



Australian Government

Department of Agriculture,
Fisheries and Forestry

Animal biosecurity risks of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States

Draft addendum to the Fresh (chilled or frozen) beef and beef products from Japan, the Netherlands, New Zealand, the United States and Vanuatu – final review

Animal Biosecurity Branch



Animal biosecurity risks of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States

© Commonwealth of Australia 2024

Ownership of intellectual property rights

Unless otherwise noted, copyright (and any other intellectual property rights) in this publication is owned by the Commonwealth of Australia (referred to as the Commonwealth).

Creative Commons licence

All material in this publication is licensed under a [Creative Commons Attribution 4.0 International Licence](https://creativecommons.org/licenses/by/4.0/) except content supplied by third parties, logos and the Commonwealth Coat of Arms.



Cataloguing data

This publication (and any material sourced from it) should be attributed as: DAFF 2024, *Animal biosecurity risks of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States*, Department of Agriculture, Fisheries and Forestry, Canberra, March. CC BY 4.0.

This publication is available at agriculture.gov.au/biosecurity-trade/policy/risk-analysis/animal/fresh-chilled-frozen-beef.

Department of Agriculture, Fisheries and Forestry

GPO Box 858 Canberra ACT 2601

Telephone 1800 900 090

Web agriculture.gov.au

Disclaimer

The Australian Government acting through the Department of Agriculture, Fisheries and Forestry has exercised due care and skill in preparing and compiling the information and data in this publication. Notwithstanding, the Department of Agriculture, Fisheries and Forestry, its employees and advisers disclaim all liability, including liability for negligence and for any loss, damage, injury, expense or cost incurred by any person as a result of accessing, using or relying on any of the information or data in this publication to the maximum extent permitted by law.

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	v
1. Introduction	1
1.1. Imports of bovines from Canada into the United States	2
1.2. Imports of bovines from Mexico into the United States	5
1.3. Food safety considerations	9
2. Purpose and scope	11
3. Method	12
3.1. Hazard identification	12
3.2. Risk assessment	13
4. Hazard identification	16
4.1. Disease agents present in Canada or Mexico but not considered in the beef review	16
4.2. Disease agents present in Canada or Mexico that are exotic to the United States	16
4.3. Disease agents identified in the beef review that are present in Canada or Mexico	16
4.4. Disease agents identified in the beef review that are not present in Canada or Mexico ..	17
5. Risk assessment	18
5.1. Anthrax	18
5.2. Aujeszky's disease (pseudorabies)	18
5.3. Brucellosis (<i>B. abortus</i> , <i>B. melitensis</i> and <i>B. suis</i>)	19
5.4. Bovine tuberculosis (<i>Mycobacterium bovis</i> and <i>M. caprae</i>)	24
5.5. Bovine viral diarrhoea	34
5.6. Bovine cysticercosis (<i>Cysticercus bovis</i>)	35
5.7. Echinococcosis	36
5.8. Paratuberculosis (<i>Mycobacterium avium</i> subsp. <i>paratuberculosis</i>)	37
5.9. <i>Salmonella enterica</i> serotype Typhimurium DT104	38
5.10. Vesicular stomatitis	39
6. Risk management	41
6.1. Compliance or equivalence with Australian standards	41
6.2. Proposed risk management measures	41
6.3. Meeting Australia's food standards	43
6.4. Verification and compliance with biosecurity measures	43
7. Conclusion and next steps	45
References	46

Tables

Table 1 Number of bovines imported from Canada into the United States.....	2
Table 2 Number of bovines imported from Mexico into the United States.....	5
Table 3 USDA Brucellosis classifications for foreign regions	23
Table 4 Bovine brucellosis requirements by USDA brucellosis classifications for foreign regions.....	23
Table 5 USDA bovine TB classifications for foreign regions.....	26
Table 6 Bovine TB requirements by USDA bovine TB classifications for foreign regions	29

Figures

Figure 1 Matrix for combining qualitative likelihoods.....	15
Figure 2 Risk estimation matrix	15

Summary

Australia's review of biosecurity import conditions for the importation of Fresh (chilled or frozen) beef and beef products from Japan, the Netherlands, New Zealand, the United States and Vanuatu ([the beef review](#)) was published in August 2017 (DAWR 2017). The beef review considered market access for fresh beef and beef products for human consumption from Japan, the Netherlands, New Zealand, the United States and Vanuatu, referred to as applicant countries.

Beef and beef products in the beef review were defined as meat, bone and offal from domesticated American bison (*Bison bison*), buffalo (*Bubalus bubalis*—water buffalo or domestic Asian water buffalo), or cattle (*Bos taurus* and *Bos indicus*), for import as fresh (chilled or frozen) beef and beef products for human consumption. Offal was considered the heart, oesophagus, organs of the abdominal cavity (other than reproductive organs), the muscular tissues of the head, tissues of the diaphragm, the tail, and tendons.

One of the recommendations of the beef review was that imported beef and beef products be sourced from bovines that have been continuously resident in the applicant country since birth.

In early January 2020, the United States considered a draft of the health certification for the beef review. The draft health certification required that the fresh beef and beef products were derived from bovines that had been continuously resident in the United States since birth. The USDA subsequently clarified its original request for access was to include beef sourced from bovines legally imported into the United States from Mexico and Canada. The Australian Government Department of Agriculture, Fisheries and Forestry (the department) advised that this reflects a change of scope from the beef review and would require a science-based assessment.

This addendum to the beef review therefore considers the bovine diseases relevant to fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported into the United States. It assesses whether the biosecurity risk of fresh beef and beef products exported to Australia, when derived from bovines born and raised in Mexico or Canada, and legally imported into the United States from Mexico or Canada, is not greater than fresh beef and beef products derived from bovines born and raised in the United States.

Food Standards Australia New Zealand (FSANZ) has completed an assessment of Mexico's bovine spongiform encephalopathy (BSE) status (FSANZ 2014), and as of March 2024 is undertaking a BSE food safety risk assessment of Canada in line with FSANZ's published assessment guidelines. Beef and beef products sourced from bovines imported from Canada cannot be imported into Australia from the United States until a FSANZ BSE food safety risk assessment is completed, with a favourable outcome, this addendum is finalised, and health certification is agreed.

The USDA has published import protocols for bovines from Canada and Mexico. The United States has imported an average of 706,806 bovines from Canada each year between 2019 and 2023, mostly for immediate slaughter, with smaller numbers of feeders and breeders. For the same period (2019-2023) the United States has imported an average of 1,222,868 bovines from Mexico each year, mostly as feeder cattle, with smaller numbers of bovines imported as breeders. The United States

Department of Agriculture has advised that there are currently no imports of cattle from Mexico for immediate slaughter, and no establishments approved to slaughter these cattle.

Cattle may be imported from Mexico for immediate slaughter (noting that this pathway is not currently active) from any state or region, irrespective of the bovine tuberculosis (bovine TB) prevalence. As Australia had concerns of an increased biosecurity risk for bovine TB originating from beef and/or beef products sourced from cattle imported from Mexico under the immediate slaughter protocol, a risk assessment was undertaken for this hazard. This risk assessment considered the likelihood of entry, establishment and/or spread and the likely consequences of bovine TB in Australia from this pathway. It concluded that the overall risk for bovine TB was **very low** and therefore achieves Australia's ALOP with respect to animal biosecurity risks. This finding was based, in part, on the anticipated volume of trade and the current absence of the immediate slaughter pathway from Mexico. If trade commences, Australia will continue to monitor the volume of trade and other parameters; should the underlying assumptions in either the beef review or this addendum change, Australia may undertake further risk analysis.

This addendum's findings support expanding the scope of the beef review to permit entry of fresh beef and beef products from bovines legally imported from Canada and Mexico into the United States. The current USDA protocols for the import of bovines from Canada and Mexico apply rigorous control measures which will address Australia's biosecurity concerns with beef sourced from bovines born and raised in Canada and Mexico and legally imported into the United States. It is therefore recommended that the requirements of the beef review be amended to allow the importation of fresh beef and beef products from the United States derived from:

- immediate slaughter, feeder and breeder bovines born and raised in Mexico and legally imported into the United States, subject to all other relevant requirements of the beef review, including having passed ante- and post-mortem veterinary inspection under official veterinary supervision; and
- immediate slaughter, feeder and breeder bovines born and raised in Canada and legally imported into the United States, subject to all other relevant requirements of the beef review, including having passed ante- and postmortem veterinary inspection under official veterinary supervision if Canada receives a favourable FSANZ BSE food safety risk assessment.

1. Introduction

A review of biosecurity import conditions for the importation of fresh (chilled or frozen) beef and beef products from Japan, the Netherlands, New Zealand, the United States and Vanuatu was published in August 2017, and will be referred to in this addendum as [the beef review](#). These countries are referred to in this document to as applicant countries. This determined imports of fresh beef and beef products could meet Australia's appropriate level of protection (ALOP) from biosecurity risk with appropriate controls. Australia's ALOP is defined in the [Biosecurity Act 2015](#) as 'a high level of sanitary and phytosanitary protection aimed at reducing biosecurity risks to a very low level, but not to zero'.

Following publication of the beef review in 2017, the Australian Government Department of Agriculture, Fisheries and Forestry (the department) conducted an in-country verification visit of the United States from 19 July to 6 August 2019. The beef review and the in-country verification required that the meat be sourced from bovines that have been continuously resident in the applicant country (in this case the United States) since birth.

The in-country verification visit included a border visit to the United States-Canada border. The purpose of that site visit was to review the ability of the USDA to effectively ensure the identity of cattle entering into the United States rather than their health status and treatments prior to entry. United States-Mexican cattle entry procedures were not verified nor seen by Australian officials during that visit, as it was not necessary to verify further official controls over imported cattle given the scope of the assessment.

The 2019 verification visit recommended that the export of fresh (chilled and frozen) beef and beef products from the United States to Australia be permitted subject to the finalisation of bilateral health certificate negotiations and full compliance with import conditions.

By January 2020, the United States had successfully completed Australia's assessment process for access to the Australian market for fresh beef and beef products to the point where Australia was seeking the United States agreement on a veterinary health certificate. Agreement on a bilateral veterinary certificate would enable the trade for fresh beef and beef products from cattle that had been continuously resident in the United States since birth.

As USDA subsequently clarified its original request for access was to include beef sourced from bovines born and raised in Mexico and Canada that were legally imported into the United States, the relevant import conditions and associated export health certificates were not finalised, and this addendum to the beef review was initiated.

In December 2023, following an application from the Government of Canada, the department released a draft addendum to the beef review that considered the biosecurity risk associated with the importation of fresh beef and beef products for human consumption from Canada into Australia for public consultation. That report is referred to as the draft Canadian beef addendum. Publication is expected in mid-2024. After it is finalised, Canada may become an approved country for export of fresh beef and beef products once it has been fully assessed for the importation of fresh beef and beef products into Australia. This includes receiving a favourable BSE categorisation by Food

Standards Australia and New Zealand (FSANZ) (see [Section 1.3.1](#)), as well as a successful evaluation of the competent authority and its ability to meet import requirements. Health certification would also need to be negotiated and agreed before direct trade could commence. No application for direct market access for fresh beef or beef products has been received from the Government of Mexico.

1.1. Imports of bovines from Canada into the United States

Between 2019 and 2023, the United States imported an average of 706,806 bovines per year from Canada under the USDA protocol, Import of Live Cattle or Bison from Canada to the United States (USDA 2024a), most of which are for immediate slaughter. For example, in 2023, 74% of bovines imported from Canada were for immediate slaughter, 24.% were feeders and 2% were breeders ([Table 1](#)) (USDA 2024b).

By way of comparison, for the (United States) fiscal years 2018-2022, an average of 33.4 million cattle (domestic and imported) were slaughtered each year (Statista n.d). As indicated above, the average number of cattle imported from Canada each year for fiscal years 2019-2023 was 706,806. This represents approximately 2.12% of the number of cattle slaughtered annually in the United States.

Table 1 Number of bovines imported from Canada into the United States

Category	2019 ^a	2020 ^a	2021 ^a	2022 ^a	2023 ^a
Immediate slaughter	520,757	528,419	484,467	538,401	540,470
Feeder	191,800	134,029	152,499	205,529	179,260
Breeder	10,251	10,581	9,811	13,456	14,302
Total	722,808	673,029	646,777	757,386	734,032

^a Fiscal year 1 October to 30 September

Source: USDA APHIS

The import of bovines into the United States is regulated by [9 CFR 93.424-427](#). The import of bovines from Canada is also regulated by the Protocol for the Importation of Cattle or Bison from Canada to the United States (USDA 2024a). The requirements of the USDA protocol for bovines imported from Canada for immediate slaughter are similar to those for other-than-immediate slaughter bovines; except for requirements for bovine TB, brucellosis, permanent branding, and moving from the port of entry to an approved immediate slaughter facility. NOTE: “*other-than-immediate slaughter*” is the term used for other bovines in the Protocol for the Importation of Cattle or Bison from Canada to the United States. There are no brucellosis or bovine TB restrictions on bovines for immediate slaughter whereas the protocol for other-than-immediate slaughter requires the animals to be from a brucellosis-free province, territory, or herd, and from a bovine TB Accredited Free (AF) or Modified Accredited Advanced (MAA) province.

As mentioned in [Section 5.4](#), the United States is moving to a new system to classify the bovine TB status of foreign regions, and in December 2021, USDA Animal and Plant Health Inspection Service (APHIS) classified Canada as Level I for both bovine TB and brucellosis (CFIA 2024). Immediate slaughter bovines from Canada now have the same favourable status as feeder and breeder bovines

for both bovine TB and brucellosis. The requirements of protocols for immediate slaughter, feeder and breeder bovines from Canada are described in [Section 1.1.1](#).

1.1.1. Animal health conditions for import of bovines into the United States from Canada

The USDA and the Canadian Food Inspection Agency (CFIA) have a long standing and continuous relationship which has allowed harmonisation of import-export regulatory requirements for bovines. The health requirements for the export of bovines to the United States (USDA 2018) are as follows:

- Sanitary Requirements for Export of Previously Imported Bob-Calves Re-Exported from Canada to the USA for Immediate Slaughter HA 2610 (September 20, 2010)
 - The bob (*Bos taurus*, male) calves must be born in Canada or in the United States and legally imported into Canada not more than 36 weeks previously.
 - The bob calves originating from the United States and destined for re-export to the United States for immediate slaughter remain under import quarantine for the duration of their stay in Canada.
- Sanitary Requirements for Export of Cattle or Bison for Immediate Slaughter from Canada to the United States of America HA 2183 (Amended 2017-09-28)
 - The animals were born in the United States or Canada or were legally imported into Canada from a region recognized by the United States Department of Agriculture (USDA) as a region not restricted due to BSE and have been under no movement restrictions within Canada or the United States for at least 60 days prior to importation into the United States.
 - The animals were inspected and found to be free from any evidence of communicable disease and that, as far as can be determined, they have not been exposed to any such disease during the preceding 60 days.
 - Canada is free of foot-and-mouth disease, rinderpest, surra, and contagious bovine pleuropneumonia.
 - The animals were born on or after March 1, 1999, which is the date determined by APHIS to be the effective enforcement of a ruminant-to-ruminant feed ban.
 - The animals are not in quarantine in Canada.
 - The animals have been individually identified with an official Canadian ear-tag, applied prior to each animal's entry into the United States.
 - Based upon information provided by the exporter, the animals will be transported by truck from the point of entry in the U.S., along the following route_____
- Sanitary Requirements for Export of Cattle or Bison from Canada to the United States of America HA1941 (Amended 2021-07-06).
 - The cattle (but not bison) must be permanently and humanely identified with a distinct and legible "CAN" mark (brand).
 - Bison without a permanent mark (brand) must be identified with a secondary dangle tag bearing the same official number.
 - The animals must be from a brucellosis-free province or territory or from a brucellosis free herd.

- The animals must have continuously resided in a bovine tuberculosis (*Mycobacterium bovis*) free province or territory or region in Canada, or their United States equivalent for example, an AF or MAA state or from a tuberculosis free herd.

All animals must be individually identified with an official Canadian ear tag or, if originally imported from the United States, an official United States ear tag prior entry into the United States. All bovines must be inspected by CFIA and certified to be free from any evidence of communicable disease and that, as far as can be determined, they have not been exposed to any such disease during the preceding 60 days. Certification is also required that Canada is free of foot-and-mouth disease, rinderpest, surra, and contagious bovine pleuropneumonia in accordance with the relevant United States CFRs.

