB: Wash hands after handling material unfit for human consumption. Thoroughly sterilise knife after trimming material unfit for human consumption. |

**Note:** for further information refer to AMPA3046 *Undertake retain rail operations.*

The question of disposition i.e. what to do with the retained carcase and its parts is a question that should be addressed in conjunction with AS4696:2023 *Australian Standard for the hygienic production and transportation of meat and meat products for human consumption,* which offers good guidelines on disposition.

But in the end it is up to the meat inspector to make the decision. The decision should be made on good scientific principles.

When making disposition on a carcase, an organ or any other parts the inspector can make a disposition on:

* the total carcase (including its parts)
* a part of the carcase
* pass as suitable for human consumption and remove the retain tags
* retain requiring further inspection and apply a retain tag ECA 2 for small stock ECA 3 for large stock and supervise the segregation of the carcase and/or carcase parts in the retain facility
* retain requiring further treatment and apply a retain tag and supervise the segregation of the carcase and/or carcase parts in the chiller retain facility- these carcases are retained using the ECA 4 tag



* + The procedure for using this tag is as follows:
		- record the item being tagged, the reason for tagging, the name of the person applying the tag and the date. The same information is recorded on the tear of section on the base. This section is taken to the DOA office and recorded in a ECA4 register when a final disposition is made this also is recorded in the register to correlate with the ECA4 unique number
* relegate to an inedible purpose other than condemnation, i.e. animal food or pharmaceutical purposes; identify the carcase and/or carcase parts as suitable for the designated purpose, e.g. pet food only and supervise the removal of the carcase and/or carcase parts to the designated processing area
* identify the carcase and/or carcase parts as condemned by the application of the condemned stamp or the application of ink and/or disposal in a condemned tub/bin or chute.

**What hygiene and sanitation and WHS requirements apply when handling an affected carcase?**

The company work instructions will set down all the hygiene requirements for working on the slaughter floor and for handling affected carcases.

These will require the inspector to:

* wash hands between carcases or when contaminated
* wear PPE such as aprons and boots which can be cleaned regularly and easily
* follow the sanitary sequence which is to handle edible product (heart, lung, kidney) before handling inedible materials (intestines)
* sterilise knife between carcases and when contaminated and after steeling
* change uniform if it is grossly contaminated
* wash hands before and after work.

These practices will protect health and minimise cross contamination.

Inspectors should always wear the Personal Protective Equipment (PPE) set down in the company work instructions or WHS policy.

PPE will include:

* hand protection like mesh and cut-resistant gloves
* hearing protection
* footwear
* aprons
* uniforms
* hair net.

It is important to handle diseased or contaminated product that may require trimming in a way that avoids contamination of clean parts of the carcase. This may involve holding the affected parts with a hook and trimming from a clean area to remove offending material.

The workplace will also have a ‘dropped meat policy’ for product that accidently contacts the floor. This will need to be followed if product is dropped.

**Retaining carcases**

**What are the procedures for retaining carcases on the slaughter floor?**

When minor defects cannot be removed by an inspector on the slaughter floor or if a carcase requires a more detailed assessment the carcase may be passed onto the retain rail for further treatment and assessment.

Carcases on the chain can be identified in a number of ways to indicate the pathology or defects that needs to be removed or re assessed on the retain rail. This includes knife cuts, tie-on tags, stick-on tickets, plastic tags and formal approved retain tags (ECA3 and ECA4 in an export works). Workplace procedures will detail how this is to be done.

These tags are temporary tags and are removed by the trimmer on the retain rail after the defects have been addressed, with the exception of tags used to retain a carcase for a pathological disease or condition. Any ECA tag can only be removed by an authorised officer- Department of Agriculture Fisheries and Forestry (DAFF) employee.

The ECA4 Tag or equivalent on the other hand can only be removed by an authorised person. It is generally used for more permanent control over product where more detailed assessments need to be done to determine the suitability of the product for human consumption.

**What are the procedures for retaining carcases in a chiller?**

If carcases are to be retained in the chiller because it may take some time for laboratory results to return, the carcases to be retained must not only be identified by tags but also need to be locked in such a way by a meat safety inspector or other authorised person, so that it cannot be used for human consumption until the results of tests have been received.

Carcases may be locked on the rail or in a special cage and records need to be maintained of any such actions. Workplace procedures will detail how this is to be done.

