



# Evaluation of Bovine Post Mortem Examination Requirements in New Zealand

Stage 1

Prepared for MAF Standards  
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## Executive summary

The current bovine post mortem procedures in New Zealand for the examination of the gall bladder, pericardium, penis and reticulum were scientifically evaluated as to their contribution to food safety. A risk profiling approach demonstrated that the following changes to current procedures would not affect food safety outcomes: no examination of the gall bladder, examination of the pericardium included within viewing of the heart, examination of the penis when saved as for human consumption by viewing and examination of the reticulum by viewing during examination of the gastro-intestinal tract.

These changes align the procedures in New Zealand with those of our major trading partners.

## Background

The procedures for the post mortem examination of bovines in New Zealand have not been scientifically evaluated since their inception apart from the head and tongue procedures that were appropriate for the risk to human health from *Cysticercus bovis* in the previous decade.

This report presents a qualitative review of the food safety implications of some proposed changes in some post mortem meat examination procedures. It has been agreed between MAF and the meat industry to carry out the evaluation in three stages.

The first stage would involve some specific procedures only applied in New Zealand, the second stage would cover those changes that relate to the detection of bovine tuberculosis and the final stage would incorporate all other tissues and organs not already covered by the first two stages.

# Examination of the gall bladder

## CURRENT POST MORTEM PROCEDURES

The current New Zealand examination procedures for cattle include the gall bladder as a separate tissue to be examined by viewing. This procedure for the gall bladder is not specified for any other slaughter species in New Zealand.

The gall bladder is not described as a particular organ to be examined within the post mortem examination procedures of Australia, the US, Canada or the EU.

## ANATOMY, PRESENTATION AND PROCESSING

The bovine gall bladder is located partially attached to the visceral surface of the liver. It is a pear-shaped sac (10 to 15 cm in length) which lies between the liver and the abdominal wall at the ventral part of the tenth or eleventh intercostal space and adjacent to the duodenum. The neck of the gall bladder is continued by the cystic duct which joins the hepatic duct at an acute angle to form the bile duct.

The liver is presented for examination on the viscera table with the gall bladder attached. After examination, the gall bladder is routinely removed from the liver and directed to the pet food room for bile collection, which is sold as a pharmaceutical product

## HAZARD IDENTIFICATION

### 1. Bacterial infection

The circulatory system of the gall bladder is closely associated with that of the liver and so any circulating pathogens within the liver will be expected to be present in the tissue of the gall bladder.

Some conditions are known to have pathognomonic changes in the gall bladder such as infection by *Samonella* spp which generally cause enlargement of the organ but always with concurrent pathological changes to the liver or gastro-intestinal tract.

### 2. Cholecystitis

This condition has been reported in association with fascioliasis with sub acute or chronic inflammation, hyperplasia of tubuloalveolar glands and increased numbers of enterochromaffin cells in the walls of gall bladders have all been reported from cattle with fascioliasis (Cheema, 1976) although in comparison to the situation in New Zealand, these cattle were predominantly affected by *Fasciola gigantica* rather than *F. hepatica*.

The distinction between hyperplastic adenomatous cholecystitis and benign cystadenomas of the bovine gall bladder appear to be arbitrary (Anderson et. al., 1958)

### 3. Poisoning

Poisoning with pentachloronaphthalene has been reported to produce a distended gall bladder filled with dark, sticky, viscid bile along with changes in the liver including the edges becoming thickened and rounded and more obviously hyperkeratosis. These changes were observed in an experimental intoxication to determine the cause of hyperkeratosis (Sikes, Bridges, 1952). Other toxicities that produce changes in the gall bladder include ingestion of some plants, such as lantana and rangiora (Connor, 1977)

### 4. Protozoon infections

In other countries, the disease conditions of anaplasmosis, babesiosis and theileriosis are all characterised in cattle by enlargement and distension of the gall bladder although all of these conditions have other associated gross pathology. There have been occasional reports of infections with the benign protozoan parasite *Theileria orientalis* in cattle in New Zealand (Northland), with most infections being subclinical. *T. orientalis* is the only piroplasm organism found in New Zealand, and its presence may be due to immunosuppression caused by concurrent conditions (Thompson, 1998). A survey has been carried out which confirmed New Zealand's freedom from anaplasmosis (MacDiarmid et. al., 1984) and there have been no indications of arrival of the organism since that time.