Bovines are imported into the United States from Canada in accordance with [9 CFR](#) 93.424-429, some sections of [9 CFR](#) 94, and the 2007, updated 2018 requirements specified in the Protocol for the importation of cattle or bison from Canada to the United States (USDA 2018). The requirements for immediate slaughter and other-than-immediate slaughter are similar, except for requirements for bovine TB testing, identification, and moving from the port of entry to the slaughter establishment. All imported bovines must have individual identification. Feeder and breeder animals must also have a permanent tattoo and/ or CAN brand. A health certificate is required. All shipments are inspected at the port of entry into the United States.

In December 2021, the USDA APHIS classified Canada as Level I, the highest classification in the United States' system, for both bovine TB and brucellosis based on APHIS evaluations for both diseases (USDA 2021). The [9 CFR](#) 93.437 defines a level I region for bovine TB as having a program that meets APHIS requirements for bovine TB in accordance with § 93.438, and a prevalence of bovine TB in their domestic bovine herds of less than 0.001% over at least the previous 2 years (24 consecutive months).

Animal health conditions for immediate slaughter bovines from Canada

Sealed loads of bovines for immediate slaughter are checked at the port of entry and unsealed by approved staff at the destination. Animals are inspected and their identification is verified prior to processing. Any discrepancies are reported to APHIS veterinary services for investigation and possible rejection of the animals if their import status cannot be verified. All product from unverified animals must be destroyed. Facilities must apply for approval and permit for operation before acceptance into the immediate slaughter program. Approved immediate slaughter facilities are inspected by USDA and permits renewed twice yearly.

Animal health conditions for feeder and breeder bovines from Canada

Exporters provide electronic identification codes and copies of valid health certificates in advance of the import. The port veterinarian verifies 10-20% of the radio frequency identification (RFID) tags and "CAN" brands and performs a visual health assessment.

Feeder and breeder bovines must be certified that they are from a brucellosis-free province or territory or from a brucellosis-free herd, and that they have continuously resided in a bovine TB AF or MAA province or United State. Pre-entry tuberculosis tests are not required for bovines that are certified by CFIA as continuously residing in a bovine TB free province (USDA 2018). Complete requirements are available at [Protocol for the importation of cattle or bison from Canada to the United States](#).

1.2. Imports of bovines from Mexico into the United States

Between 2019-2023, the United States imported on average 1,222,868 head of bovines from Mexico each year. In 2023 there were 1,149,840 steers and spayed heifers imported as feeder cattle under the United States protocol for the import of steers and spayed heifers cattle and bison (feeders) from Mexico; and 1,850 breeder cattle were imported under the Protocol for the import of sexually intact (breeder) bovines from Mexico into the United States (USDA 2022a, 2022b). USDA has advised that no Mexican cattle have been imported into the United States for immediate slaughter, and that currently there are no United States establishments approved for the immediate slaughter of cattle imported from Mexico.

As mentioned in section 1.1, an average of 33.4 million cattle (domestic and imported) were slaughtered each year in the United States for years 2018-2022. And as indicated above, the average number of cattle imported from Mexico (for all purposes) each year for fiscal years 2019-2023 was 1,222,868. This represents approximately 3.7% of the number of cattle slaughtered annually in the United States.

Steers and spayed heifers represent approximately 99% of the bovines imported into the United States from Mexico each year ([Table 2](#)) (Mackenzie & Lopez 2019). They are imported as feeder under the United States protocol for the import of steers and spayed heifers cattle and bison (feeders) from Mexico (USDA 2022a, 2022b, 2024b). The feeder and breeder bovines undergo rigorous quarantine procedures prior to and on entry into the United States. On release they become part of the United States' national herd without further restrictions, except those that may be applied by the commercial entities importing the animals. Although there is no current trade, bovines imported for immediate slaughter go direct from border entry to approved United States' abattoirs in sealed trucks where they must remain segregated from non-imported bovines and be slaughtered within 14 days. Bovines imported for immediate slaughter are not incorporated into the United States' national herd. The requirements of protocols for immediate slaughter, feeder and breeder bovines from Mexico, as well as Mexican requirements for bovine TB testing prior to export, are described in Section 5.4.4.

Table 2 Number of bovines imported from Mexico into the United States

Category	2019 ^a	2020 ^a	2021 ^a	2022 ^a	2023 ^a
Steers	1,026,361	1,114,452	897,886	719,940	872,960
Spayed heifers	314,423	345,815	319,081	166,941	276,880
Roping steers	12,947	10,427	11,150	10,785	11,835
Breeding	240	88	198	82	1,850
Direct slaughter	0	0	0	0	0
Total	1,353,971	1,470,782	1,228,315	897,748	1,163,525

^a Fiscal year 1 October to 30 September

Source: USDA APHIS

1.2.1. Animal health conditions for import of bovines into the United States from Mexico

Mexico's Individual Identification System of livestock (Sistema Nacional de Identificación Individual de Ganado (SINIIGA)) is moving towards the use of RFID tags to identify the entire national herd. This system assigns a unique, permanent number for each animal which will remain with the animal throughout its entire life. A dynamic database will follow the animal from birth to its final destination and disposition (Mackenzie & Lopez 2019). Pending USDA approval of Mexico's RFID ear tag system, the USDA currently relies on individual animal identification using the uniquely numbered blue metal tags.

Prior to 2009, Mexico imported cattle from the United States, Canada, Australia, New Zealand and Central America (SENASICA 2019). In 2019, Mexico signed an MOU with Guatemala which could facilitate a bilateral trade in cattle (Martínez et al. 2021). In recent years, imports of cattle have occurred from a number of countries including United States, Guatemala, Belize, Canada and Nicaragua for the purpose of breeding and slaughter. United States [9 CFR](#) 93.436 underpins controls to ensure that bovines are not imported into the United States from undetermined BSE risk countries as defined by [9 CFR](#) 92.1. Mexico's closest central American countries (Guatemala, Belize, El Salvador and Honduras) are not classified by USDA APHIS as having either negligible risk or controlled risk for BSE, have no WOA official BSE status and therefore would be considered undetermined BSE risk countries by the USDA. Similarly, FSANZ has not assessed these countries for BSE food safety risk. Bovines are imported into the United States from Mexico in accordance with [9 CFR](#) 93.424-429, some sections of [9 CFR](#) 94, and specific protocols for immediate slaughter, feeder and breeder animals (USDA 2023a); as well as country disease status with [9 CFR](#) Parts 92 and 94.

The following documents must be provided to USDA APHIS port personnel before bovines are presented for entry into the United States:

- Current health certificate
- United States Declaration of Importation of Animals (VS Form 17-29)
- Request for Inspection and Dipping (VS 17-32)
- Herd of origin certificate and annexes
- Spay Certificate (for spayed heifers).
- Bovine TB test charts with negative results.
- Certificate/attestation of tick treatment, 7-14 days prior to export (when applicable).
- Brucellosis test chart, with negative results (only required for breeding bovines).

The Mexican government also requires that all bovines be tested negative for bovine TB between 30 to 180 days for internal movement prior to export. Note this is outside of the United States' protocol requirements.

All imported bovines from Mexico are offloaded at the port of entry, inspected, and treated for ticks. As a general requirement for bovines imported from Mexico, the USDA requires Mexican spayed or castrated cattle to be branded with an "M" brand on the right hip. Mexican breeding cattle are branded with an "M" on the right shoulder or bear an ear tattoo in one ear, or another means of

permanent identification upon request; if deemed adequate by the Administrator to identify the animal in a distinct and legible way as imported from Mexico ([9 CFR 93.427](#)). Cattle imported for immediate slaughter are exempt from the branding.

USDA regulations require individual animal identification and traceability of all bovines imported from Mexico. These bovines have a unique numbered blue metal ear tag enabling individual animal trace back to the farm of origin of any Mexican bovines found with bovine TB or other diseases of concern to USDA. The blue metal ear tag is applied when bovines are tuberculosis tested for export to the United States. Only personnel approved by the Mexican Government can apply these ear tags. A reconciliation of SINIIGA tags (required by Mexico) and blue metal ear tags (required by APHIS) is conducted via the Annex to the Certificate of the Herd of Origin at the port of entry.

The *USDA Protocol for the Importation of Sexually Intact Bovines (breeders) from Mexico to the United States* requires that the imported bovines “were born in the U.S. or Mexico and have been in no other region OR were legally imported into Mexico from another county/region and have been unconditionally released and eligible to move freely within Mexico for at least 60 days after such release”.

Similarly, the *USDA Protocol for the Import of Steers and Spayed Heifers Cattle and Bison (feeders)* from Mexico requires that “the bovines were born in Mexico or the United States or were legally imported into Mexico. The animals have been under no movement restrictions within Mexico for at least 60 days prior to importation into the United States.”

Both protocols require that “the animals for export have been kept in the region of export during the last 60 days immediately preceding the date of the shipment to the US, and that during this time the region has been entirely free of foot-and-mouth disease, contagious pleuropneumonia, and surra.” (USDA 2023a).

The USDA protocol *Bovine Tuberculosis Testing Requirements for Cattle Imported to the United States from Mexico* has specific tuberculosis testing requirements for imports of feeder and breeder cattle. The United States does not independently undertake tuberculosis testing of cattle for immediate slaughter. Mexican official attestations and test records must be presented at entry and demonstrate that such testing has been negative for all animals in the consignment. As mentioned previously, Mexico requires a negative caudal fold tuberculin test between 180 and 30 days prior to export. These tuberculosis charts are required documentation for export to the United States to ensure cattle are test negative for tuberculosis. These bovine TB requirements are discussed in detail in Section 5.4. Once in the United States, such imports are subject to ante- and post-mortem inspection by USDA qualified meat inspectors at abattoirs under the control of the veterinary authority, enabling detection of bovine TB lesions during ante- and post-mortem inspection and appropriate disposition of affected carcasses.

All abattoirs approved for export participate in a federal slaughter establishment bovine TB surveillance program that is maintained collaboratively by USDA APHIS and FSIS. In the United States fiscal year 2023, approximately 121 federally inspected slaughter establishments submitted 5,601 granulomas for tuberculosis testing. Through these efforts, 4 bovine TB positive animals were detected. Tracebacks were conducted and test-and-remove protocols were implemented. Further

information including definitions of USDA bovine TB programs, classifications and surveillance is available on via the USDA website (USDA 2023b) and in [9 CFR-77](#).

Mexican bovines presented for entry to the United States that do not meet import requirements are refused entry and returned to Mexico. Bovines refused entry, will be accompanied by a VS Form 17-30R (Refusal of entry form). Depending on the reason for refusal, noting that USDA protocols list some of these reasons, without being exhaustive, APHIS could require these cattle are identified for national consumption in Mexico with a “CN” brand and escort the cattle back to Mexico. APHIS staff are present when the “CN” brand is applied. Mexican cattle that are “CN” branded, are permanently ineligible for export to the United States (Mackenzie & Lopez 2019).

Animal health conditions for feeder bovines from Mexico

Over 99% of all bovines imported into the United States from Mexico are desexed bovines imported as feeders under the United States protocol for the import of steers and spayed heifers cattle and bison (feeders) from Mexico (USDA 2022b, 2023a). The protocol requires residency in Mexico for at least 60 days prior to entry and individual animal identification with blue metal ear tags and a “M” brand on their right hip.

In addition to the negative bovine TB test required by Mexican authorities prior to export, the USDA protocol Bovine Tuberculosis Testing Requirements for Cattle Imported to the United States from Mexico has specific bovine TB testing requirements for feeder cattle based on ongoing USDA evaluations of the status and control of bovine TB in the state or zone of origin of the cattle. These bovine TB requirements are discussed in detail in Section 5.4.

Pre-export veterinary inspection and dipping for ectoparasites on entry is required. Brucella testing is not required for feeder bovines as they are desexed, as desexing eliminates the principal mode of transmission between animals through contact with aborted fetuses, reproductive fluid, semen and milk.

Feeder bovines are incorporated into the United States’ national herd and are typically held for 90 to 120 days for finishing prior to slaughter but can be held for between 80 to 300 days.

Animal health conditions for breeder bovines from Mexico

In 2020, only 88 breeder cattle were imported from Mexico and 1,401 in total between 2012 and November 2021 (USDA). Breeder bovines are imported under the United States *Protocol for the import of sexually intact (breeder) bovines from Mexico into the United States* (USDA 2022a). The identification, health and certification requirements for breeders are similar to those for feeder bovines with the following key differences.

They must be branded with an “M” on the right shoulder or bear an ear tattoo in an ear, or another means of permanent identification upon request if deemed adequate by the Administrator to identify the animal in a distinct and legible way as having been imported from Mexico ([9 CFR 93.427](#)). All bovines in the herd of origin (except calves under 6 months of age and steers) must be tested negative for brucellosis between 30 and 90 days prior to the export to the United States.

The USDA protocol Bovine Tuberculosis Testing Requirements for Cattle Imported to the United States from Mexico also has specific bovine TB testing requirements for breeder cattle. These requirements are detailed under the relevant bovine tuberculosis section below.

Breeder bovines are incorporated into the United States' national herd and are typically kept for several years prior to slaughter.

Animal health conditions for immediate slaughter bovines from Mexico

USDA has advised that there is currently no trade in immediate slaughter bovines from Mexico and there are currently no establishments approved to slaughter these animals. However, given the possibility of future trade, the animals biosecurity risks from fresh beef and beef products to Australia from this pathway has been considered in this addendum.

The USDA Protocol for the import of bovines from Mexico for immediate slaughter requires bovines prepared for import to be:

- resident in Mexico for at least 60 days
- identified individually with uniquely numbered blue metal ear tags
- treated with ectoparasiticide prior to export
- subject to veterinary inspection pre-export under authority by the Mexican competent authority, and
- dipped for ectoparasites on entry.

A tuberculosis test chart demonstrating a negative bovine TB test for each animal is required by Mexican authorities for movement prior to export. Bovines imported for immediate slaughter may only be shipped to approved abattoirs in the United States, then segregated and slaughtered within 14 days (USDA 2014a). Therefore, bovines imported for immediate slaughter remain segregated by load in holding pens and may not be allowed any contact with any cattle at the facility and must not be removed from the facility until slaughter and, unlike the situation for imported spayed heifers and steers for feeding and breeder animals, do not become part of the United States national herd. Once in the United States, such imports are subject to ante- and post-mortem inspection by USDA qualified meat inspectors under USDA controls at abattoirs under the control of the veterinary authority, enabling detection of bovine TB lesions during ante- and post-mortem inspection and appropriate disposition.

Additionally, all abattoirs approved for export, including any that may in future apply for approval to export meat derived from cattle imported from Mexico for direct slaughter, participate in a federal slaughter establishment tuberculosis surveillance program that is maintained collaboratively by USDA APHIS and FSIS. In United States fiscal year 2023, approximately 121 federally inspected slaughter establishments submitted 5,601 granulomas for tuberculosis testing. Through these efforts, four bovine TB positive animals were detected. Tracebacks were conducted and test-and-remove protocols were implemented. Further information including definitions of USDA bovine TB programs, classifications and surveillance is available on via the USDA website (USDA 2023b) and in [9 CFR-77](#). Further information including definitions of USDA bovine tuberculosis programs, classifications and surveillance is available on via the USDA website (USDA 2023b) and in [9 CFR-77](#).

1.3. Food safety considerations

To assist with [the beef review](#), FSANZ considered the food safety risks associated with the import of fresh beef and beef products. They developed risk advice (in the form of risk statements) for the

following foodborne hazards: shigatoxin-producing *E. coli* (STEC), *Salmonella* spp. (including DT104) and *Campylobacter* spp. FSANZ provided advice to the department that imports of fresh beef and beef products are considered to present a potentially medium to high public health risk for STEC and *Salmonella* spp. To manage this risk, exporting countries will need to demonstrate competent authority oversight of the beef exporting establishments, ensuring these facilities are operating through-chain Hazard Analysis Critical Control Point (HACCP) based food safety programs to control the risks associated with STEC and *Salmonella* spp. Consignments of beef being exported will need to be certified by the competent authority and at-border verification testing will be applied. Further information regarding testing and inspection at the Australian border can be found at Raw beef and beef products.

The USDA has been advised that currently there is no maximum residue limit for beta-agonists, except for ractopamine which gained FSANZ approval as a permitted residue in 2022. A maximum residue limit is the highest amount of an agricultural or veterinary chemical residue that is legally allowed in a food product sold in Australia whether it is produced domestically or imported.

