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Department of Agriculture, Fisheries and Forestry

Import risk review for natural casings: issues paper

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Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

Contents

Summary

The Australian Government Department of Agriculture, Fisheries and Forestry has prepared this issues paper as an interim step in the development of a draft risk review of its policy for the importation of natural sausage casings.

The risk review was commenced at the request of industry to consider the treatment of natural casings with salt, or phosphate supplemented salt, for at least 30 days at a temperature over 20°C, as an alternative to existing import conditions. Industry included with its proposal a range of contemporary research, explaining that this body of work had also provided the substantive underpinning for the recommendations of the World Organisation for Animal Health (WOAH) in respect of international trade in natural casings.

This issues paper addresses industry's proposal in part, with a review of the provided research. The review found that temperature is a clear factor in the effectiveness of salting as a treatment for the inactivation of the five diseases that are the focus of the import risk review. Significant inactivation of African swine fever virus (ASFv), classical swine fever virus (CSFv), and foot-and-mouth disease virus (FMDv) occurs in casings following the salting process with either sodium chloride (NaCl) salt, or phosphate supplemented salt, when the process is conducted at temperatures at or above 20°C. Swine vesicular disease virus (SVDv) was resistant to inactivation with NaCl at any temperature, although inactivated by phosphate supplemented salt at 20°C. For each of these disease agents, there was limited further inactivation above 25°C. There is at this time no applicable data available to consider the effect of the salting process on the inactivation of peste-des-petits ruminants virus (PPRv).

The issues paper does not assess the level of biosecurity risk for each disease, nor does it propose any import conditions. These further considerations will be the focus of the draft import risk review.

Stakeholders are invited to provide comment on the department's interpretation of the science underpinning industry's proposal. In particular, this includes the department's interpretation of research designs and results in respect of the inactivation of the identified disease agents. Comments can be submitted through the department's website for 60 days following release.

Regulating trade in natural casings

1 Introduction

Natural casing products fall into two categories: natural casings, which are processed, consumer-ready products and animal runners, which are semi-processed intestine. Australia is both an exporter and an importer of natural casings and also exports animal runners for offshore processing.

Natural casings are traded worldwide, with a 2021 estimated market value of approximately $2.44 billion that is expected to grow to $2.79 billion by 2028 (Research-Markets 2021). Drivers of market growth include consumer preference for natural over artificial products; greater demand for meat products in emerging economies; and the associated expansion of the fast-food sector. China is the most significant export destination for Australian natural casing products, accepting 96% of Australia's runners and 95% of processed casings (DAFF 2024). China is also the global leader in casings processing and handles large quantities of casings from around the world. Egypt is Australia's second largest export market for runners intended for processing. Other countries in Africa (notably Morocco), Europe, Asia and the Pacific make up the remaining market for Australian natural casing products.

Within this integrated global market, trade regulation based on certification of the disease status of the countries from which casings were derived requires a reliable system for verifying the provenance of individual consignments. Across the industry, this may not be a robust expectation.

2 Current and proposed conditions for the importation of natural casings

In 2000, the department completed an import risk analysis (IRA) for the Importation of Sausage Casings into Australia (AQIS 1999). From this, two options were implemented for the management of natural sausage casings.

Option 1

Country freedom requirements:

- Sourced from pigs from countries officially free from foot-and-mouth disease (FMD), African swine fever (ASF), classical swine fever (CSF), swine vesicular disease (SVD) and Teschen disease (variably, teschovirus encephalomyelitis)
- Sourced from sheep and goats from countries officially free from FMD and peste-des-petits ruminants (PPR), with risk management options for scrapie
- Sourced from cattle from approved countries free from FMD with risk management options for bovine spongiform encephalopathy (BSE).

The import conditions required casings to be stored for at least 30 days after slaughter, prior to being released from quarantine.