**PPE requirements for post-mortem inspection**

**What PPE is required to perform post-mortem inspection?**

Personal Protective Equipment to be used will be set down in the work instruction and WHS procedures. PPE may include:

* protective hand and arm covering
* protective head and hair covering
* head wear
* coat and apron
* work safety or waterproof footwear
* protective boot covers
* ear plugs/muffs
* eye and facial protection
* waterproof clothing.

**What workplace requirements apply when using PPE?**

According to the *National Guidelines for Health and Safety in the Meat Industry*:

*‘ PPE and clothing are those items of equipment worn by an employee to minimise or eliminate exposure to specific occupational hazards’.*

The emphasis is always on eliminating the hazards thereby making it unnecessary for workers to wear Personal Protective Equipment (PPE). However, it is not always possible to eliminate the hazards, and PPE may be required to protect the worker from the consequences of exposure. For example, workers may be required to wear ear plugs to reduce the likelihood of deafness resulting from exposure to an excessively noisy environment. Workers in the meat industry are frequently required to wear PPE. In this case it is the employer’s responsibility to ensure PPE is:

* assigned to the worker for their exclusive use
* cleaned and maintained after use
* stored when not in use
* inspected and repaired regularly
* checked for continued functioning and effectiveness.

It is also the employer’s responsibility to ensure training is provided as appropriate. Workers should receive training about:

* proper use of PPE
* the deficiencies and restrictions of PPE
* fitting PPE and how to test for fit
* use of PPE
* maintenance of PPE
* storage of PPE
* identification of faults in PPE
* procedure for replacing PPE.

**How should PPE be used, maintained and stored?**

Workers are responsible to:

* wear PPE as instructed by the supervisor and as set out in the work instruction
* fit PPE to ensure it is used to maximum benefit
* check for any faults and replace it if faulty
* follow maintenance procedures as instructed by the supervisor and set out in work instructions
* store PPE as instructed.

Examples of specific PPE are included in the *National Guidelines for Health and Safety in the Meat Industry*.

**Taking pathological and residue samples**

**How are lesions and tissues necessary for determining dispositions identified?**

The type of lesions and tissues necessary for determining dispositions will depend on the nature of the abnormality and the nature of the suspected disease condition. For certain conditions such as granulomas, it is a regulatory requirement to take a sample for laboratory analysis for Bovine tuberculosis. It is vital under these circumstances that there is an accurate record of the property of origin of the animal so that trace back can be instituted if necessary.

For other conditions the list below indicates what suitable specimens should be taken.

**What are the requirements for collecting and submitting specimens?**

Sometimes in order to make a correct disposition on product at post-mortem inspection or to confirm suspicion of a notifiable disease it will be necessary to take samples for laboratory analysis.

In each State or Territory there is usually a Veterinary Laboratory where samples can be sent for analysis. Detailed information on the collection and handling of samples for each laboratory should be obtained directly from the laboratory. Most laboratories have a manual that will outline the collection and handling requirements. The following is a brief guide of the samples required for various types of tests.

**Bacteriology**

Swabs of tissue e.g. heart blood, intestinal content, in transport medium and /or 30 ml of chilled lesion, fluid or tissue e.g. liver, lung, intestine in a screw-capped container.

**Biochemical tests**

Full 10 ml plain and Lithium/ heparin blood tube.

**Gross Pathology**

 Representative samples of affected tissue with any adjacent normal tissue.

**Haematology**

Full 10 ml EDTA blood tube and blood smear.

**Histopathology**

A representative sample of affected tissue with adjacent normal tissue. Tissue should be 1 cm thick in ten times their volume of buffered formalin solution.

**Parasitology**

Approximately 30g of faeces for faecal egg count.

**Serology**

A full 10 ml plain blood tube.

**Toxicology**

Approximately 50 ml of ingesta, faeces or flesh tissue.

**Virology**

Full 10 ml plain tube and EDTA blood tubes.

30 ml of fresh chilled tissue e.g. heart, spleen or swab of lesion or tissue in PBGS.

**How are specimens for residue testing taken?**

Specimens for residue testing will vary according to the type residue that is suspected. For example if cadmium is suspected kidney samples will be taken. If pesticides are suspected samples could include meat or offal such as livers.