1.3.1. FSANZ assessment of Canada's BSE status

The Australian Government's BSE food safety policy 2009 requires that all countries exporting or seeking to export beef or beef products to Australia have a BSE food safety risk assessment undertaken by Food Standards Australia New Zealand (FSANZ 2023). The FSANZ BSE food safety risk assessment includes a desk assessment and typically an in-country verification assessment. It examines the effectiveness of BSE-related controls throughout the beef production chain in the applicant country, including animal feeding practices, transportation, animal identification and traceability, slaughtering, and food safety and food recall systems. Countries categorised as either Category 1 or Category 2 are eligible to export beef and beef products to Australia subject to the relevant certification requirements. Category 1 status means there are comprehensive and well-established controls to prevent both the introduction and amplification of the BSE agent in a country's cattle population, and contamination of the human food supply with the BSE agent. Category 2 status means that countries have effectively implemented and complied with appropriate BSE controls to prevent both the introduction and amplification of the BSE agent in a country's cattle population, and contamination of the human food supply with the BSE agent (FSANZ 2023).

Canada's current BSE food safety risk is currently being assessed by FSANZ.

1.3.2. FSANZ assessment of Mexico's BSE status

Mexico was assessed by FSANZ as a BSE Category 1 country in 2014 (FSANZ 2014) which allows for heat-treated shelf-stable beef products to be imported subject to compliance with negotiated health conditions. However, Mexico has not been evaluated by the department for animal biosecurity risks, or food safety related matters (except for BSE), associated with fresh beef and beef products, and these products remain ineligible for direct export to Australia.

2. Purpose and scope

The purpose of this addendum is to assess whether the biosecurity risk of fresh beef and beef products exported to Australia from bovines born and raised in Mexico or Canada and legally imported into the United States is not greater than fresh beef and beef products derived from bovines born and raised in the United States.

This addendum evaluates USDA controls applicable to those legally imported animals which are integral to determining any additional animal biosecurity risk to Australia from this request to expand the scope.

This addendum is not a biosecurity assessment or competent authority assessment of Mexico or Canada, nor does it cover BSE risks, as this is undertaken through an assessment undertaken by FSANZ. The food safety risks of these pathogens were assessed in the beef review and are out of scope for this assessment.

3. Method

This draft addendum has been developed as a supplement to [the beef review](#) (DAWR 2017), and should be read in conjunction with the beef review. Unless otherwise stated, the definitions and methods used in this addendum are consistent with those of the beef review. The methods are also consistent with those in the Fresh (chilled or frozen) beef and beef products from Canada – draft addendum ([the draft Canadian beef addendum](#))

3.1. Hazard identification

Hazards were identified in the beef review using the hazard identification process described in the WOAHP Terrestrial Animal Health Code (the WOAHP Code) (Article 2.1.2). Hazard identification is a classification step undertaken to identify the pathogenic or disease agents which could potentially produce adverse consequences associated with the importation of beef and beef products (WOAHP 2023d).

In the hazard identification in the beef review, the department identified bovine diseases primarily affecting animal health and referred to the then Department of Health and FSANZ any additional disease agents that may primarily affect human health. The Director of Human Biosecurity can implement biosecurity measures to manage the risks to human life or health associated with the importation of beef and beef products.

In accordance with the WOAHP Code, a disease agent was considered a hazard potentially present in fresh beef and beef products if it was assessed to cause:

- a disease or infection of cattle (*Bos taurus* and *Bos indicus*) or buffalo (*Bubalus bubalis*) or domesticated American bison (*Bison bison*) and
- a WOAHP-listed disease, an emerging disease, or a disease or infection capable of producing adverse animal biosecurity consequences in Australia.

3.1.1. Identification of additional hazards relevant for Canada or Mexico

The hazard identification for the beef review considered all WOAHP-listed diseases and disease agents of bovines, as well as any emerging bovine diseases, or those with adverse consequences to Australia present in the applicant countries (Japan, the Netherlands, New Zealand, the United States and Vanuatu).

A disease in the hazard list was not considered further in the beef review if it was exotic to the applicant countries. In undertaking this additional review of fresh beef and beef products in relation to bovines born and raised in Canada and Mexico and legally imported into the United States, it was necessary to identify bovine disease agents:

- present in Canada or Mexico that were not considered in the hazard identification of the beef review
- present in Canada or Mexico that are exotic to the United States
- identified in the beef review that are present in Canada or Mexico

- identified in the beef review that are not present in Canada or Mexico

3.2. Risk assessment

Disease agents retained following the hazard identification stage were subjected to scientific review to determine whether the likelihood of entry from fresh beef or beef products derived from cattle born and raised in Canada or Mexico, legally imported and slaughtered in the United States are equivalent to those from cattle born and raised in other applicant countries, including the United States.

Risk assessment is the evaluation of the likelihood and the biological and economic consequences of entry, establishment and spread of a hazard within the territory of an importing country. As described in Chapter 2.1 of the WOA Code, it consists of an entry assessment, exposure assessment, consequence assessment and risk estimation for each hazard.

The unrestricted risk estimate is defined as the level of risk that would be present if there were no safeguards in excess of standard practices. The department adopted the following standards as the benchmark for assessment of the unrestricted risk estimate (relevant Australian standards):

- AS 4696:2023 Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption (Standards Australia 2023).
- Bovine spongiform encephalopathy (BSE): requirements for the importation of beef and beef products for human consumption – effective 1 March 2010 (FSANZ 2010).
- [Imported Food Control Act 1992](#) which requires imported food to comply with the Food Standards Code and not pose a risk to human health.

3.2.1. Risk assessment framework

For each disease agent identified as requiring risk assessment, the evaluation of risk associated with the importation of fresh beef and beef products includes:

- the likelihood of the disease agent entering Australia via imported beef and beef products (entry assessment)
- the likelihood of susceptible animals being exposed to and infected with the disease agent via imported beef and beef products (exposure assessment)
- the likelihood of significant outbreaks occurring due to exposure (part of the consequence assessment)
- the potential impacts of any significant outbreaks (part of the consequence assessment).

For the purposes of the beef review and this addendum, the likelihood of entry, establishment and spread and consequence (impact) for each disease agent are considered equivalent to the terms referenced in the [Biosecurity Act 2015](#).

3.2.2. Entry assessment

Entry assessment describes the biological pathways necessary for importation to introduce disease agents into the importing country and estimating the probability of that process occurring. It considers biological factors of the pathogen and the species of origin; country factors including

prevalence of infection and animal health systems in the country of export; and commodity factors such as the quantity to be imported, testing, treatment and/or processing.

The minimum requirement for the entry assessment was equivalency with the relevant Australian standards (the Australian Meat Standard, the Australian BSE food safety requirements and the Imported Food Control Act 1992) for sourcing of domesticated bison, buffalo or cattle, the production of beef and beef products for human consumption and their storage and transportation (DAWR 2017; FSANZ 2023).

This addendum considered any potential increase in the likelihood of entry of each disease agent associated with imports of fresh beef and beef products from the United States derived from bovines born and raised in Canada or Mexico, legally imported and slaughtered in the United States, compared with the likelihood of entry associated with fresh beef and beef products derived from bovines born and raised in the United States.

Where this likelihood of entry was considered equivalent, or lower, a conclusion was made that the overall risk was consistent with the findings of the beef review. This is because the likelihood of establishment and spread and the consequences of each disease agent would not be affected by the source of the animals.

3.2.3. Exposure assessment

The likelihood of entry of bovine tuberculosis (bovine TB) associated with bovines imported from Mexico for immediate slaughter in the United States was not considered equivalent to that of cattle born and raised in the United States. Therefore, an exposure and consequence assessment was conducted for this disease agent and pathway. Exposure assessment was not required for other disease agents identified in the hazard identification.

A description of the approaches used for exposure assessment can be found in Section 3.2 of [the beef review](#).

3.2.4. Estimation of the likelihood of entry and exposure

The likelihood of entry and exposure was estimated by combining the likelihood of entry and the corresponding likelihood of exposure using the matrix shown in Figure 1.

3.2.5. Consequence assessment

In accordance with the risk assessment process described above, a consequence assessment was only required for bovine TB associated with bovines imported from Mexico for immediate slaughter in the United States.

The consequence assessment describes the relationship between exposures to the identified hazard and the consequences of those exposures. It assesses the likelihood of establishment and/or spread of the hazard and the potential impacts/effects of the disease (that is, the outbreak scenario).

A description of the approaches used for consequence assessment can be found in Section 3.4 of [the beef review](#).

Figure 1 Matrix for combining qualitative likelihoods

Likelihood of entry	<i>High</i>	Negligible	Extremely low	Very low	Low	Moderate	High
	<i>Moderate</i>	Negligible	Extremely low	Very low	Low	Low	Moderate
	<i>Low</i>	Negligible	Extremely low	Very low	Very low	Low	Low
	<i>Very low</i>	Negligible	Extremely low	Extremely low	Very low	Very low	Very low
	<i>Extremely low</i>	Negligible	Negligible	Extremely low	Extremely low	Extremely low	Extremely low
	<i>Negligible</i>	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
		<i>Negligible</i>	<i>Extremely low</i>	<i>Very low</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>
Likelihood of exposure							

3.2.6. Risk estimation

The overall likelihood of entry and exposure was combined with the likely consequences using Figure 2 to produce the risk estimate in imported bovine skeletal muscle meat.

Figure 2 Risk estimation matrix

Likelihood of entry and exposure	<i>High</i>	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
	<i>Moderate</i>	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
	<i>Low</i>	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk	High risk
	<i>Very low</i>	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk
	<i>Extremely low</i>	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk
	<i>Negligible</i>	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk
		<i>Negligible</i>	<i>Very low</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Extreme</i>
Likely consequences of establishment and/or spread							

4. Hazard identification

4.1. Disease agents present in Canada or Mexico but not considered in the beef review

The hazard identification of [the beef review](#) considered all WOAHA-listed diseases of bovines, as well as any emerging bovine diseases, or those with adverse consequences to Australia. Diseases currently known to affect bovines in Canada and Mexico were reviewed, including ProMED posts since 2010. No relevant bovine diseases were identified that were not considered in the beef review. The possibility of parasites, transmissible via beef, present in Canada and Mexico was also explored. No intermediate stages of parasites (e.g. cysts in muscle) were identified as of biosecurity concern that were not previously considered in the beef review (ISID 2024; Martínez et al. 2021; Rodríguez-Vivas et al. 2017).

4.2. Disease agents present in Canada or Mexico that are exotic to the United States

The beef review concluded that *Brucella melitensis* is not present in the United States and Australia's animal biosecurity measures would include certification of country freedom from brucellosis caused by *B. melitensis*. Canada has never reported a case of *B. melitensis*; however, the WOAHA World Animal Health Information System (WAHIS) lists *B. melitensis* as present in limited zones in domestic animals in Mexico.

B. melitensis was therefore retained for further assessment. Consistent with the WOAHA Code and the beef review, this has been considered together with the risks of other causes of brucellosis (*B. abortus* and *B. suis*) (see [Section 5.3](#)).

No additional bovine disease agents were found that are present in Canada or Mexico that are exotic to the United States.

4.3. Disease agents identified in the beef review that are present in Canada or Mexico

Hazards in the beef review that are also present in Canada or Mexico include:

- anthrax
- Aujeszky's disease (pseudorabies)
- brucellosis (*B. abortus*, *B. suis*)
- bovine tuberculosis (bovine TB) (*Mycobacterium bovis* and *M. caprae*)
- bovine viral diarrhoea
- bovine cysticercosis (*Cysticercus bovis*)
- echinococcosis
- paratuberculosis (*Mycobacterium avium* subsp. *paratuberculosis*)

- Salmonella enterica serotype Typhimurium DT104
- vesicular stomatitis.

These diseases were retained for further assessment.

4.4. Disease agents identified in the beef review that are not present in Canada or Mexico

Considering officially reported animal health status of Canada and Mexico, the following diseases were therefore not required to be assessed further in this addendum:

- contagious bovine pleuropneumonia
- Crimean-Congo haemorrhagic fever
- foot-and-mouth disease
- haemorrhagic septicaemia
- lumpy skin disease
- surra
- Rift valley fever
- theileriosis
- Trypanosomiasis
- Wesselsbron disease.

5. Risk assessment

5.1. Anthrax

Technical information on anthrax can be found in Section 4.1 of [the beef review](#).

The beef review found that anthrax occurs sporadically in the United States and is subject to surveillance and official control programs in both countries. The most recent available WAHIS report on the status of anthrax in Mexico from July to December 2021 indicates that infection was absent in the country over that period. The last reported outbreak in 2010 (WOAH 2024). A 2019 study was unable to detect any evidence of anthrax in western Mexico (Valle-Reyes et al. 2019). The most recently accessible WAHIS report for Canada (July to December 2023) lists anthrax as suspected in limited zones, with the last reported outbreak in 2014 (WOAH 2024). The incidence of anthrax in Canada and Mexico is comparable to that of the United States.

5.1.1. Conclusion

The likelihood of entry of *Bacillus anthracis* in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the findings of the beef review, and the Canadian beef addendum, the animal biosecurity risk of anthrax is therefore considered **negligible** and achieves Australia's ALOP.

Additional risk management for anthrax is therefore not required for the importation of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States.

5.2. Aujeszky's disease (pseudorabies)

Technical information on Aujeszky's disease can be found in Section 4.2 of [the beef review](#).

This disease is caused by Suid herpesvirus 1 (SHV-1). It is primarily a disease of pigs but can infect cattle and other species. According to the beef review, Aujeszky's disease occurs in the United States but is limited to feral and/or non-commercial production swine in the United States. WAHIS indicates that Aujeszky's disease has never been reported in Canada. WAHIS contains records of outbreaks of Aujeszky's disease in Mexico in 2015 and more recently in three states in 2019. A stamping out campaign appears to have eliminated the disease with no further cases reported since December 2019 although Mexico has not yet claimed freedom (WOAH 2024). Although Mexico has not claimed freedom from Aujeszky's disease, the beef review concluded that risk management in relation to Aujeszky's disease (SHV-1) is not applicable to imports of beef and beef products from the applicant countries, including countries where SHV-1 is present.

The WOAH Code does not recommend any risk management measures for SHV-1 for international trade in meat and meat products. The beef review concluded that the risk of SHV-1 associated with importation of beef and beef products from the applicant countries is considered negligible and achieves Australia's Appropriate Level of Protection.

5.2.1. Conclusion

The likelihood of entry of SHV-1 in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the findings of the beef review, and the Canadian beef addendum, the animal biosecurity risk of Aujeszky's disease is therefore considered **negligible** and achieves Australia's ALOP.

Additional risk management for Aujeszky's disease is therefore not required for the importation of fresh beef and beef products bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States.

5.3. Brucellosis (*B. abortus*, *B. melitensis* and *B. suis*)

Brucellosis, an infectious disease characterised by abortion, infertility, decreased milk production and/or lameness, is caused by bacteria of the *Brucella* genus. The genus consists of small, gram-negative, aerobic, intracellular-reproducing coccobacilli and comprises a group of closely related bacteria (Cem Gul & Erdem 2015). Its classification into species is based mainly on the difference in host preference and pathogenicity. Three of six species that infect terrestrial animals can infect cattle, bison and/or buffalo; these are *Brucella abortus*, *B. melitensis* and *B. suis*. *B. abortus* preferentially infects cattle, *B. melitensis* goats and sheep and *B. suis* pigs (Adams 2002).

Bovine brucellosis caused by *B. abortus*, caprine and ovine brucellosis caused by *B. melitensis* and porcine brucellosis caused by *B. suis* are OIE-listed diseases (WOAH 2023a). They generally occur worldwide, although control and eradication, especially of *B. abortus*, has been achieved in several countries. There is less progress with control and eradication of *B. melitensis* and *B. suis*, though several countries are free from disease and have no history of infection (WOAH 2024).

The three forms of brucellosis are nationally notifiable in Australia (DAFF 2019). Australia has been free of bovine brucellosis, caused by *B. abortus*, since 1989. This was a result of a national eradication campaign (BTEC – the Brucellosis and Tuberculosis Eradication Campaign), which began in 1970. Australia is also free from brucellosis caused by *B. melitensis* (never reported) but not *B. suis*, which is endemic in feral pigs in Queensland and found in the feral pig population of northern NSW (NSW DPI 2023) and in South Australia (PIRSA 2024). Spillover of *B. suis* to domestic pigs (Seddon & Albiston 1965), cattle (Cook & Noble 1984) and horses (Cook & Kingston 1988) has occurred. Vaccination, often an effective and practical method of controlling *B. abortus* in cattle, is not permitted in Australia.