Option 2

The IRA also proposed alternative risk management measures for natural sausage casings sourced from non-approved countries. These conditions reiterated the requirement that the casings are stored for at least 30 days after slaughter, prior to being released from quarantine, but added to this that the casings must be desalinated and soaked for 2 hours in chlorine solution maintained at a level of 80 ppm of free available chlorine.

Since 2000, Australia's import conditions have been amended on several occasions to reflect Australia's animal biosecurity policies. In 2017, the department removed a scrapie clause from the existing conditions, deeming it was not relevant as the likelihood of exposure of susceptible species (sheep and goats) was considered negligible. In 2020, the approval to use chlorine as a treatment to manage the risk from non-approved countries was removed.

Current import requirements for natural casings: the importation of natural casings is subject to the provisions of the *Biosecurity Act 2015* and its subordinate legislation, including the Biosecurity (Conditionally Non-prohibited Goods) Determination 2021 (Biosecurity Determination). The Biosecurity Determination enables certain goods to be imported into Australia under specified conditions, but without the requirement for an import permit.

Section 17 of the Biosecurity Determination sets out the conditions that apply to the importation of natural casings derived from bovine, caprine, ovine or porcine animals, as shown below:

> *All of the following:*
>
> *a) the animals from which the goods were derived:*
> *i. were born, raised and slaughtered in one or more countries, each of which is a listed country for natural casings derived from bovine, caprine, ovine or porcine animals; and*
> *ii. were found to be free from contagious and infectious disease at ante mortem and postmortem veterinary inspections, conducted under official veterinary supervision; and*
> *iii. were slaughtered at least 30 days before the day the goods are brought or imported into Australian territory;*
> *b) the goods were not exposed to contamination before being exported;*
> *c) each package containing the goods states the identification or veterinary control number of the establishment at which the casings were packed;*
> *d) the goods are accompanied by a health certificate stating the matters referred to in paragraphs (a), (b), and (c)*

Section 6 (Definitions) of the Biosecurity Determination explains that:

> *Listed country for natural casings derived from bovine, caprine, ovine or porcine animals means a country that is listed in the List of Countries for Natural Casings Derived from Bovine, Caprine, Ovine or Porcine Animals prepared by the Director of Biosecurity and published on the Agriculture Department's website, as existing from time to time.*
>
> *Note: A country is listed in the List of Countries for Natural Casings Derived from Bovine, Caprine, Ovine or Porcine Animals, if the Director of Biosecurity is satisfied that the level of*

biosecurity risk associated with natural casings derived from animals born, raised and slaughtered in that country is acceptable.

The list of countries approved for the importation of natural casings derived from bovine, caprine, ovine or porcine animals can be downloaded from the department's website.

In 2013, the (then) Australian Natural Sausage Casing Association (ANSCA) wrote to the department, requesting that the treatment of natural casings with salt, or with phosphate supplemented salt, for at least 30 days at a temperature over 20°C, be evaluated as an alternative to post-entry quarantine treatment for imported casings from countries not free from FMD and other diseases – noting that in 2013, the department still operated post-entry quarantine treatment as an alternative to country freedom.

This request from ANSCA broadly reflected the contemporary (and current) recommendations of the World Organisation for Animal Health (WOAH) for trade in natural casings (Table 1). The request cited as evidence the work of Wieringa-Jelsma et al. (2011); Wijnker (2006); Wijnker (2009); Wijnker, Depner and Berends (2008); Wijnker, Haas and Berends (2007, 2012); Wijnker et al. (2008). In the context of this request, salting was with saturated brine (NaCl, water activity $a_W < 0.80$); while phosphate supplemented salt contained 86.5% NaCl, 10.7% Na_2HPO_4 (disodium phosphate) and 2.8% Na_3PO_4 (trisodium phosphate) and presented either dry or as a saturated brine ($a_W<0.80$).

Although 20°C was proposed by ANSCA in 2013, acknowledging that salted casings can be stored at 20°C without loss of quality (Bakker et al. 1999), it was later observed (ENSCA 2017) that a storage temperature of between 8°C and 12°C is generally recommended and is better aligned with usual practice within the casings industry.