## 5. Tumours

Adenoma and adenocarcinoma of the gall bladder are seldom reported in domestic animals (Moulton, 1978) although adenomas may be more frequent since it is not detected by external examination, the gall bladder is not opened prior to examination generally. Gall bladder neoplasms have not been associated with gall stones. Papillary cystadenoma is believed by some (Anderson et. al., 1958) to represent a distinct pathological entity.

Nearly all adenomas arise in the fundus of the gall bladder although some appear in the neck, are usually solitary but occasionally multiple. They may be up to 5 to 7 cm in diameter, occupy most of the lumen and extend the gallbladder moderately. Carcinomas are similar to adenomas in shape, more solid in structure and often invade the wall of the gall bladder and protrude externally or into the adjacent liver.

## RISK PROFILE

The gall bladder is not saved for human consumption and no indicator function has been established for this organ.

Enlargement of the gall bladder often accompanies any period of decreased food intake in the absence of any disease. There are no reported conditions restricted to the bovine gall bladder that have any significance of the consumer of the liver or any other part of the carcass or viscera and that would require examination directed towards that organ for detection.

Consequently, there is no demonstrated necessity for this organ to be examined.

## RECOMMENDATION

There should be no examination requirement for the gall bladder.



# Examination of the pericardium

## CURRENT POST MORTEM PROCEDURES

Under the current New Zealand post mortem examination procedures the meat inspector is required to specifically examine the pericardium by viewing and palpation.

The pericardium is not described within the post mortem examination procedures for either Australia, the US or Canada.

The EU prescribes the routine examination of the pericardium by viewing, although in some member states the only part of the pericardium being viewed would be the epicardium as the bovine heart is presented already trimmed of the distal atria and remainder of the pericardium.

## ANATOMY AND PRESENTATION

The pericardium is the fibro-serous sac which surrounds the heart and the great vessels connected to it. There is an external fibrous layer which is thin, strong and inelastic and attached dorsally to the large vessels at the base of the heart and ventrally by the sterno-pericardiac ligaments to the middle of the posterior half of the thoracic surface of the sternum. The inner serous layer is the internal closed sac which contains clear serous fluid, is surrounded by the fibrous pericardium and invaginated by the heart. The serous membrane has two parts, the parietal part which lines the fibrous layer while the visceral layer covers the heart and parts of the great vessels as is also known as the epicardium.

This section of the pericardium will be examined along with the heart even when the remainder of the pericardium is removed.

The pericardium is generally incised and retracted from the heart prior to presentation to the inspector. It lies attached to the major afferent and efferent blood vessels of the heart in a contracted state and is not easily palpated.

## HAZARD IDENTIFICATION

1. Generalised conditions such as septicaemia and toxæmia may result in gross pathological changes in the heart which may include petechial haemorrhages and blood-stained fluid in the pericardial sac (Thornton and Gracey, 1974). Inflammation of the pericardium and epicardium often occurs concurrently and may extend to the myocardium. Acute pathology will include fibrinous, serofibrinous and suppurative inflammatory changes. Some cases of localised pericarditis may contain large volumes of purulent material.
2. Pericarditis may occur as an extension of respiratory diseases involving organisms such as *Pasteurella multocida* capsular type B strain (McFadden et.al., 2011) , *Actinomyces pyogenes*, *Haemophilus somnus*, *Pasteurella haemolytica*, bovine herpes virus 1, bovine viral diarrhoea virus, bovine respiratory syncytial virus and parainfluenza 3 virus, (Nichols, 1996). None of these organisms have been reported as food-borne zoonoses.
3. Traumatic pericarditis caused by penetration of the pericardium by a foreign body. The reticulum is separated from the pericardium by approximately 2 cm (Sisson 1930) and not uncommonly in cattle being hard fed in feedlots, or with access to food stuffs other than pasture, any sharp foreign object that reaches the reticulum is capable of penetrating both the wall of the reticulum and the diaphragm to reach the pericardium. The gross

pathology will include fibrinous, serofibrinous and suppurative inflammatory changes and be obvious upon examination.

## RISK PROFILE

The pericardium is not saved for human consumption and no indicator function has been established for this organ.

Any condition of the pericardium and contents of the pericardial sac that affects either the nature of the fluid or the epicardium or myocardium will be apparent upon viewing the heart. There is no evidence of the external pericardium being a site of predilection for *Cysticercus bovis* and to date there have been no reported detections of *C. bovis* within the pericardium in New Zealand cattle. Palpation of the pericardium is not required under the additional *Taenia saginata* examination procedures (OMAR 09/28)

## RECOMMENDATION

The pericardium should not be examined as a separate tissue from the heart but examined by viewing if present and attached to the heart.