Brucellosis is a zoonotic disease of worldwide public health concern. It is a multisystem disease characterised by undulant fever, arthralgia and fatigue in over 75 per cent of cases (Cem Gul & Erdem 2015). Dairy products, especially those from unpasteurised milk, are a common source of human cases (Mailles et al. 2012). Occupational exposure among livestock handlers (Godfroid et al. 2005; Seleem, Boyle & Sriranganathan 2010) and zoonotic transmission of *B. suis* through recreational and occupational exposure to infected feral pigs in Australia has been reported (Irwin et al. 2010). *Brucella* spp. are most commonly isolated from the udder, the supramammary lymph nodes and the genitalia although it can also be isolated from samples throughout the carcass, particularly the lymph nodes (Sadler 1960). It is noted that reproductive organs and udders are

excluded under the scope of the beef review; and that there has been no report confirming brucellosis in animals because of exposure to meat and meat products.

Most cases of human brucellosis arise from drinking unpasteurised milk and milk products (Gwida et al. 2010) or from handling infected animals and animal parts such as placenta. However, brucellosis has been confirmed in people who had consumed improperly cooked meat and meat products, including liver (Chan, Baxter & Wenman 1989).

Technical information on brucellosis can be found in Section 4.3 of [the beef review](#).

5.3.1. Occurrence and control in the United States

B. abortus is present in the United States. Brucellosis is notifiable in the United States and there is an eradication and surveillance plan (USDA 2003). Abattoir surveillance has identified that bovine brucellosis affects less than 0.001% of all domestic program herds. *B. suis* is endemic in feral pigs in the United States with reported spill-over into some bovine herds occurring in Texas and the southeastern United States (Ewalt et al. 1997). *B. melitensis* has rarely occurred in the United States and was last reported to the WOA in 1999 (WOAH 2024). *B. melitensis* is listed on the United States National List of Reportable Animal Diseases (NLRAD) (USDA 2023c). The United States reports that *B. melitensis* is absent from the United States (last reported to WAHIS in January-June 2022 reporting period).

Brucellosis due to *B. abortus* has become a ‘geographic disease’ in the United States, maintained in wildlife reservoirs within the Greater Yellowstone Area (GYA).

The GYA includes parts of Idaho (ID), Montana (MT) and Wyoming (WY). Each of these states has an annual memorandum of understanding (MOU) with the USDA, which describes their brucellosis management plan. The MOUs help to ensure that infected or potentially exposed animals do not leave the Designated Surveillance Areas and enter the national herd. States that appropriately manage their brucellosis management plans (BMPs) maintain their free status. The USDA also requires that the states have their BMP reviewed every 3 years.

The USDA reports success with the collaborative program since it commenced in 1954. There have been no infected dairy herds in the United States since 1988 and no affected herds outside the GYA since 2011. All 50 states are considered to be free of *B. abortus* in accordance with the definition of freedom in the WOA code (WOAH 2023b).

Data is available indicating the number of brucellosis affected herds detected annually from United States fiscal year 2000 - 2023. A total of 216 herds were detected from 2000 to the present ranging from 1 to 14 affected herds per year.

Over the past 10 (United States) fiscal years there have been between 0 to 7 newly affected herds each year, all within the GYA states (MT, WY and ID). The USDA reports that it is not seeing significant numbers of infected herds in the GYA itself due to management controls and testing requirements that each of the three GYA states have in place for their Designated Surveillance Areas.

Brucellosis surveillance is carried out at National Surveillance Plants. In 2019 the number of National Slaughter Surveillance Plants was reduced from 13 plants to 4, concentrating on plants with large GYA state catchment. Of the 4 plants within the National Slaughter Surveillance Plan, 2 are outside of

the 3 GYA states, but are the plants that have the catchment for the desired surveillance stream. Focusing efforts on these 4 plants results in a more targeted surveillance than previously, while collecting a more representative sample for the program. Despite the reduction in the number of slaughter plants sampling, the surveillance target is met (and exceeded) which allows detection of the disease at a 1:100,000 prevalence with 95% confidence interval each (United States) fiscal year (exceeding WOAHA requirements).

USDA have collected 224,064 brucellosis slaughter surveillance samples in the first quarter of (United States) fiscal year 2024, therefore expecting to meet their National Surveillance Target of 350,000 per (United States) fiscal year. The current WOAHA standards to qualify for brucellosis disease-free status require that a country's rate of brucellosis infection does not exceed 0.2% of their cattle herds – USDA surveillance can detect brucellosis at a 0.001% prevalence level. 799,388 samples were collected in (United States) fiscal year 2023.

The beef review concluded that the likelihood of entry of *B. abortus* and *B. suis* with the importation of beef and beef products derived from bovines born and raised in the United States that passed ante- and post-mortem inspection was considered negligible, and therefore met Australia's ALOP. The beef review concluded that *B. melitensis* is not present in the United States and Australia's animal biosecurity measures would include certification of country freedom from brucellosis caused by *B. melitensis*.

5.3.2. Occurrence and control in Canada

Brucellosis (caused by *B. abortus*, *B. melitensis* and *B. suis*) is a reportable disease under the Health of Animals Act 1990 in Canada and all cases must be reported to the Canadian Food Inspection Agency. More information on reportable diseases in Canada can be found in Appendix A of the Canadian beef addendum (DAFF 2023).

Canada reports that *B. abortus* and *B. suis* are absent from domestic animals and *B. melitensis* is not present in Canada. *B. abortus* is suspected but not confirmed in wildlife and *B. suis* infection is present in wildlife limited zones (WOAHA 2023b). Sporadic cases of *B. suis* have been detected in wildlife including caribou and muskoxen in the far north of the country such as the Western Canadian Archipelago (Tomaselli et al. 2019). These areas are distant from cattle-production regions in Canada.

Canada initiated an eradication program for bovine brucellosis in livestock in the 1940s, and self-declared freedom from the disease in 1985. Isolated cases of bovine brucellosis in livestock were subsequently identified, and the last case was reported a Saskatchewan cattle herd in 1989.

Vaccination of cattle for brucellosis is not permitted in Canada. To be considered officially free of brucellosis under the criteria established by WOAHA, a country cannot practise vaccination for the disease (CFIA 2016).

Further information surveillance for brucellosis in wildlife and domestic animals in Canada can be found in Section 4.5 of the draft Canadian beef addendum. The draft Canadian beef addendum recommended that certification of country freedom is sufficient, reasonable and practical to address the risk of the importation of fresh beef and beef products from Canada for *B. melitensis*.

It concluded that the likelihood of entry of *B. abortus* or *B. suis* with the importation of beef and beef products from Canada and derived from domesticated bovines which passed ante and post mortem inspection, was considered negligible and achieves Australia's ALOP.

5.3.3. Occurrence and control in Mexico

Mexico has a national campaign against brucellosis (SAGAR Norma Oficial Mexicana NOM-041-ZOO-1995, 1996) (SENASICA 1996). Mexico reports in WAHIS that *B. suis* is absent from domestic and wild animal populations since 2015. USDA has recently recognised that the state of Sonora has a Level I status for brucellosis. However, *B. abortus* is present in domestic animals in other zones as per the most recent report to WAHIS (January-June 2023).

Recently (January-June 2023) available data from the WAHIS for Mexico lists *B. melitensis* as present in limited zones in domestic animals. Brucellosis control in Mexico is based on 1995 rules for the National Control of Brucellosis in Animals (SENASICA 1996). The SENASICA website reports the zoosanitary status of Mexico with respect to brucellosis, as of 2023, 77 municipalities (out of 2,475) are reported as free.

United States Brucellosis requirements for bovines imported from Mexico

The United States classifies regions of Mexico according to the assessed prevalence of *B. abortus*. The legislative basis for evaluating and classifying brucellosis statuses of foreign regions (including Mexico) is in [9 CFR 93.440](#). Regions must initially meet the USDA's program criteria to be classified and then the prevalence of brucellosis determines the final classification ([Table 3](#)).

Regionalization Evaluation Services (RES) evaluations to classify foreign regions for bovine TB (*M. bovis*) and brucellosis (*Brucella abortus*) in bovine animals follow the procedures and criteria outlined in title 9, Code of Federal Regulations, parts 93.438 and 93.441, respectively. Regions which APHIS has not evaluated for brucellosis are classified at the highest risk level for that disease (Level III). Regions seeking to export sexually intact cattle to the United States may wish to request an APHIS evaluation for brucellosis classification as Level I or II, which are associated with reduced import testing for that disease.

Regions seeking APHIS evaluation and classification brucellosis must define the region under consideration, specify the prevalence of the disease among bovine herds in the region, and demonstrate the following:

- 1) effective veterinary control and oversight within the region
- 2) brucellosis is a notifiable disease within the region
- 3) the region has a program for brucellosis that includes, at a minimum:
 - epidemiological investigations following the discovery of any animal or affected herd that has non-negative test results
 - management of affected herds in a manner designed to eradicate the disease from those herds and documentation regarding this management
 - regulatory controls on the movement of livestock into, within, and from the region that correspond to the risk of dissemination of the disease associated with such movement
 - access to, oversight of, and quality control of diagnostic testing for the disease.

Animal biosecurity risks of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States

- surveillance that is equivalent to or exceeds Federal standards for brucellosis surveillance within the United States; and
- if the region vaccinates for brucellosis, it is in a manner that has been approved by APHIS.

The RES processes for conducting brucellosis evaluations are further described in this document: APHIS Brucellosis Evaluation Procedures

Table 3 USDA Brucellosis classifications for foreign regions

State or zone classification	Prevalence in bovine herds
Level I	<0.001% over at least the previous 2 years
Level II	≥0.001% and <0.01% over at least the previous 2 years
Level III	≥0.01% or not evaluated

Source: USDA APHIS

The state of Sonora is the only region in Mexico recognised by the United States as Level I. All the other Mexican states are Level III. The United States also recognises the brucellosis status of individual herds. APHIS teams evaluating the Mexican control program examine data on laboratory sample submissions and results, quarantine herd lists, and case files to determine whether brucellosis program personnel follow the classification criteria.

The testing requirements for bovines imported from Mexico into the United States vary according to the status of the region, the herd of origin, and the classification of bovines ([Table 4](#)).

Table 4 Bovine brucellosis requirements by USDA brucellosis classifications for foreign regions

USDA region brucellosis classification	Steers / spayed heifers (feeders)	Sexually intact cattle (breeders)
Level I	no brucellosis testing required	no brucellosis testing required
Level II Accredited herd	no brucellosis testing required	no test but must have accredited herd certificate
Level II Non-accredited herd	no brucellosis testing required	whole herd test 30-90 days prior to export and individual test at port of entry
Level III Accredited herd	no brucellosis testing required	must have accredited herd certificate and individual test at port of entry
Level III Non-accredited herd	no brucellosis testing required	2 whole herd tests 9-15 months apart with second whole herd test conducted 30-90 days prior to export and individual test at the port of entry

Source: USDA APHIS

Feeder cattle imported into the United States must be castrated or spayed before importation to reduce the likelihood of introduction of brucellosis. There are no specific testing requirements for bovines imported from Mexico for direct slaughter; however as noted previously there is currently no trade occurring.

The Rose Bengal test is the initial screening test. If the screening test gives a positive result (and false positives are known to occur frequently) this is confirmed with either (or more commonly both) the rivanol test or the complement fixation test. If either of these confirmatory tests is positive, the animal is deemed to be positive.

To manage the risks of brucellosis (and bovine TB) the USDA requires that live bovines imported from Mexico into the United States require the following documentation:

- declaration of Importation (VS Form 17-29)
- official health certificate which must be issued by a veterinarian authorised by the Mexican Competent Authority (SADER) and endorsed by a veterinarian employed full-time by SADER
- certificate of the Herd of Origin (HOO)
- annex to the Certificate of the Herd of Origin which is a reconciliation of SINIIGA tags (required by Mexico) and the blue metal ear tags (required by APHIS)
- accredited TB- or brucellosis-free herd certificate (if required)
- TB and/or brucellosis test charts—
 - whole herd test chart (if required)
 - individual / lot test chart (if required).

5.3.4. Conclusion

The likelihood of entry of *B. abortus*, *B. melitensis* or *B. suis* in beef and beef products bovines born and raised in Canada and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the draft Canadian beef addendum, the animal biosecurity risk of brucellosis (*B. abortus*, *B. melitensis* or *B. suis*) is considered **negligible** and achieves Australia's ALOP.

The likelihood of entry of *B. abortus*, *B. melitensis* or *B. suis* in beef and beef products derived from bovines born and raised in Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). This has considered the information above including the official control program in Mexico, and the United States' import controls which include testing, castration/spaying of feeder cattle, documentation and identification checks for brucellosis for bovines from Mexico, as well as ante- and post-mortem inspections. Therefore, the animal biosecurity risk of brucellosis (*B. abortus*, *B. melitensis* or *B. suis*) is considered negligible and achieves Australia's ALOP.

Additional risk management for brucellosis (*B. abortus*, *B. melitensis* or *B. suis*) is therefore not required for the importation of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States.

5.4. Bovine tuberculosis (*Mycobacterium bovis* and *M. caprae*)

Bovine TB is primarily caused by *Mycobacterium bovis*. As detailed in the beef review, *M. caprae* has also been identified as a cause of bovine TB. *M. caprae* is isolated to continental Europe and has not been reported in Mexico or Canada. It has therefore been excluded from this analysis as a hazard.

The outcome of the beef review was that the likelihood of entry of bovine TB with imports of beef and beef products from the United States is considered not significant, in part due to “the existing low prevalence and surveillance or eradication controls in applicant countries reduce the likelihood of infected animals and animal product being presented for human consumption”. However, the beef review proposed that health certification would require that veterinary ante- and post-mortem inspection be undertaken because bovine TB is exotic to Australia.

Once in the United States, cattle imports for slaughter are subject to ante- and post-mortem inspection by USDA qualified meat inspectors at abattoirs under the control of the veterinary authority, enabling detection of bovine TB lesions during ante- and post-mortem inspection and appropriate disposition of affected carcasses.

Direct contact with infected animals is the main route of infection, while animal to human transmission of *M. bovis* via unpasteurised milk is of public health importance. The most common sites for lesions are lymph nodes associated with lungs and in the thoracic cavity; however, lesions can be found in most organs and lymph nodes of the body. Less frequently, granulomas can be found in the liver, hepatic lymph nodes and mesenteric lymph nodes.

For bovine TB, typical post-mortem inspection procedures require palpation and/or incision of lymph nodes and organs commonly affected with tuberculous lesions with the complete or partial condemnation of affected carcasses.

Oral transmission of bovine TB is possible via the consumption of mycobacteria in contaminated feed, tissues or milk, and the beef review noted there is epidemiological and experimental evidence of oral transmission of *M. bovis* in adult cattle. Transmission of bovine TB via carcase and carcase parts is due to the presence of tuberculous lesions; however, infectious tubercles rarely occur in meat tissue itself.

Further technical information on bovine TB can be found in Section 4.4 of [the beef review](#).

5.4.1. Occurrence and control in the United States

M. bovis is present in the United States and is a notifiable disease. Based on USDA data, the beef review reported that the national herd prevalence of bovine TB is currently less than 0.001%. States recognised as Accredited Free states have not recorded a case of bovine TB in the previous 5 years or have appropriate plans in place to prevent further spread from any identified cases. All abattoirs approved for export, including any that may in the future apply for approval to export meat derived from cattle imported from Mexico for direct slaughter, participate in a federal slaughter establishment TB surveillance program that is maintained collaboratively by USDA APHIS and FSIS. In United States fiscal year 2023, approximately 121 federally inspected slaughter establishments submitted 5,601 granulomas for TB testing. Through these efforts, four bovine TB positive animals were detected. Tracebacks were conducted and test-and-remove protocols were implemented. Further information including definitions of USDA bovine TB programs, classifications and surveillance is available on via the USDA website (USDA 2023b) and in [9 CFR-77](#).

APHIS’ cattle health surveillance system uses whole genome sequencing (WGS) of *M. bovis* bacterial DNA to assess relatedness among TB bacterial strains. WGS has shown that there is not a reservoir of *M. bovis* that continuously reinfects cattle herds nationwide each year. Previously seen isolates of

M. bovis are almost never found again in the United States. Bovine TB strains found in Mexican origin feeder bovines at slaughter are not later found in United States cattle (USDA APHIS pers comm February 2024).