3 WOAH recommendations

Recognising the difficulty in reliably verifying the provenance of individual consignments of casings within a globally integrated industry, WOAH has developed the conditions set out in Table 1. These conditions are closely aligned to those proposed by ANSCA in 2013.

Table 1 WOAH recommendations for trade in natural casings

Disease	WOAH recommendation for trade in natural casings
African swine fever	**For the inactivation of ASFv in casings of pigs**: treating for at least 30 days either with dry salt (NaCl) or with saturated brine ($a_W < 0.80$), or with phosphate supplemented dry salt containing 86.5% NaCl, 10.7% Na_2HPO_4 and 2.8% Na_3PO_4 (weight/weight/weight) at a temperature of 12°C or above.
Classical swine fever	**For the inactivation of CSFv in casings of pigs**: treatment for at least 30 days with phosphate supplemented salt, containing 86.5% NaCl, 10.7% Na_2HPO_4 and 2.8% Na_3PO_4 (weight/weight/weight), either dry, or as a saturated brine ($a_W < 0.80$), and at a temperature of 20°C or above.
Foot-and-mouth disease	**For the inactivation of FMDv present in casings of ruminants and pigs**: treating for at least 30 days either with dry salt (NaCl) or with saturated brine (NaCl, $a_W < 0.80$), or with phosphate supplemented salt containing 86.5% NaCl, 10.7% Na_2HPO_4 and 2.8% Na_3PO_4 (weight/weight/weight), either dry or

Disease	WOAH recommendation for trade in natural casings
	as a saturated brine (a_W < 0.80), and kept at a temperature of greater than 12°C during this entire period.
Peste-des-petits ruminants	**For the inactivation of the PPRv in casings of sheep and goats**: treatment for at least 30 days either with dry salt (NaCl) or with saturated brine (a_W < 0.80), or with phosphate supplemented salt containing 86.5% NaCl, 10.7% Na_2HPO_4 and 2.8% Na_3PO_4 (weight/weight/weight), either dry or as a saturated brine (a_W < 0.80), and kept at a temperature of 20°C or more during this entire period.

Source: woah.org/en/what-we-do/animal-health-and-welfare/animal-diseases/

Assessments for key diseases

This issues paper focussed on the following five key animal diseases:

- African swine fever
- Classical swine fever
- Foot-and-mouth disease
- Swine vesicular disease
- Peste-des-petits ruminants

In 2015, the Inspector-General of Biosecurity (IGB 2015), in consideration of the biosecurity controls for importing natural sausage casings, made the following recommendation regarding the assessment of important diseases.

> *The department should update the import risk analysis for natural sausage casings, incorporating relevant internal policies and/or guidelines used by policy and operational areas for imports into Australia. An update might consider any relevant scientific literature on the persistence of pathogenic agents in sausage casings published since 1999.*

Stakeholders are invited to provide comment on the department's interpretation of the science underpinning industry's proposal (Section 2). In particular, this includes the department's interpretation of research designs and results in respect of the inactivation of the identified disease agents. Comments can be submitted through the department's website for 60 days following release.

Comments received will help to inform the import risk review, noting that this will also frame the department's response to the recommendations of the Inspector-General of Biosecurity (IGB 2015).

4 African swine fever

African swine fever is a significant WOAH listed disease of pigs. Caused by a large double-stranded DNA enveloped virus, African swine fever virus (ASFv). ASFv is the only DNA arbovirus and the only member of the family *Asfarviridae.*

ASFv is known to be present throughout the entire porcine intestine at high titres and these high titres remain for a significant period of time post-mortem (Jelsma et al. 2021).

When stored at 4°C ASFv is infectious in casings for up to 97 days post treatment (dpt) (McKercher et al. 1980). In commercially processed casings salted with phosphate supplemented salt at 4°C ASFv titres are rapidly reduced to the limit of detection in less than 48 hours; however, residual infectivity above the limit of detection was present until after 15 dpt in NaCl treated casings at 4°C (Jelsma et al. 2019; Wieringa-Jelsma et al. 2011).