It is vital under these circumstances that there is an accurate record of the property of origin of the animal so that trace back can be instituted if necessary.

The workplace instructions will describe what samples to take. If not the relevant authority responsible for meat safety in each state will advise.

The relevant laboratory doing the testing will also advise what type of specimen they require.

**How are results interpreted?**

The laboratory will determine the interpretation of the results of residue sampling. They will advise if the result is below or over the regulatory limit for that residue.

If the result is over the regulatory limit public health authorities will decide what is to happen to the carcase.

**What are the requirements for retaining carcases while waiting for results?**

If carcases are to be retained in the chiller because it may take some time for laboratory results to return, the carcases to be retained must not only be identified by tags but also need to be locked in such a way by a meat safety inspector or other authorised person, so that it cannot be used for human consumption until the results of tests have been received. Under supervision retained carcases can be boned and packaged to be returned to chillers and identified as retained.

Records need to be maintained of any such actions.

Workplace procedures will detail how this is to be done.

**Bibliography**

These publications were used to develop this training material.

*Eddie Andriessen Meat Safety Quality and Veterinary Public Health in Australia 11th edition Penny Farthing Publishing PO Box 190 Woodville SA*

*Food Standards Australia New Zealand Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption FRSC technical report No 3 AS 4696:2023 CSIRO Publishing*

*AMIC National Animal Welfare Standards for Livestock Processing Establishments Preparing Meat for Human Consumption 2nd Edition (2010)*

*Model Code of Practice for the Welfare of animals: Livestock at Slaughtering Establishments*

AUS-MEAT Limited, 1998, *Handbook of Australian Meat*, seventh edition, AUS-MEAT Limited, South Brisbane.

Commonwealth Department of Agriculture Fisheries and Forestry.

*Export Control Act 2020*

*Export Control (Meat & Meat Products) Rules 2021*

*Manual of Importing Country Requirements – European Union*

 *United States*

*National Residue Survey – Approved Laboratories for Chemical Residue Testing*

Note: Other than Eddie Andriessen’s book all of the above can be accessed at Elmer 3

<http://www.agriculture.gov.au/export/food/meat/elmer-3>

*La Viande Australian Alpaca, 2007, Australian Alpaca – Carcase and Cuts Specifications, Rural Industry Research and Development Corporation http://www.laviande.com.au/download/laviande-alpaca-cuts-brochure.pdf*

*Johnson, LW, 2014, Overview of Llamas and Alpacas, Merek’s Veterinary Manual,* [*http://www.merckvetmanual.com/mvm/exotic\_and\_laboratory\_animals/llamas\_and\_alpacas/overview\_of\_llamas\_and\_alpacas.html*](http://www.merckvetmanual.com/mvm/exotic_and_laboratory_animals/llamas_and_alpacas/overview_of_llamas_and_alpacas.html)

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*Gibsona, TJ, Whiteheadb, C, Taylora, R, Sykesa, O, Chancellora, NM, Limona, G, 2014, Pathophysiology of penetrating captive bolt stunning in Alpacas (Vicugna pacos), Meat Science, Vol. 100, Pages 227–231*

*Animal Health Australia http://www.animalhealthaustralia.com.au/programs/johnes-disease/market-assurance-programs-maps/alpacamap-manual/*

*Australian Alpaca Assoication http://www.animalhealthaustralia.com.au/programs/johnes-disease/market-assurance-programs-maps/alpacamap-manual/*

**Additional resources**

Registered Training Organisations (RTOs) should refer to the Unit-by-Unit listing of resources on the MINTRAC website [www.mintrac.com.au](http://www.mintrac.com.au) for additional resources to support the delivery of this Unit.

RTOs which develop or identify additional resources are encouraged to advise MINTRAC so that these can also be added to the Unit-by-Unit listing.

**The Exam Generator**

The Exam Generator is a question bank containing hundreds of questions related to meat safety and Quality Assurance. There are two CDs in the set – one for RTOs (Albert) to create the exams and a student CD (Eddie) that creates electronic practice exams containing all the same questions.

**Meat Inspection Currency tool**

The Meat Inspector Currency exam generator generates quizzes for the assessment of the currency of a meat inspector’s knowledge.

1. This information is taken from the Australian Alpaca Association website: <https://www.alpaca.asn.au/i> [↑](#footnote-ref-1)