5.4.2. United States classification system for foreign regions

USDA has a categorisation system ([Table 5](#)) for the tuberculosis status of foreign regions (Level I to Level V regions) that is described in [9 CFR](#) § 93.437, that considers the prevalence of bovine TB in domestic bovine herds.

Table 5 USDA bovine TB classifications for foreign regions

State or zone classification	Prevalence in bovine herds
Level I	<0.001% over at least the previous 2 years
Level II	≥0.001% and <0.01% over at least the previous 2 years
Level III	≥0.01% and <0.1% over the previous year
Level IV	≥0.1% and <0.5% over the previous year
Level V	≥0.5% or not evaluated

Source: USDA APHIS

5.4.3. Overview of bovine tuberculosis controls for the import of bovines from Canada

Canada reports bovine TB as present in limited zones in domestic animals and suspected in limited zones for wild animals. Bovine TB is a reportable disease in Canada and has been subject to a mandatory national eradication program since 1923. The CFIA considers all provinces to be bovine TB free. Based on the WOAHP Chapter 8.11 on bovine TB, where the prevalence of bovine TB has fallen to exceedingly low levels, the CFIA uses an abattoir surveillance system as a key control point to look for bovine TB in slaughtered animals. As of August 2023, livestock herds last confirmed with bovine TB were 4 cases in a single herd in British Columbia in November 2018; and 6 cases in a single herd in Alberta and Saskatchewan in September 2016; and a single case in Saskatchewan in September 2022 (CFIA 2023a; WOAHP 2024).

The relevant USDA live bovine import protocol requires other-than-immediate slaughter bovines to have continuously resided in a bovine TB free province or territory or region in Canada, or their United States equivalent, for example, tuberculosis AF or MAA state or from a tuberculosis free herd. However, there are no regional bovine TB restrictions on bovines imported for immediate slaughter into the United States, but the United States and Mexico have a negotiated protocol of restrictions in place to mitigate risk that includes animal identification and tuberculosis testing 180 to 30 days prior to export (CFIA 2023b). The USDA APHIS recently classified Canada as Level I for bovine TB based on APHIS evaluations (USDA 2021). This means that immediate slaughter bovines would have the equivalent favourable bovine TB status as feeders and breeders.

5.4.4. Overview of bovine tuberculosis controls for the import of bovines from Mexico

USDA publications and communications indicate that Mexican bovine TB controls and related official programs are closely monitored within the United States, with updates occurring on an as required basis. Mexican and United States have bilateral engagement on eradication of bovine TB and

brucellosis. A Binational Committee is established under the United States Animal Health Association to promote collaboration, coordination, and resolution of cattle health and trade issues at all levels, particularly related to bovine TB, brucellosis and cattle tick (USDA 2021).

Mexico's Bovine Tuberculosis National Program classifies geographic territories into either eradication zones (with a regional bovine TB prevalence of <0.5%) or control zones (with a regional bovine TB prevalence of >0.5%). Currently 86% of the country is recognised as an eradication zone, and eradication zones produce beef cattle predominantly. The control zones, where the prevalence is higher, contain primarily dairy cattle (Ortiz et al. 2021).

The USDA protocol Bovine Tuberculosis Testing Requirements for Cattle Imported to the United States from Mexico has specific tuberculosis testing requirements for imports of feeder and breeder cattle (USDA 2023d). The specific tuberculosis testing requirements are detailed in section 5.4.4.1 Bovine tuberculosis controls for the import of breeder bovines from Mexico and section 5.4.4.2 Bovine tuberculosis controls for the import of bovines from Mexico for immediate slaughter.

Separately to the USDA protocols, Mexico requires all bovines test negative for bovine TB between 30 to 180 days prior to export. Once in the United States, such imports are subject to ante- and post-mortem inspection by USDA qualified meat inspectors at abattoirs under the control of the veterinary authority, enabling detection of bovine TB lesions during ante- and post-mortem inspection and appropriate disposition of affected carcasses. If required, proof of TB accredited-free herd status must be provided to the port veterinarian.

As per [9 CFR 93.400](#) "Accredited herd for tuberculosis" is a herd that meets APHIS' standards for accreditation for bovine tuberculosis status. Standards for accreditation are specified in import protocols. More information regarding accredited herd can be found in the publication APHIS Evaluation Procedures for Bovine Tuberculosis (TB) Classification of Foreign Regions April 2020. Evaluation criteria for accreditation and reaccreditation of herds include:

- meeting APHIS standards for export purposes
- require inventory reconciliation at the time of reaccreditation testing
- restrict entry to animals from other accredited herds or with appropriate testing
- require all testing for (re-) accreditation to be conducted by an authorised veterinarian
- herds are accredited and reaccredited in accordance with APHIS standards for export
- regulatory officials responsible for oversight of herd files receive adequate instruction and training
- annual review of accredited herd files results in detection and correction of any deficiencies

All abattoirs approved for export in the United States, including any that may in the future apply for approval to export meat derived from bovines imported from Mexico for immediate slaughter, participate in a federal slaughter establishment tuberculosis surveillance program that is maintained collaboratively by USDA APHIS and FSIS. In United States fiscal year 2023, approximately 121 federally inspected slaughter establishments submitted 5,601 granulomas for TB testing. Through these efforts, 4 bovine TB positive animals were detected. Tracebacks were conducted and test-and-remove protocols were implemented. Further information including definitions of USDA

bovine TB programs, classifications and surveillance is available on via the USDA website (USDA 2023b) and in [9 CFR-77](#).

Bovine tuberculosis controls for the import of feeder bovines from Mexico

A summary of the testing requirements for bovine TB for feeder cattle can be found in [Table 6](#).

In addition to the negative bovine TB test required by Mexican authorities for all bovines prior to export, USDA specifically excludes the importation of feeder bovines from tuberculosis Level V states or zones (USDA 2023d).

No additional bovine TB testing is required for feeder bovines from the state of Sonora which is the only Mexican state recognised by the USDA as having a Level II bovine TB status.

Feeder bovines from accredited herds in states or zones with a Level III bovine TB status require no additional testing but require the accredited herd certificate to be presented with the consignment. Feeder bovines from non- accredited herds in states or zones with a Level III bovine TB status require a negative individual caudal fold tuberculin test within 60 days of export.

Feeder bovines from accredited herds from states or zones with a Level IV bovine TB status require the accredited herd certificate and a negative caudal fold tuberculin test within 60 days of export. Bovines from non-accredited herds in Level IV states or zones must come from a herd where there has been a negative whole-herd test within 1 year and a negative caudal fold tuberculin test within 60 days of export.

Bovine tuberculosis controls for the import of breeder bovines from Mexico

Feeder and breeder bovines imported from Mexican states with a higher prevalence of bovine TB are subjected to increasing level of testing as described in the Bovine Tuberculosis Testing Requirements for Cattle Imported to the United States from Mexico (Veterinary Services Bulletin 2022.1).

Breeder bovines from the state of Sonora, given its Level II status, must have one negative caudal fold tuberculin test within 60 days prior to export. Advice from USDA is that this is undertaken by an APHIS veterinarian (USDA APHIS, pers. comm. February 2024).

Breeder bovines from states or zones with a Level III status require one negative whole-herd TB test within 1 year of export and a negative individual test at the port of entry, if from a non-accredited herd. Breeders from an accredited herd require a negative individual test at port of entry.

Breeder bovines from states or zones with a Level IV status require a negative whole-herd test within 1 year of export and a negative individual test within 60 days of export, if from a non-accredited herd. Breeders from an accredited herd require the accredited herd certificate and negative individual test at port of entry.

The bovine TB protocol specifically excludes the importation of breeder bovines from tuberculosis Level V states or zones (USDA 2023d).

Bovine tuberculosis controls for the import of bovines from Mexico for immediate slaughter

Although there is no current trade, the immediate slaughter protocol allows for the importation of bovines from any region of Mexico, including level V regions. The Mexican Service for the National

Health for Food Safety and Food Quality (SENASICA) reports the prevalence in Mexico varies from 0% up to 11.29% (September 2022).

As mentioned earlier, Mexico requires cattle for export have been individually tested using caudal fold tuberculin testing methods once for bovine tuberculosis between 180 and 30 days prior to export, with negative results. The USDA's Protocol for the import of bovines from Mexico for immediate slaughter notes that bovine TB test charts documenting this testing must be presented with consignments of cattle imported for immediate slaughter (USDA 2014a). The caudal fold tuberculin test is conducted by veterinarians authorised by the Mexican competent authority or official veterinarians (from the Federal or State governments or from the U.S.—Mexico Committee for Tuberculosis, Brucellosis, and Cattle Fever Tick).

The Mexican government is in process of evaluating the caudal fold tuberculin test performance locally but currently uses the USDA APHIS caudal fold tuberculin test performance standards. The Mexican government posts list of veterinarians eligible to conduct export testing quarterly.

Table 6 Bovine TB requirements by USDA bovine TB classifications for foreign regions

USDA region bovine TB classification	Steers / spayed heifers (feeders)	Sexually intact cattle (breeders)
Level I	no TB testing required	no TB testing required
Level II	no TB testing required	negative individual test at port of entry (conducted by APHIS veterinarian)
Level III Accredited herd	no TB testing required but need accredited herd certificate	negative individual test at port of entry (conducted by APHIS veterinarian)
Level III Non-accredited herd	negative individual test within 60 days of export	negative whole-herd test within 1 year <u>and</u> negative individual test at port of entry (conducted by APHIS veterinarian)
Level IV Accredited herd	accredited herd certificate and negative individual test within 60 days of export	accredited herd certificate and negative individual test at port of entry (conducted by APHIS veterinarian)
Level IV Non-accredited herd	negative whole-herd test within 1 year and negative individual test within 60 days of export	2 x negative whole-herd tests 9-15 months apart <u>and</u> negative individual test at port of entry (conducted by APHIS veterinarian)
Level V Immediate slaughter	has not occurred Declaration of Importation (VS Form 17-29) Unique identification (APHIS blue metal ear tag / SINIIGA ear tag) Negative individual test for TB 180-30 days prior to export (SENASICA requirement) Export health certificate endorsed by SENASICA with TB test chart(s) Travel from point of assembly to U.S. port of entry under seal Inspection by APHIS veterinarian at the U.S. port of entry: APHIS issues Report of Animals, Poultry or Eggs Offered for Importation (VS Form 17-30) APHIS issues Animals Imported for Immediate Slaughter (VS Form 17-33) APHIS veterinarian applies official seal to transport vehicle Approved route of travel to an APHIS-approved slaughter facility Confirmation of arrival at facility (reconciliation of VS Form 17-33) Held separate and apart from other cattle at the approved facility (currently no APHIS-approved U.S. slaughter facilities) Slaughtered within 14 days	

USDA region bovine TB classification	Steers / spayed heifers (feeders)	Sexually intact cattle (breeders)
	Import protocol developed with Mexico in July 2014	
	Export health certificate agreed in September 2019	

Source: USDA APHIS

The immediate slaughter protocol allows the importation of bovines from all states or regions in Mexico for slaughter within 14 days of entry in the United States. The importation of Holstein steers, Holstein spayed heifers, Holstein cross steers, and Holstein cross spayed heifers from Mexico is prohibited ([9 CFR 93.427 c](#)).

5.4.5. Conclusion

Consistent with the beef review and the draft Canadian beef addendum, the likelihood of entry of bovine TB (*M. bovis* or *M. caprae*) from these pathways is considered **negligible** and achieves Australia's ALOP.

However, as in the beef review, proposed health certification will include a requirement that veterinary ante and post-mortem inspection is undertaken because bovine TB is exotic to Australia.

This conclusion has been made on the basis that:

- *M. caprae* has not been reported in Mexico or Canada.
- There is a very low prevalence of bovine TB in Canada.
- The bovine TB surveillance controls in Mexico, the testing of all bovines by Mexican authorities prior to export (not verified by the USDA on border), and the additional controls applied by the USDA, including restricting access to lower prevalence states or zones, reduces the likelihood of infected feeder and breeder animals entering the United States and being presented for slaughter.
- *M. bovis* has rarely been detected in muscle tissue, even in generalised infection.
- The most common sites of TB lesions (i.e. lungs and associated lymph nodes) are not eligible for export to Australia.
- Beef and beef products from cattle slaughtered in the United States, including that derived from Mexican and Canadian cattle, is produced under processes equivalent to the Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption including ante- and post-mortem inspection; and ensures that meat is wholesome, does not contain macroscopic granulomas and is fit for human consumption.
- Veterinary supervision of qualified meat inspectors at abattoirs under the control of the veterinary authority enables detection of bovine TB lesions at ante- and post-mortem for all beef and beef products and appropriate disposition of affected carcasses.

Although there is no current trade in immediate slaughter bovines from Mexico to the United States, the prevalence of bovine TB in certain parts of Mexico eligible to export bovines into the United States does not fulfil the requirement of the beef review that “the existing low prevalence and surveillance or eradication controls in applicant countries reduce the likelihood of infected animals and animal product being presented for human consumption”. Therefore, a full risk assessment was

conducted to consider the risks of beef and beef products imported into Australia from this pathway ([Section 5.4.6](#)).

5.4.6. Risk assessment of immediate slaughter bovines from Mexico to the United States

Entry assessment

The following factors were deemed relevant to the possible presence of *M. bovis* in imported beef and beef products derived from bovines imported from Mexico to the United States for immediate slaughter:

- there is no current trade (for commercial reasons) in immediate slaughter bovines from Mexico to the United States and no establishments are approved by USDA to process these animals. It is anticipated that only small volumes of beef derived from these animals would be exported to Australia. As mentioned in section 1.1, the total average number of cattle imported annually from Mexico in recent years (under all protocols) is equivalent to approximately 3.7% of the number of cattle slaughtered annually in the United States.
- the Mexican Government reports the prevalence in Mexico to vary, by region, from 0% to 11.29% (September 2022).
- under the current protocol, cattle from all regions of Mexico are eligible to be imported into the United States for immediate slaughter.
- Holstein steers, Holstein spayed heifers, Holstein cross steers, and Holstein cross spayed heifers are prohibited for import into the United States, because of the risk of bovine TB ([9 CFR 93.427 c](#)). The prevalence of bovine TB in dairy producing regions in Mexico is higher than in beef producing regions. This further reduces the likelihood of bovine TB being present in animals prepared for immediate slaughter.
- Mexican authorities require that all bovines exported for immediate slaughter test negative for bovine TB between 30 to 180 days for internal movement prior to export using caudal fold tuberculin test. Estimates of the sensitivity of the caudal fold tuberculin test are 80-84%, meaning that 16-20% of animals with bovine TB would be expected to be test negative.
- *M. bovis* has rarely been detected in muscle tissue, even in generalised infection.
- the most common sites of tuberculous lesions (i.e. lungs and associated lymph nodes) are excluded from the beef review and would not be eligible for export to Australia.
- beef (and beef products) from cattle slaughtered in the United States, including from cattle that may be imported for immediate slaughter, is produced under processes equivalent to the Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption including ante- and post-mortem inspection; and ensures that meat is wholesome, does not contain macroscopic granulomas and is fit for human consumption.
- veterinary supervision of qualified meat inspectors at abattoirs under the control of the veterinary authority enables detection of bovine TB lesions at ante- and post-mortem for all beef and beef products and appropriate disposition of affected carcasses.

Based on the factors presented above, the likelihood of beef and beef products derived from bovines legally imported for immediate slaughter in the United States from Mexico being contaminated with *M. bovis* is considered to be **very low**.