Studies assessing the inactivation of ASFv at temperatures above 12°C demonstrate rapid inactivation of ASFv to below the limit of detection within 2 dpt in the presence of phosphate supplemented salt and 7 dpt in the presence of NaCl. At 20°C ASFv was inactivated below the limit of

detection within 2 dpt in the presence of either NaCl or phosphate supplemented salt (Jelsma et al. 2019; Wieringa-Jelsma et al. 2011).

5 Classical swine fever

Classical swine fever virus (CSFv) is a small-enveloped single-stranded positive-sense RNA virus in the family *Flaviviridae*. CSFv causes the significant WOAH-listed disease classical swine fever and is closely related to many other significant pathogens of animals, notably the also listed disease bovine viral diarrhoea virus (BVDv). BVDv is notable alongside CSFv as without laboratory confirmation BVDv infection in pigs is indistinguishable from CSFv infection and in a number of early studies predating routine molecular identification the BVDv National Animal Disease Laboratory (NADL) strain is used in place of CSFv (Jelsma et al. 2021; McKercher et al. 1980).

CSFv and BVDv are present in the intestines of pigs and cattle at high viral titres for a significant period post mortem (Jelsma et al. 2021) and pigs fed on casings treated using various salting processes were infected out to 86 and 147 days respectively (Helwig & Keast 1966; McKercher et al. 1980).

CSFv is resistant to inactivation through salting with either NaCl or phosphate supplemented salt below 20°C with detectable infectivity remaining at 30 dpt at 4°C and 12°C (Jelsma et al. 2019; Wieringa-Jelsma et al. 2011). At 20°C detectable CSFv was present following salting with NaCl at 21 dpt but no detectable CSFv was isolated following phosphate supplemented salt treatment after the first time point at 7 dpt (Jelsma et al. 2019; Wieringa-Jelsma et al. 2011).

6 Foot-and-mouth disease

Foot-and-mouth disease is a WOAH listed disease of animals and is caused by a small, non-enveloped singled-stranded positive-sense RNA virus (FMDv). FMDv has been demonstrated to be present in viscera and intestines and the virus remains infectious post-mortem in the absence of any treatment (Bohm 1975; Cottral 1969).

A number of recent studies have addressed the presence of FMDv prior to and after treatment and storage with various NaCl, phosphate supplemented salt and pH combinations.

Low temperature salting and storage of casings with either salt or phosphate supplemented salt for up to 30 dpt at 4°C resulted in recoverable infectious FMDv (Wieringa-Jelsma et al. 2011; Wijnker, Haas & Berends 2007). At 12°C there may be differences in the effect of NaCl and phosphate supplemented salt on FMDv; however, in each instance some FMDv was detectable out to greater than 20 dpt and potentially detectable at 30 dpt (Wieringa-Jelsma et al. 2011).

Higher temperature storage and salting (room temperature, 20°C or 25°C) resulted in significant reductions in titre with no FMDv detectable at 30 dpt (Wieringa-Jelsma et al. 2011; Wijnker, Haas & Berends 2007, 2012). This is consistent with older work assessing FMDv inactivation in whole sausages (Cottral 1969) and salted beef (Heidelbaugh & Graves 1968). However, it is also clear that the rate of inactivation had slowed with FMDv detectable out to more than 20 dpt (Wijnker, Haas &

Berends 2012). It appears in salted casings that inactivation of FMDv proceeds in a biphasic curve typical of FMDv, as observed in other animal products and substrates (Ryan, Mackay & Donaldson 2008; Tomasula & Konstance 2004) demonstrating lengthy residual infectivity.

It is clear that in the case of FMDv that while salting may play a role in the inactivation of FMDv, time and temperature are the key variables in the inactivation of FMDv above refrigeration temperatures at neutral or alkaline pH. Careful consideration of starting titres and pH is required when considering the effectiveness of salting, duration and temperature for the inactivation of FMDv.