# Examination of the penis

## CURRENT POST MORTEM PROCEDURES

New Zealand does not require any examination of the bovine penis unless the organ is being saved for human consumption, when it is required to be examined by both viewing and palpation.

Australia requires the penis to be viewed only when recovered for human consumption but otherwise does not require examination.

Both the US and Canada have no requirements described for the examination of the bovine penis.

The EU requires the genital organs to be viewed without any specification of which particular organs are required to be presented for examination.

## ANATOMY & PRESENTATION

The bovine penis is a dense, cylindrical organ approximately 90 cm in length including the sigmoid flexure which is attached to the pelvic symphysis by suspensory ligaments. The glans penis is about 8 cm in length behind which the prepuce is attached.

The penis is usually exposed by the midline abdominal opening incision which precedes hide removal. It is generally freed from its preputial attachment by the hide puller and left suspended from the attachment over the pelvic symphysis. The penis is usually removed from the carcass at evisceration and placed on the viscera table for examination if saved for human consumption.

## HAZARD IDENTIFICATION

1. Sexually transmitted diseases in the bovine in New Zealand include bovine viral diarrhoea, bovine herpes virus, trichomoniasis, *Campylobacter* spp., infectious bovine rhinotracheitis and chlamydiosis (Mackereth, 2003) along with *Ureaplasma* spp., *Mycoplasma* spp., *Acholeplasma* spp. and *Haemophilus somnus* (Parkinson and Vermunt, 2000) but these conditions generally have no pathology associated with the penis.
2. Both posthitis and balano-posthitis are associated with improved pasture and high protein content (Hungerford, 1975) and occasionally with the infectious bovine rhinotracheitis virus. There are no implications for human health from these conditions.
3. Papillomas / fibropapillomata of the penis are considered common in young bulls in New Zealand but are generally restricted to the distal end of the penis and usually removed when the penis is freed from the prepuce and hide.
4. Tuberculous granulations as the result of a primary genital infection have been observed on the glans penis of a bull (Thornton, 1962) but are now considered extremely unlikely to occur in New Zealand.

## RISK PROFILE

The penis may be saved for human consumption but no indicator function has been established for this organ.

There are no known conditions of the bovine penis that would require palpation for their detection rather than viewing and no indicator function of the organ.

## **RECOMMENDATION**

That the penis be examined by viewing only when saved for human consumption.

# Examination of the reticulum

## CURRENT POST MORTEM PROCEDURES

The New Zealand post mortem procedures require the reticulum to be examined by viewing and palpation.

Australia, the US, Canada and the EU all require the bovine reticulum to be examined by viewing only.

## ANATOMY & PRESENTATION

The reticulum is the most anterior and smallest of the four divisions of the stomach and lies against the liver and diaphragm opposite the sixth and seventh ribs. The mucous membrane of the interior lining of the reticulum is raised into folds with a distinctive “honeycomb” pattern.

The reticulum is presented on the viscera table along with the entire gastro-intestinal tract.

## HAZARD IDENTIFICATION

1. Traumatic reticulitis / peritonitis. The anatomical configuration of the reticulum tends to predispose foreign bodies to accumulate in that organ and this condition is not uncommon in cattle that have been fed other than pasture during their lifetime. If the object is sharp, such as a nail, it may penetrate the wall of the reticulum. After penetration of the wall, the usual pathogenesis includes peritonitis and, if the animal recovers, extensive adhesions between the reticular wall and adjoining tissue. These conditions are readily apparent by viewing.
2. Large numbers of immature *Paramphistomes* (stomach fluke) can cause severe enteritis, most commonly in cattle less than 12 months of age in late summer, autumn and early winter. The presence of mature flukes in the reticulum is of little or no consequence (Vermunt and Parkinson, 2000).

## RISK PROFILE

The reticulum is regularly saved for human consumption but no indicator function has been established for this organ.

The conditions most likely to be encountered in the rumen are those resulting from penetration of the rumen wall by a foreign object. The condition, if restricted to the reticulum and not sufficient to cause peritonitis, will be of no consequence to the consumer and discovered when the reticulum is opened. Any peritonitis and external abscessation of the reticulum will be readily detected by viewing.

## RECOMMENDATION

That the reticulum be examined by viewing.

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