Exposure assessment

The following factors were deemed relevant to the possible exposure of Australian animals to *M. bovis* from imported beef and beef products derived from bovines legally imported from Mexico to the United States for immediate slaughter:

- only small volumes of beef and beef products are likely to be imported into Australia from the United States.
- imports of primal cuts of beef are likely to be very high value product and waste generated would be very low. Ground beef would be a lower value product although would generate proportionally less waste.
- inhalation and oral transmission via contaminated feed and/or water or infected sputum has been considered to be the mode of transmission in several cases of *M. bovis* in animals but is rare (Neill et al. 1994; Palmer, Waters & Whipple 2004; Phillips et al. 2003).
- during preparation of beef and beef products for sale and processing, trimming might result in removal of some lymph nodes which may harbour *M. bovis*. However, much of the trimmed material would probably be used in processed or ground beef. Trimmings not directed for human consumption would be discarded for disposal.
- a single colony forming unit is enough to initiate infection (Dean et al. 2005).
- a possible exposure pathway for bovine TB from imported, contaminated fresh beef and/or beef products would be the exposure to susceptible animals via the feeding of food waste. As bovine TB primarily infects cattle, which are not fed meat products (this is illegal under Australia's ruminant feed ban) there is no probable exposure pathway to ruminants.
- Domestic ruminants are unlikely to have direct access to waste from imported beef and beef products.
- Pigs can become infected with *M. bovis* following oral exposure (Corner et al. 1981)
- there is the possibility that uncooked beef and/or beef products would be disposed of in areas where feral and wild animals can access domestic or commercial waste.
- metropolitan landfills are under the control of local councils and are usually fenced and covered and managed to prevent access by wild and feral animals. Rural landfills may be less well controlled.
- feral pigs have been observed to scavenge private rubbish tips in some peri-urban, rural and remote areas and other feral animals (for example, goats, dogs, cats, foxes, birds and rodents) may also scavenge for meat and meat products in this manner.
- feral pigs were not documented as an important reservoir species for the transmission of bovine TB to cattle during the BTEC scheme.

Based on these exposure factors, and consistent with the findings of the beef review:

- there is not a significant potential exposure pathway to domestic ruminants.
- there is a possible potential exposure pathway to feral pigs

The potential for exposure to feral pigs would be considerably lower for high value beef (for example, primal cuts) compared with ground beef and other lower value products.

The likelihood of exposure of domestic ruminants with imported contaminated beef and beef products leading to infection with *M. bovis* is considered **negligible**.

The likelihood of exposure of imported contaminated beef and beef product to feral pigs with imported contaminated beef and beef products leading to infection with *M. bovis* is considered **very low**.

Estimate of the likelihood of entry and exposure

The likelihood of entry of bovine TB was estimated to be **very low**, and the likelihood of exposure of ruminants was estimated to be negligible. Using Figure 1, the likelihood of entry and exposure for ruminants was estimated to be **negligible**.

The likelihood of entry of bovine TB was estimated to be **very low**, and the likelihood of exposure of feral pigs was estimated to be **very low**. Using Figure 1, the likelihood of entry and exposure for feral pigs was estimated to be **extremely low**.

Consequence assessment

The following factors were considered in assessing the likely consequences of bovine TB in Australia:

- bovine TB is nationally notifiable in Australia.
- Australia declared freedom from bovine TB in accordance with the WOA Code in December 1997, following an extensive national eradication campaign which began in 1970. Australia has a longstanding history of surveillance to support its ongoing claim of freedom. The high level of veterinary inspections of slaughter animals in Australia provides a powerful animal health surveillance tool which, when coupled with a range of passive and active surveillance programs, help underpin Australia's claim to freedom from exotic diseases including bovine TB. The testing of cattle for *M. bovis* before export provides additional evidence that the disease is not present (Sergeant, Happold & Langstaff 2017).
- Australia's campaign to eradicate *M. bovis* took 27 years and cost approximately \$840 million in operational expenditure (More, Radunz & Glanville 2015)
- bovine TB has the potential to cause significant national socio-economic consequences, both domestically and internationally, through international trade losses (international trade pathways for valuable domestic industries would likely be interrupted), national market disruptions and severe production losses in the cattle industry.
- significant public investment would be required for national eradication of bovine TB should it become established in domestic species.

Based on this information, the likely consequences of establishment and/or spread of bovine TB associated with the importation of fresh beef and/or beef products were estimated to be **high**.

Risk estimation

The likelihood of entry and exposure of Australian ruminants to *M. bovis* from beef or beef products derived from bovines born and raised in Mexico and legally imported for immediate slaughter in the United States was estimated to be **negligible**. The likely consequences of establishment and/or spread was estimated to be **high**. Using Figure 2, the unrestricted risk of bovine TB through direct exposure of ruminants was estimated to be **negligible**.

The likelihood of entry and exposure of Australian feral pigs to *M. bovis* from beef or beef products derived from bovines born and raised in Mexico and legally imported for immediate slaughter in the United States was estimated to be **extremely low**. The likely consequences of establishment and/or spread was estimated to be **high**. Using Figure 2, the unrestricted risk of bovine TB through direct exposure of feral pigs was estimated to be **very low**.

Conclusion

The overall risk of bovine TB from fresh beef and beef products derived from born and raised in Mexico and legally imported for immediate slaughter in the United States was estimated to be at maximum **very low** and achieves Australia's ALOP.

This finding was based, in part, on the anticipated very small volume of trade and the current absence of the immediate slaughter pathway from Mexico. Once trade commences, Australia will monitor the quantity of fresh beef and/or beef products imported from the United States and a significant increase (in the department's view) may trigger a review of this commodity.

Additional risk management for bovine TB, apart from veterinary ante- and post-mortem inspection, is therefore not required for the importation of fresh beef and beef products derived from bovines born and raised Mexico and imported for immediate slaughter in the United States.

5.5. Bovine viral diarrhoea

BVD is a WOA-listed disease and is endemic world-wide. BVD virus (BVDV) is classified into two antigenically and phylogenetically distinct genotypes, BVDV-1 and BVDV-2 (Ridpath, Bolin & Dubovi 1994), which are now considered separate species (Walker et al. 2022). BVDV-2 sub-genotypes have not been reported in Australia (Kirkland & MacKintosh 2006) and infection with BVDV-2 is a nationally notifiable animal disease (DAFF 2019). BVDV-1 (a and b sub-genotypes) and BVDV-2 (sub-genotype a) are predominantly detected in bovines from the United States and Canada. There is evidence that four sub-genotypes (BVDV-1a, 1b, 1c, and 2a) are circulating in animal populations in Mexico (Gomez-Romero et al. 2021).

The beef review noted that there is no scientific evidence showing experimental or natural oral transmission of BVDV to bovines via consumption of carcase and carcase parts. Technical information on bovine viral diarrhoea (BVD) can be found in Section 4.5.2 of [the beef review](#).

5.5.1. Conclusion

The likelihood of entry of BVDV in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the findings of the beef review, and the Canadian beef addendum, risk of bovine viral diarrhoea is therefore considered **negligible** and achieves Australia's ALOP.

Additional risk management for bovine viral diarrhoea is therefore not required for the importation of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States.

5.6. Bovine cysticercosis (*Cysticercus bovis*)

Technical information on bovine cysticercosis (or *Cysticercus bovis*) can be found in Section 4.6 of [the beef review](#).

Bovine cysticercosis is infection with the metacestode of *Taenia saginata*, commonly known as beef tapeworm. Bovines are the intermediate hosts in the transmission of this parasite. Bovine cysticercosis is detected occasionally in Australia, where it is a nationally notifiable animal disease.

According to the beef review, a 1997 study found that the prevalence of bovine cysticercosis in the United States is very low, ranging from 0.0003 in central United States to 0.0697 in western United States. The beef review also reported that prevalence was around 2% in the 1980s, decreasing to 0.3% in cattle in 2011 with suspected *C. bovis* lesions found in 0.002% of slaughtered veal calves.

Bovine cysticercosis is found sporadically in Canada. The CFIA investigates all positive cases and premises determined to be the source of infection are immediately placed under CFIA control. The CFIA oversees cleaning and disinfection, removal of contaminated feed and the movement of the bovines to a federally inspected abattoir for slaughter and disposal or treatment of infected carcasses (CFIA 2015).

A prevalence of 0.21% of bovine cysticercosis was established using routine post-mortem inspection of 52,322 feedlot cattle slaughtered in Baja California, México but sourced from 18 states (Cueto González et al. 2015). This is higher than the prevalence in the United States.

Outbreaks of bovine cysticercosis in Canada are only sporadic and the prevalence is likely to be very low, like the situation in Australia. The prevalence of bovine cysticercosis in Mexico is similar to the Netherlands which was assessed in the beef review as negligible risk.

The outcome of the beef review was that there is no direct animal biosecurity risk associated with the importation of bovine cysticercosis contaminated beef and beef parts and therefore an animal biosecurity risk assessment was not required. The beef review found that risk management measures may be warranted to meet human health and food safety requirements if food safety risk assessment determines that applicant countries' disease prevalence and meat inspection programs do not meet Australian food standards. The department also referred the hazards for bovine cysticercosis to the then Australian Government Department of Health and FSANZ which advised there are no additional human biosecurity or food safety risks associated with the disease.

5.6.1. Conclusion

The likelihood of entry of bovine cysticercosis in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the findings of the beef review, and the Canadian beef addendum, the animal biosecurity risk of bovine cysticercosis is therefore considered **negligible** and achieves Australia's ALOP.

Additional risk management for bovine cysticercosis is therefore not required for the importation of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States.

5.7. Echinococcosis

Technical information on echinococcosis can be found in Section 4.7 of [the beef review](#).

Echinococcosis is a zoonotic disease caused by several species of the genus *Echinococcus*, cestode parasites in the family Taeniidae. Disease in bovines is caused predominantly by three species: *E. granulosus sensu stricto*, *E. ortleppi* and *E. multilocularis*.

E. granulosus sensu stricto has an almost worldwide distribution including Australia. *E. multilocularis* rarely infects cattle, sheep and pigs and when exposure occurs the cysts may not be viable (WOAH 2023c). *E. multilocularis* is not present in Australia or Mexico but is present in Canada (WOAH 2024). There are several reports of *E. multilocularis* in Canadian wild animals e.g. wolves, foxes, cats, but no reports found of infection in bovines. It may have been introduced into Canada with domestic dogs or red foxes, followed by establishment in wildlife (Thompson 2020). *E. ortleppi* is not known to be present in the United States or Canadian cattle. In Mexico, *E. granulosus sensu stricto* has been reported in a rural pig and a human patient's surgically removed cyst was confirmed as *E. ortleppi* infection. However, there is no evidence that infections are being maintained in Mexico, because only isolated cases have been documented (Flisser et al. 2015).

Post-mortem inspection of the carcass is an effective way of detecting echinococcosis. The WOAH Terrestrial Animal Health Code does not recommend any risk management measures for *Echinococcus* spp. for international trade in meat. However, the WOAH Terrestrial Animal Health Code recommends post-mortem inspection in abattoirs, and either disposal or inactivation of metacestodes in offal as part of any risk management measures for Echinococcosis in meat products (WOAH 2023c).

The beef review noted that inspection of the carcass is an effective way of detecting echinococcosis and reduces risks of it being in imported fresh beef and beef products. It concluded that the importation of beef and beef products the United States is unlikely to introduce *Echinococcus* spp. into Australia, and that the risk from *Echinococcus* spp. associated with importation of beef and beef products from the United States is negligible achieves Australia's ALOP with respect to animal biosecurity risks.

5.7.1 Conclusion

The likelihood of entry of *Echinococcus* spp. in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the findings of the beef review, and the Canadian beef addendum, the animal biosecurity risk of *Echinococcus* spp. is therefore considered **negligible** and achieves Australia's ALOP.

Additional risk management for *Echinococcus* spp. is therefore not required for the importation of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States.

5.8. Paratuberculosis (*Mycobacterium avium* subsp. *paratuberculosis*)

Technical information on *Mycobacterium avium* subsp. *paratuberculosis* (*M. paratuberculosis*) can be found in Section 4.8 of [the beef review](#).

M. paratuberculosis is a bacterium which causes paratuberculosis or Johne's disease (JD), a chronic enteritis and wasting disease of ruminants with a worldwide distribution (Buergelt, S & A 2004). Most animals become infected by ingestion of contaminated colostrum, milk or faecal material from infected dams or from grazing contaminated pastures, soil, water or feed (RW 1996). Studies have shown that beef can be contaminated with *M. paratuberculosis* via the dissemination of the organism in infected tissues and that tissue distribution may be poorly correlated with clinical signs. The surface of carcasses can also be contaminated by *M. paratuberculosis* in faeces present on the hides of animals at slaughter (Eltholth et al. 2009).

JD is present in Australia and national control and management programs are in place. JD is endemic in the dairy industry in southeastern Australia. JD has rarely been detected in northern and western beef cattle. JD is also uncommon in beef herds in southeastern (AHA 2021).

As detailed in the beef review, *M. paratuberculosis* occurs in ruminants in the United States with reports of 68.1% of dairy operations infected; a prevalence of *M. paratuberculosis* infection in beef cattle varying between 3-5% and over 40% of herds studied infected. At slaughtering plants in Canada and the United States, *M. paratuberculosis* was detected on 54 to 80% of cull dairy and beef cow hides and 1 to 6% of feedlot cattle.

The WOAHP Terrestrial Animal Health Code does not recommend any risk management measures for paratuberculosis for international trade in meat and meat products. Australia does not impose any domestic management measures for paratuberculosis on the domestic trade in meat and meat products.

There is evidence that *M. paratuberculosis* can be transmitted via the beef carcass or carcass parts after ante- and post-mortem inspection.

The prevalence of *M. paratuberculosis* in bovines in Canada and Mexico is not significantly greater than that in the United States. WAHIS lists *M. paratuberculosis* as present in Canada and Mexico (WOAH 2024). Based on a survey of cattle at slaughter, a prevalence of paratuberculosis was estimated in culled dairy cattle in Eastern Canada and Maine of 16.1% (McKenna et al. 2004). In a study of dairy cattle in New Brunswick, Nova Scotia, and Prince Edward Island, 2.6% (1.8% to 3.9%) of cows were positive for *M. paratuberculosis* and 16.7% of herds had at least 2 positive cows (VanLeeuwen et al. 2001). A more recent study reported estimates of 66% for farms in Western Canada, 54% in Ontario, 24% in Québec, and 47% in Atlantic Canada infected with paratuberculosis (Corbett et al. 2018). An overall prevalence of *M. paratuberculosis* in Mexican cattle was estimated to be 5% (Feliciano et al. 2015).

The beef review found that the risk from *M. paratuberculosis* infection associated with the importation of beef and beef products from the United States is considered negligible and therefore achieves Australia's Appropriate Level of Protection with respect to animal biosecurity risks.

5.8.1. Conclusion

The likelihood of entry of *M. paratuberculosis* in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the findings of the beef review, and the Canadian beef addendum, the animal biosecurity risk of paratuberculosis is therefore considered **negligible** and achieves Australia's ALOP.

Additional risk management for paratuberculosis is therefore not required for the importation of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States.

5.9. *Salmonella enterica* serotype Typhimurium DT104

Salmonella enterica causes clinical and subclinical enteric infections in both livestock and humans and is a leading cause of food-borne illness in the United States (USDA 2014b). In the early 1990s, a distinct multi-drug resistant strain of *S. enterica* serotype Typhimurium became prominent as a pathogen of both livestock and humans in the United States and western Europe (Foley, Lynne & Nayak 2008). The new strain, known as definitive type 104 R-ACSSu and commonly called *S. enterica* serotype Typhimurium DT104 (or *S. Typhimurium* DT104), is now present in many countries including the United States.

There are few reports of *Salmonella enterica* serotype Typhimurium DT104 in Mexican livestock although a survey of *Salmonella* spp. in pigs slaughtered at Mexican abattoirs found 2 (2.28%) of the 87 strains detected were DT104 (Rojas et al. 2011). Another study of salmonella in cattle and poultry showed most serovar Typhimurium isolates (8 of 10) exhibited a penta-resistant phenotype similar to that reported for the Typhimurium DT104 strain (Delgado-Suárez et al. 2021). *S. enterica* serotype Typhimurium DT104 has also been reported in Canada (Leekitcharoenphon et al. 2016).

Infection with *S. enterica* serotype Typhimurium DT104 has not been reported in Australian livestock or products derived from Australian livestock (Barlow & Gobius 2008). The beef review concluded that, as there is scientific evidence that *S. Typhimurium* DT104 is present in cattle in the United States and that because it can be transmitted via beef and beef products, a risk assessment was required.

Further technical information on *S. Typhimurium* DT104 can be found in Section 4.9 of [the beef review](#).

In the beef review, the entry assessment component of the risk assessment for *S. Typhimurium* DT104 concluded that a proportion of beef and beef products imported from the United States could be contaminated with DT104. Based on the proportion of product imported from the United States that is likely to be contaminated with viable DT104, and the estimated volume of trade, the likelihood of entry of DT104 with beef and beef product derived from the United States where *S. enterica* serotype Typhimurium DT104 is present is **high**.

S. Typhimurium DT104 is also present in livestock in Mexico. Although the prevalence in bovines is unknown, it will be assumed that it is significant and equivalent to the United States. This review therefore concludes that the likelihood of entry of *S. Typhimurium* DT104 with beef and beef product

derived from bovines legally imported into the United States from Mexico or Canada and slaughtered in the United States is also **high**.