7 Swine vesicular disease

Swine vesicular disease (SVD) has historically been considered an important disease of pigs due to its clinical similarity to FMD. It is no longer a WOAH-listed disease and modern laboratory investigations can readily differentiate between SVDv and FMDv. SVD is caused by the small non-enveloped positive-sense RNA virus, swine vesicular disease virus (SVDv).

SVDv is highly stable in the environment and in pork products, and may be detectable following some salt treatments in casings out to at least 200 dpt (McKercher et al. 1974). Treatment following the WOAH recommended protocol at either 4°C, 12°C or 20°C, with NaCl or with phosphate supplemented salt at either 4°C or 12°C, did not reduce SVDv titres to the limit of detection at 30 dpt (Wieringa-Jelsma et al. 2011). At 20°C, treatment of SVDv-infected casings with phosphate supplemented salt reduced SVDv tires to the limit of detection at, but not before, 30 dpt (Wieringa-Jelsma et al. 2011).

8 Peste-des-petits ruminants

Peste-des-petits ruminants (PPR) is a significant WOAH listed disease of small ruminants – primarily sheep and goats. PPR is caused by peste-des-petits ruminants virus (PPRv – a small ruminant morbillivirus). PPRv is an enveloped negative sense RNA virus which is well established to be present in high titres in the intestines of sheep and goats (Jelsma et al. 2021) . The intestines may be an important site of replication for PPRv in sheep and goats (Jelsma et al. 2021). PPRv is spread through close contact, and via fomites, and by the ingestion of PPRv contaminated material. While there have been no direct studies of PPRv infection through sausage casings, the viral load and known mechanisms of PPRv infection would indicate that if intestines derived from PPRv infected animals are ingested that it is likely these animals would become infected (Jelsma et al. 2021).

There are no publications or data available which directly consider the inactivation of PPRv through salting.

9 Assessments: concluding remarks

Temperature is a clear factor in the effectiveness of salting as a treatment for the inactivation of key viral pathogens of animals. For each disease agent significant increases in inactivation effectiveness were observed above 20°C with limited further increases at 25°C.

Significant reduction in viral titres of ASFv, CSFv, and FMDv occurs in casings following the salting process with either NaCl or phosphate supplemented salt when the process is conducted at temperatures at or above 20°C. In the case of ASFv rapid inactivation occurred in the presence of either NaCl or phosphate supplemented salt. Phosphate supplemented salt was significantly more effective at inactivating CSFv at 20°C with residual infectivity remaining after 21 dpt in the presence of NaCl. In the case of FMDv a clear biphasic inactivation pattern remains at 20°C in the presence of both NaCl and phosphate supplemented salt with residual infectivity lasting until after 21 dpt. SVDv was resistant to inactivation with NaCl at any temperature, although reduced to the limit of detection by phosphate supplemented salt at 20°C. There is at this time no applicable data available to consider the effect of the salting process on the inactivation of PPRv.

Glossary

ANSCA	Australian Natural Sausage Casing Association
AQIS	(former) Australian Quarantine and Inspection Service
ASFv	African swine fever virus
a_W	Water activity
BSE	Bovine spongiform encephalopathy
BVDv	Bovine viral diarrhea virus
CSFv	Classical swine fever virus
DAFF	Department of Agriculture, Fisheries and Forestry (the department)
DPT	Days post infection
DPT	Days post treatment
ENSCA	European Natural Sausage Casings Association
FMDv	Foot-and-mouth disease virus
FSANZ	Food Standards Australia and New Zealand
MPI	New Zealand Ministry for Primary Industries
Na_2PO_4	Disodium phosphate
Na_3PO_4	Trisodium phosphate
NaCl	Sodium chloride (salt)
NADL	National Animal Disease Laboratory
PPRv	Peste-des-petits ruminants virus
SVDv	Swine vesicular disease virus
WOAH	World Organisation for Animal Health

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