Following importation, the likelihoods of exposure, establishment and spread and the consequence (impact) of an outbreak remain the same as assessed in the beef review. Therefore, the risk (likelihood and consequence) of beef and beef products from bovines imported from Mexico or Canada is equivalent to the risk from beef and beef products from bovines born and raised in the United States (i.e. **negligible**). Therefore, the importation of beef and beef product from bovines from Canada and Mexico that are legally imported into the United States is considered to achieve Australia's ALOP in relation to animal biosecurity issues relating *S. Typhimurium* DT104.

5.9.1. Conclusion

The animal biosecurity risk of *S. Typhimurium* DT104 in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). This is consistent with the findings of the beef review, and the Canadian beef addendum and achieves Australia's ALOP.

As proposed for bovines born, raised and slaughtered in the United States (in the beef review) and bovines born raised and slaughtered in Canada (in the draft Canadian beef addendum), Australia will require that listed establishments in the United States operate Hazard Analysis Critical Control Point Quality Assurance plans (HACCP-based QA plans), and have their satisfactory operation verified via a bacteriological testing program equivalent to that undertaken in Australia, in accordance with relevant Australian standards.

Verification that HACCP-based QA plans in the United States are operating as required to provide the necessary assurances will occur through assurance and verification activities undertaken by the department.

5.10. Vesicular stomatitis

Vesicular stomatitis is an insect-transmitted viral disease that primarily affects horses, bovines, and pigs. There are two serologically distinct serotypes of the vesiculovirus, Indiana (IND) and New Jersey (NJ) serotypes (Reis Júnior et al. 2009; WOA 2013). Vesicular stomatitis does not occur in Australia and is a notifiable disease (DAFF 2019).

Vesicular stomatitis is zoonotic as it can cause an influenza-like illness in humans following direct contact with infected livestock (Letchworth, Rodriguez & Del Cbarrera 1999; Reis Júnior et al. 2009). It is generally assumed that animals acquire infection either through the bite of an infected competent insect vector, exposure to a clinically affected host (McCluskey & Mumford 2000; Smith et al. 2012), or possible infection following ingestion of immature stages of grasshoppers infected with the virus (Drolet, Stuart & Derner 2009).

There is little data available on oral transmission of vesicular stomatitis virus and there are no known studies that assess transmissibility in meat. Feeding pigs infected epithelial tissues has led to clinical signs but this may have been due to these tissues contacting abraded skin (Patterson, Jenney & Holbrook 1955). Prior to the removal of vesicular stomatitis from the WOA Code, WOA did not

recommend any risk management measures for vesicular stomatitis virus for international trade in meat and meat products.

Subclinical infection is short-lived (about one week), and a carrier state does not occur (McCluskey & Mumford 2000). Veterinary ante- and post-mortem controls in the United States substantially reduce the potential for an infected carcass to pass inspection.

Further technical information on vesicular stomatitis can be found in Section 4.10 of [the beef review](#).

Vesicular stomatitis is currently limited to the American continents. The NJ and IND-1 serotypes are endemic in livestock in areas of southern Mexico, Central and much of South America. Sporadic activity of NJ and IND-1 serotypes has been reported in northern Mexico and the western United States (Reis Júnior et al. 2009).

Vesicular stomatitis is a reportable disease in the United States, Canada and Mexico. Outbreaks occur every few years in the United States with the last outbreak reported in 2020 (USDA 2020).

Vesicular stomatitis was last diagnosed in Canada in 1949 and Canada is free from infection (CFIA 2023c). Vesicular stomatitis is endemic in southern Mexico, where there is annual circulation of the virus between livestock and insect vectors (USDA 2020).

The beef review found that the likelihood of entry of vesicular stomatitis with imports of beef and beef products that have passed ante- and post-mortem inspection is considered not significant based on the following:

- subclinical infection is short-lived (about one week), and a carrier state does not occur
- there is no evidence that meat tissue harbours virus particles
- United States' law requires notification of any cases of VS and quarantining of affected properties until resolution of disease
- Ante- and post-mortem controls in the United States substantially reduce the potential for an infected carcass to pass inspection.

These findings are also applicable for the import of beef and beef products derived from bovines sourced from Mexico.

5.10.1. Conclusion

The likelihood of entry of vesicular stomatitis virus in beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported slaughtered in the United States is considered equivalent to that of bovines born and raised in the United States (i.e. **negligible**). Consistent with the findings of the beef review, and the Canadian beef addendum, the animal biosecurity risk of vesicular stomatitis is therefore considered **negligible** and achieves Australia's ALOP.

6. Risk management

6.1. Compliance or equivalence with Australian standards

Consistent with the beef review, compliance with relevant Australian standards (described in Sections 3.2) or an equivalence determination as appropriate, will be required to determine whether applicant countries including the United States are eligible to export beef and beef products to Australia.

FSANZ undertakes assessments of countries to ensure compliance with Australian BSE food safety requirements and advises the department of the BSE risk management measures required before beef and beef products can be imported. FSANZ also monitors assessed countries for any change in BSE status that may impact on a favourable BSE categorisation that was issued after finalising a BSE Food Safety Risk Assessment Report for that country. As of March 2024, FSANZ is undertaking an assessment of Canada's BSE status (see Section 1.3.1). As mentioned in Section 1.3.2, Mexico has been assessed by FSANZ as a BSE Category 1 country.

An applicant country's ability to meet the Australian Meat Standard and the Imported Food Control Act 1992 is determined by the department through an assurance and verification process before fresh beef and beef products can be imported.

6.2. Proposed risk management measures

6.2.1. Animal residency status

The beef review found that fresh beef or beef products must be sourced from bovines that have been continuously resident in the United States since birth. This addendum proposes revising this requirement. It finds that the requirements of the beef review should be amended to allow the importation of beef and/or beef product from the United States derived from:

- immediate slaughter, feeder and breeder bovines legally imported into the United States from Mexico subject to all other relevant requirements of the beef review including having passed ante- and post-mortem veterinary inspection under official veterinary supervision, and
- immediate slaughter, feeder and breeder bovines legally imported into the United States from Canada, subject to all other relevant requirements of the beef review, including having passed ante- and post-mortem veterinary inspection under official veterinary supervision, if Canada receives a favourable BSE assessment from FSANZ.

Fresh beef and beef products derived from bovines born and raised in Canada or Mexico, legally imported and slaughtered in the United States will require certification that they were born and have only resided in the United States, Canada and/or Mexico.

6.2.2. Recognition of country freedom status

Consistent with the beef review, certification of country freedom is considered sufficient, reasonable and practical to address the risk of the importation of fresh beef and beef products. This would

require certification that all countries the animals resided in are free from the following diseases and disease agents:

- contagious bovine pleuropneumonia
- Crimean-Congo haemorrhagic fever
- foot-and-mouth disease
- haemorrhagic septicaemia
- lumpy skin disease
- Rift Valley fever
- surra
- theileriosis (*Theileria annulata* and *T. parva*)
- trypanosomiasis (Tsetse transmitted)
- Wesselsbron disease

As per the [Final report: Risk of lumpy skin disease via fresh \(chilled or frozen\) bovine skeletal muscle meat from applicant countries](#), certification of country freedom from lumpy skin disease is not required when the beef meat is derived exclusively from bovine skeletal muscle and contains no lymphatic or other tissues. (Skeletal muscle includes any attached rind, fat, connective tissue, nerve, blood and blood vessels).

6.2.3. Other risk management measures

This addendum concludes that the risk management measures proposed in the beef review are adequate to address the following diseases in relation to beef and beef products sourced from bovines born and raised in Canada or Mexico and legally imported into and slaughtered in the United States:

- anthrax
- Aujeszky's disease
- brucellosis (*B. abortus*, *B. melitensis* and *B. suis*)
- bovine TB
- bovine viral diarrhoea
- bovine cysticercosis
- echinococcosis
- paratuberculosis
- infection due to *S. Typhimurium* DT104
- vesicular stomatitis

As mentioned earlier, Australia will require that listed establishments in the applicant countries operate HACCP-based QA plans, and have their satisfactory operation verified via a bacteriological

testing program equivalent to that undertaken in Australia in accordance with relevant Australian standards.

This risk management also addresses food safety concerns associated with STEC and Salmonella spp. Taking into account the preliminary advice from FSANZ that imports of fresh beef and beef products are considered to present a potential medium to high risk to public health for STEC and Salmonella spp., as outlined in the beef review.

As required in the beef review, the United States will need to demonstrate competent authority oversight of the beef exporting establishments ensuring these facilities are operating through-chain HACCP based food safety programs which control the risks associated with STEC and Salmonella spp. Consignments of beef being exported will need to be certified by the competent authority and at border verification testing will be applied. Verification that HACCP-based QA plans in the applicant country are operating as required to provide the necessary assurances will occur through an audit process (i.e. competent authority assessment). Any additional food safety controls required to address food safety risks identified in these assessments will be advised by the relevant area within this department when available.

6.3. Meeting Australia's food standards

Imported food for human consumption must satisfy Australia's food standards. Australian law requires that all food, including imported food such as beef and beef products, meets the standards set out in the Food Standards Code. FSANZ is responsible for developing and maintaining the Food Standards Code, including Standard 1.4.2, maximum residue limits, available on the Legislation website. The standards apply to all food in Australia, irrespective of whether it is grown domestically or imported.

6.4. Verification and compliance with biosecurity measures

It is expected that agreement on health certification would occur after the finalisation of this addendum. Model health conditions for applicant countries can be found in Section 5.1.5 of [the beef review](#).

The department undertakes competent authority assessments of countries that apply to export fresh beef and beef products to Australia. These assessments determine whether that country's official animal health, export control, and supervision systems are of sufficient scope and applied at an adequate intensity to ensure Australia's biosecurity and food safety requirements will be reliably met.

Verification activities may be implemented at the border to provide Australia with ongoing assurances that trade in beef and beef products achieves Australia's ALOP. Verification may include an appropriate level of on-arrival testing at a rate considered appropriate by the department for any of the pathogenic agents listed in Section 5.1.5 of [the beef review](#).

The department may, at any time deemed necessary, request information or seek to visit areas in exporting countries that produce beef and beef products for export to Australia. The information requested and visits will be for the purposes of verifying the implementation of agreed import

Animal biosecurity risks of fresh beef and beef products derived from bovines born and raised in Canada or Mexico and legally imported and slaughtered in the United States

conditions and sanitary systems. These verification visits and audits may be undertaken in-person or remotely.

The department can review the import policy at any time.

7. Conclusion and next steps

This draft addendum concludes that the animal biosecurity risks associated with the importation of fresh beef and beef products from bovines born and raised in Canada or Mexico and legally imported into and slaughtered in the United States can be managed to achieve Australia's ALOP.

The risk assessment for bovine TB found the animal biosecurity risk associated with the importation of fresh beef and/or beef products derived from cattle legally imported into the United States from Mexico for immediate slaughter is **very low**. This achieves Australia's ALOP with respect to animal biosecurity risks. This finding was based, in part, on the anticipated very small volume of trade and the current absence of the immediate slaughter pathway from Mexico. Once trade commences, Australia will monitor the quantity of fresh beef and/or beef products imported from the United States and a significant increase (in the department's view) may trigger a review of this commodity.

This draft addendum has been released for 60 days public consultation to give stakeholders the opportunity to provide technical comment. Stakeholder submissions will be considered when finalising the addendum.

Once this addendum is finalised, bilateral negotiation of health certification and the basis of health certification may occur with the United States. After health certification and any associated arrangements, is concluded, trade could commence when an application for an import permit is lodged with, and approved by, the department.

References

- Adams, LG 2002, 'The pathology of brucellosis reflects the outcome of the battle between the host genome and the *Brucella* genome', *Veterinary Microbiology*, vol. 90, no. 1-4, pp. 553-61.
- AHA 2021, *Animal health in Australia system report, first edition*, Animal Health Australia, Canberra.
- Barlow, R & Gobius, K 2008, *Pilot survey for antimicrobial resistant (AMR) bacteria in Australian food: prepared for the Australian Government Department of Health and Ageing*, by DoHa Ageing.
- Buergelt, C, S, B & A, M 2004, 'Paratuberculosis', in R Coetzer (ed.), *Infectious diseases of livestock*, Oxford University Press, Oxford.
- Cem Gul, H & Erdem, H 2015, 'Brucellosis (*Brucella* species)', in J Bennett, R Dolin & M Blaser (eds), *Mandell, Douglas, and Bennett's principles and practice of infectious diseases, 8th edn*, Elsevier, Philadelphia, pp. 2584-9.
- CFIA 2015, *Cysticercosis - fact sheet*, Government of Canada, Canadian Food Inspection Agency, viewed 4 March 2024, <<https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/cysticercosis/fact-sheet/eng/1329807596298/1329808582354>>.
- 2016, *Fact sheet - brucellosis*, Government of Canada, Canadian Food Inspection Agency, viewed 4 March 2024, <<https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/brucellosis/fact-sheet/eng/1305673222206/1305673334337>>.
- 2023a, *Bovine tuberculosis*, Government of Canada, Canadian Food Inspection Agency, viewed 4 March 2024, <<https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/bovine-tuberculosis/eng/1330205978967/1330206128556>>.
- 2023b, *Bovine: animal health certificates for export*, Government of Canada, Canadian Food Inspection Agency, viewed 4 March 2024, <<https://inspection.canada.ca/animal-health/terrestrial-animals/exports/bovine/eng/1369550608938/1369550610610#u>>.
- 2023c, *Vesicular stomatitis – fact sheet*, Government of Canada, Canadian Food Inspection Agency, viewed 4 March 2024, <<https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/vesicular-stomatitis/fact-sheet/eng/1306640102681/1306848592941>>.
- 2024, *Herds infected with bovine tuberculosis in Canada*, Government of Canada, Canadian Food Inspection Agency, viewed 4 March 2024, <<https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/bovine-tuberculosis/herds-infected/eng/1544030894737/1544030894977>>.
- Chan, J, Baxter, C & Wenman, WM 1989, 'Brucellosis in an Inuit Child, Probably Related to Caribou Meat Consumption', *Scandinavian Journal of Infectious Diseases*, vol. 21, no. 3, pp. 337-8.
- Cook, D & Kingston, G 1988, 'Isolation of *Brucella suis* biotype 1 from a horse', *Australian Veterinary Journal*, vol. 65, no. 5, pp. 162-3.
- Cook, D & Noble, J 1984, 'Isolation of *Brucella suis* from cattle', *Australian Veterinary Journal*, vol. 61, no. 8, pp. 263-4.
- Corbett, CS, Naqvi, SA, Bauman, CA, De Buck, J, Orsel, K, Uehlinger, F, Kelton, DF & Barkema, HW 2018, 'Prevalence of *Mycobacterium avium* ssp. *paratuberculosis* infections in Canadian dairy herds', *Journal of Dairy Science*, vol. 101, no. 12, pp. 11218-28.

Corner, L, Barrett, R, Lepper, A, Lewis, V & Pearson, C 1981, 'A survey of mycobacteriosis of feral pigs in the Northern Territory', *Australian Veterinary Journal*, vol. 57, no. 12, pp. 537-42.

Cueto González, SA, Rodríguez Castillo, JL, López Valencia, G, Bermúdez Hurtado, RM, Hernández Robles, ES & Monge Navarro, FJ 2015, 'Prevalence of *taenia saginata* larvae (*cysticercus bovis*) in Feedlot Cattle Slaughtered in a Federal Inspection Type Abattoir in Northwest México', *Foodborne Pathogens and Disease*, vol. 12, no. 5, pp. 462-5.

DAFF 2019, *National list of notifiable animal diseases*, Department of Agriculture, Fisheries and Forestry, viewed 4 March 2024, <<https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/notifiable>>.

— 2023, *Fresh (chilled or frozen) beef and beef products from Canada – draft addendum*, by Department of Agriculture, Fisheries and Forestry

DAWR 2017, *Fresh (chilled or frozen) beef and beef products from Japan, the Netherlands, New Zealand, the United States and Vanuatu – final review*, by Department of Agriculture and Water Resources

Dean, GS, Rhodes, SG, Coad, M, Whelan, AO, Cockle, PJ, Clifford, DJ, Hewinson, RG & Vordermeier, HM 2005, 'Minimum infective dose of *Mycobacterium bovis* in cattle', *Infection and Immunity*, vol. 73, no. 10, pp. 6467-71.

Delgado-Suárez, EJ, Palós-Guitérrez, T, Ruíz-López, FA, Hernández Pérez, CF, Ballesteros-Nova, NE, Soberanis-Ramos, O, Méndez-Medina, RD, Allard, MW & Rubio-Lozano, MS 2021, 'Genomic surveillance of antimicrobial resistance shows cattle and poultry are a moderate source of multi-drug resistant non-typhoidal *Salmonella* in Mexico', *PLOS ONE*, vol. 16, no. 5, p. e0243681.

Drolet, BS, Stuart, MA & Derner, JD 2009, 'Infection of *Melanoplus sanguinipes* grasshoppers following Ingestion of Rangeland Plant Species Harboring Vesicular Stomatitis Virus', *Applied and Environmental Microbiology*, vol. 75, no. 10, pp. 3029-33.

Eltholth, MM, Marsh, VR, Van Winden, S & Guitian, FJ 2009, 'Contamination of food products with *Mycobacterium avium paratuberculosis*: a systematic review', *Journal of Applied Microbiology*, vol. 107, no. 4, pp. 1061-71.

Ewalt, DR, Payeur, JB, Rhyan, JC & Geer, PL 1997, '*Brucella Suis* Biovar 1 in Naturally Infected Cattle: A Bacteriological, Serological, and Histological Study', *Journal of Veterinary Diagnostic Investigation*, vol. 9, no. 4, pp. 417-20.

Feliciano, M-S, A, S-FM, Horacio, Z-M, Leticia, G-C, Laura, H-A & J, C-AG 2015, 'Prevalence and associated risk factors for *Mycobacterium avium subsp. paratuberculosis* in dairy cattle in Mexico', *Journal of Veterinary Medicine and Animal Health*, vol. 7, no. 10, pp. 302-7.

Flisser, A, Maravilla, P, Mata-Miranda, P & Martinez-Hernandez, F 2015, *Echinococcosis in Mexico — A Story Worth Sharing*, InTech, 2015/09/02, <<http://dx.doi.org/10.5772/60868>>.

Foley, SL, Lynne, AM & Nayak, R 2008, 'Salmonella challenges: Prevalence in swine and poultry and potential pathogenicity of such isolates', *Journal of Animal Science*, vol. 86, pp. E149-E62.

FSANZ 2010, *Bovine spongiform encephalopathy (BSE): requirements for the importation of beef and beef products for human consumption - effective March 2010*.

— 2014, *BSE food safety risk assessment report - Mexico*, Food Standards Australia New Zealand, Canberra.

— 2023, *Status of country BSE food safety risk assessments*, Food Standards Australia New Zealand, viewed 4 March 2024, <<https://www.foodstandards.gov.au/business/bse/bsestatus>>.

Godfroid, J, Cloeckert, A, Liautard, J-P, Kohler, S, Fretin, D, Walravens, K, Garin-Bastuji, B & Letesson, J-J 2005, 'From the discovery of the Malta fever's agent to the discovery of a marine mammal reservoir, brucellosis has continuously been a re-emerging zoonosis', *Veterinary Research*, vol. 36, no. 3, pp. 313-26.

Gomez-Romero, N, Ridpath, JF, Basurto-Alcantara, FJ & Verdugo-Rodriguez, A 2021, 'Bovine Viral Diarrhea Virus in Cattle From Mexico: Current Status', *Frontiers in Veterinary Science*, vol. 8.

Gwida, M, Al Dahouk, S, Melzer, F, Rösler, U, Neubauer, H & Tomaso, H 2010, 'Brucellosis – Regionally Emerging Zoonotic Disease?', *Croatian Medical Journal*, vol. 51, no. 4, pp. 289-95.

Irwin, MJ, Massey, PD, Walker, B & Durrheim, DN 2010, 'Feral pig hunting: a risk factor for human brucellosis in north-west NSW?', *New South Wales Public Health Bulletin*, vol. 20, no. 12, pp. 192-4.

ISID 2024, *ProMED*, International Society for Infectious Diseases, viewed 4 March 2024, <<https://promedmail.org/>>.

Kirkland, P & MacKintosh, S 2006, *Ruminant Pestivirus Infections. Australian and New Zealand Standard Diagnostic Procedures for Animal Diseases*, by S-CoAHLsFAH Committee.

Leekitcharoenphon, P, Hendriksen, RS, Le Hello, S, Weill, F-X, Baggesen, DL, Jun, S-R, Ussery, DW, Lund, O, Crook, DW & Wilson, DJ 2016, 'Global genomic epidemiology of Salmonella enterica serovar Typhimurium DT104', *Applied and Environmental Microbiology*, vol. 82, no. 8, pp. 2516-26.

Letchworth, GJ, Rodriguez, LL & Del Cbarrera, J 1999, 'Vesicular Stomatitis', *The Veterinary Journal*, vol. 157, no. 3, pp. 239-60.

Mackenzie, A & Lopez, B 2019, USDA Animal and Plant Health Inspection Service, 19 July 2019.

Martínez, CR, Rubio, EL, Camarillo, SDR, Millán, JVF, Romero, FA, Quintanilla, REL, Álvarez, JFM, Flores, MAS, Escatell, GAS & Martínez, JAÁ 2021, 'Antecedentes y perspectivas de algunas enfermedades prioritarias que afectan a la ganadería bovina en México', *Revista mexicana de ciencias pecuarias*, vol. 12, no. 111-48.

McCluskey, BJ & Mumford, EL 2000, 'Vesicular stomatitis and other vesicular, erosive, and ulcerative diseases of horses', *Veterinary Clinics of North America: Equine Practice*, vol. 16, no. 3, pp. 457-69.

McKenna, SLB, Keefe, GP, Barkema, HW, McClure, J, VanLeeuwen, JA, Hanna, P & Sockett, DC 2004, 'Cow-level prevalence of paratuberculosis in culled dairy cows in Atlantic Canada and Maine', *Journal of Dairy Science*, vol. 87, no. 11, pp. 3770-7.

More, SJ, Radunz, B & Glanville, R 2015, 'Lessons learned during the successful eradication of bovine tuberculosis from Australia', *Veterinary Record*, vol. 177, no. 9, pp. 224-32.

Neill, S, Pollock, J, Bryson, D & Hanna, J 1994, 'Pathogenesis of Mycobacterium bovis infection in cattle', *Veterinary Microbiology*, vol. 40, no. 1-2, pp. 41-52.

NSW DPI 2023, *DPI Primefact - Brucellosis (Brucella suis) in pigs*, by NDoP Industries.

Ortiz, AP, Perea, C, Davalos, E, Velázquez, EF, González, KS, Camacho, ER, García Latorre, EA, Lara, CS, Salazar, RM & Bravo, DM 2021, 'Whole Genome Sequencing Links Mycobacterium bovis From Cattle, Cheese and Humans in Baja California, Mexico', *Frontiers in Veterinary Science*, vol. 8, p. 674307.

Palmer, MV, Waters, WR & Whipple, DL 2004, 'Investigation of the transmission of *Mycobacterium bovis* from deer to cattle through indirect contact', *American Journal of Veterinary Research*, vol. 65, no. 11, pp. 1483-9.

Patterson, W, Jenney, E & Holbrook, A 1955, 'Experimental infections with vesicular stomatitis in swine: I. transmission by direct contact and feeding infected meat scraps. ', in *Annual Meeting of the United States Livestock Sanitary Association*, p. 368.

Phillips, C, Foster, C, Morris, P & Teverson, R 2003, 'The transmission of *Mycobacterium bovis* infection to cattle', *Research in Veterinary Science*, vol. 74, no. 1, pp. 1-15.

PIRSA 2024, *Brucella suis*, Government of South Australia, Department of Primary Industries and Regions, viewed 4 March 2024, <[Reis Júnior, J, Mead, D, Rodriguez, LL & Brown, CC 2009, 'Transmission and pathogenesis of vesicular stomatitis viruses', *Brazilian Journal of Veterinary Pathology*, vol. 2, no. 1, pp. 49-58.](https://pir.sa.gov.au/biosecurity/animal_health/animal_species/pigs/brucella_suis#:~:text=%2Dto%2Dperson,-,Brucella%20suis%20in%20South%20Australia,some%20distance%20since%20infection%20occurred.>.</p></div><div data-bbox=)

Ridpath, J, Bolin, S & Dubovi, E 1994, 'Segregation of bovine viral diarrhea virus into genotypes', *Virology*, vol. 205, no. 1, pp. 66-74.

Rodríguez-Vivas, RI, Grisi, L, Pérez de León, AA, Villela, HS, Torres-Acosta, JFdJ, Fragoso Sánchez, H, Romero Salas, D, Rosario Cruz, R, Saldierna, F & García Carrasco, D 2017, 'Potential economic impact assessment for cattle parasites in Mexico. Review', *Revista mexicana de ciencias pecuarias*, vol. 8, no. 1, pp. 61-74.

Rojas, MT, Guerrero, JAV, Rodríguez, NER, Bernabé, SL, Carranza, BV, Fresán, MUA & Ordóñez, VV 2011, 'Antibiotic resistance of *Salmonella* spp strain genotypes isolated from pigs slaughtered at abattoirs in the Estado de Mexico', *Veterinaria México*, vol. 42, no. 4, pp. 269-76.

RW, S 1996, 'Transmission of Paratuberculosis', *Veterinary Clinics of North America: Food Animal Practice*, vol. 12, pp. 305-12.

Sadler, WW 1960, 'Present evidence on the role of meat in the epidemiology of human brucellosis', *American Journal of Public Health and the Nations Health*, vol. 50, no. 4, pp. 504-14.

Seddon, H & Albiston, H 1965, *Diseases of domestic animals in Australia: part 5. bacterial diseases, 2nd edn*, Department of Health, Canberra.

Seleem, MN, Boyle, SM & Sriranganathan, N 2010, 'Brucellosis: a re-emerging zoonosis', *Veterinary Microbiology*, vol. 140, no. 3-4, pp. 392-8.

SENASICA 1996, *NOM-041-ZOO-1995 National Campaign against Brucellosis in Animals*, by SaQS National Agri-Food Health.

— 2019, *Mexico and Guatemala agree on health control processes for the legal introduction of cattle from Central America*, by IYCA Servicio Nacional De Sanidad.

Sergeant, E, Happold, J & Langstaff, I 2017, 'Evaluation of Australian surveillance for freedom from bovine tuberculosis', *Australian Veterinary Journal*, vol. 95, no. 12, pp. 474-9.

Smith, PF, Howerth, EW, Carter, D, Gray, EW, Noblet, R, Berghaus, RD, Stallknecht, DE & Mead, DG 2012, 'Host predilection and transmissibility of vesicular stomatitis New Jersey virus strains in domestic cattle (*Bos taurus*) and swine (*Sus scrofa*)', *BMC veterinary research*, vol. 8, pp. 1-9.

Standards Australia 2023, *AS 4696:2023 Hygienic production and transportation of meat and meat products for human consumption*, Standards Australia, Sydney, <<https://store.standards.org.au/product/as-4696-2023>>.

Statista n.d, *Number of slaughtered cattle in the United States from 2000 to 2022*, viewed 4 March 2024, <<https://www.statista.com/statistics/194357/total-cattle-slaughter-in-the-us-since-2000/>>.

Thompson, RCA 2020, 'The molecular epidemiology of Echinococcus infections', *Pathogens*, vol. 9, no. 6, pp. 453.

Tomaselli, M, Elkin, B, Kutz, S, Harms, NJ, Nymo, HI, Davison, T, Leclerc, L-M, Branigan, M, Dumond, M & Tryland, M 2019, 'A transdisciplinary approach to Brucella in muskoxen of the western Canadian Arctic 1989–2016', *EcoHealth*, vol. 16, pp. 488-501.

USDA 2003, *Brucellosis eradication: uniform methods and rules, effective October 1, 2003*, by Animal and Plant Health Inspection Service

— 2014a, *Protocol for the import of bovines from Mexico for immediate slaughter*, by Animal and Plant Health Inspection Service

— 2014b, *Serotypes Profile of Salmonella Isolates from Meat and Poultry Products January 1998 through December 2014*, by Food Safety and Inspection Service

— 2018, *Protocol for the importation of cattle or bison from Canada to the United States*, by Animal and Plant Health Inspection Service

— 2020, *2020 vesicular stomatitis virus (VSV) situation report – November 13, 2020*, by Animal and Plant Health Inspection Service

— 2021, 'Classify Canada as level 1 for bovine tuberculosis and brucellosis', *Federal Register*, vol. 86, no. 245, pp. 73238-9.

— 2022a, *Protocol for the importation of sexually intact bovines from Mexico to the United States*, by Animal and Plant Health Inspection Service

— 2022b, *U.S. protocol for the import of steers and spayed heifers, cattle and bison (feeders) from Mexico*, by Animal and Plant Health Inspection Service

— 2023a, *Import of live cattle and bison from Mexico to the United States*, Animal and Plant Health Inspection Service, viewed 4 March 2024, <<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-and-animal-product-import-information/live-animal-imports/ruminants/live-cattle-bison-germplasm/import-live-cattle-bison-mexico>>.

— 2023b, *National Tuberculosis Eradication Program*, Animal and Plant Health Inspection Service, viewed 4 March 2024, <<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/cattle-disease-information/national-tuberculosis-eradication-program>>.

— 2023c, *Voluntary 2023 U.S. National Animal Health Reporting System (NAHRS) reportable diseases, infections, and infestations list*, by Animal and Plant Health Inspection Service

— 2023d, *VS Bulletin 2023.1 - Bovine tuberculosis testing requirements for cattle imported to the United States from Mexico*, by Animal and Plant Health Inspection Services

— 2024a, *Import of live cattle and bison from Canada to the United States*, Animal and Plant Health Inspection Service, viewed 4 March 2024, <<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-and-animal-product-import-information/live-animal-imports/ruminants/live-cattle-bison-germplasm/import-live-cattle-bison-canada>>.

— 2024b, *Livestock and meat international trade data*, Economic Research Service, viewed 4 March 2024, <<https://www.ers.usda.gov/data-products/livestock-and-meat-international-trade-data/livestock-and-meat-international-trade-data/#Annual%20and%20Cumulative%20Year-to-Date%20U.S.%20Livestock%20and%20Meat%20Trade%20by%20Country>>.

Valle-Reyes, S, Lizama-Munguía, T, Salazar-Barragán, JA, Soto-Castellan, JB, Verjón-Carrillo, EJ, Espinoza-Gómez, F, Rios-Flores, PA, Ceja-Espíritu, G, Delgado-Enciso, I & López-Lemus, UA 2019, 'Anthrax-based epidemiological surveillance in Western Mexico', *Journal of Global Infectious Diseases*, vol. 11, no. 2, pp. 87-8.

VanLeeuwen, JA, Keefe, GP, Tremblay, R, Power, C & Wichtel, JJ 2001, 'Seroprevalence of infection with *Mycobacterium avium* subspecies paratuberculosis, bovine leukemia virus, and bovine viral diarrhoea virus in maritime Canada dairy cattle', *The Canadian Veterinary Journal*, vol. 42, no. 3, p. 193.

Walker, PJ, Siddell, SG, Lefkowitz, EJ, Mushegian, AR, Adriaenssens, EM, Alfenas-Zerbini, P, Dempsey, DM, Dutilh, BE, García, ML & Curtis Hendrickson, R 2022, 'Recent changes to virus taxonomy ratified by the International Committee on Taxonomy of Viruses (2022)', *Archives of virology*, vol. 167, no. 11, pp. 2429-40.

WOAH 2013, *Vesicular stomatitis*, ed. WOAH Health, World Organisation for Animal Health, Paris, <<https://www.woah.org/en/what-we-do/standards/codes-and-manuals/previous-editions-of-the-terrestrial-code/>>.

— 2023a, *Diseases, infections and infestations listed by WOAH*, ed. WOAH Health, World Organisation for Animal Health, Paris, viewed 4 March 2024, <<https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmlfile=sommaire.htm>>.

— 2023b, *Infection with *Brucella abortus*, *B. melitensis* and *B. suis** World Organisation for Animal Health, Paris, <<https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/>>.

— 2023c, *Infection with *Echinococcus granulosus* (version adopted in 2022)*, World Organisation for Animal Health, Paris, <<https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/>>.

— 2023d, *Terrestrial Animal Health Code*, ed. World Organisation for Animal Health, World Organisation for Animal Health, Paris, <<https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/>>.

— 2024, *World Animal Health Information System (WAHIS)*, World Organisation for Animal Health, Paris, 04/03/2024.